HATFIELD AERODROME, HERTFORDSHIRE

Planning Application for a new quarry and ancillary facilities on land at the former Hatfield Aerodrome

Volume 2

ENVIRONMENTAL STATEMENT

SLR Ref: 403.06559.00029
Rev. FINAL
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EIA Quality Mark

This Environmental Impact Assessment Report, and the Environmental Impact Assessment (EIA) carried out to identify the significant environmental effects of the proposed development, was undertaken in line with the EIA Quality Mark Commitments.

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INTRODUCTION

1.1 This document comprises an Environmental Statement ('ES') and has been prepared by SLR Consulting Limited ('SLR') on behalf of Brett Aggregates Limited ('the applicant'). The ES forms part of a package of documents being formally submitted to Hertfordshire County Council (as Mineral Planning Authority, or 'MPA') in support of a re-submitted planning application in respect to land at Hatfield Aerodrome, near Hatfield.

1.2 The applicant is re-submitting a planning application for the establishment of a new quarry on land at the former Hatfield Aerodrome (referred to as the application site), being part of the allocated site referred to in the extant Minerals Local Plan[1] (refer to Chapter 4 below for further information on the policy framework for the area). The proposals would involve the winning and working, together with processing for sale, of sand and gravel over a period of around 32 years. In parallel with the extraction of minerals would be the importation of low permeability inert material to infill the mineral workings to facilitate the restoration of the site to a beneficial after use, combining recreation and nature conservation. The imported material would typically comprise excavation wastes from construction and engineering projects (soils, overburden, clays etc.) within the region. This is set out further in paragraph 1.10 below, and Chapter 3 of this ES.

1.3 This ES aims to provide an objective account of the possible significant environmental effects of the proposed development by setting out the results of the Environmental Impact Assessment ('EIA') which has been undertaken. It is intended to provide the MPA with sufficient information to determine the planning application having due regard to the protection of the local amenity and the environment as a whole. The ES has been prepared in line with the framework provided in the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 with cognisance of the guidance set out in the online National Planning Practice Guidance and The Institute of Environmental Management and Assessment's (IEMA) "*Guidelines for Environmental Impact Assessment*".

Application Submission Package

1.4 This ES comprises the second of two volumes submitted to the MPA to accompany the planning submission. In addition to the formal planning application forms and certificates, the full submission comprises:

- Volume 1 - Planning Statement;
- Volume 2 - Environmental Statement (this document);
  - Volume 2A – ES Text;
  - Volume 2B – ES Technical Appendices; and
  - Volume 2C – A Non-Technical Summary of the ES.

[1] "Preferred Area 1", and illustrated on Inset Map 6 within the Mineral Local Plan

1.5 The Planning Statement supports the planning submission and considers the proposals in the context of relevant planning policies in the Development Plan, and other material considerations, such as national planning policy and 'need'.

1.6 The Non-Technical Summary (NTS) has been produced as a separate, standalone document in line with best practice prescribed by the Institute of Environmental Management and Assessment (IEMA) to accompany the planning submission, being a mandatory part of the ES. The purpose of the NTS is to provide, in non-technical language, a brief summary of the likely significant effects that the proposed development would have on the environment.

The Site

1.7 Land to which the planning application relates (referred to as '*the application site*') is located on the north-western edge of Hatfield and to the east of St Albans on land associated with the former Hatfield Aerodrome. It lies within an area bounded by the A1057 (Hatfield Road/St Albans Road) to the south, Oaklands Lane to the west, Coopers Green Lane to the north and the western fringe of Hatfield to the east.

1.8 The application site covers an area of around 87.1ha and comprises the southern part of the former aerodrome.

1.9 Chapter 2 within this Volume provides further information on the application site and its environs.

The Proposed Development

1.10 A planning application was submitted in January 2016 (application reference 5/0394-16) for the extraction of 8 million tonnes (Mt) of sand and gravel along with the installation of ancillary buildings, plant and machinery (including a concrete batching plant) on land at the former Hatfield Aerodrome. The planning application was accompanied by a comprehensive ES (the '2016 ES') which identified the likely significant effect of the development. Despite an initial resolution to approve (in January 2017), the planning application was refused by the planning committee at its meeting on 24 September 2020, with the decision notice issued on 6 January 2021. The reasons cited for refusing the application are set out in the Planning Statement (Volume 1).

1.11 The applicant is re-submitting a planning application for the establishment of a new quarry. As before, the proposals would involve the winning and working, together with processing for sale, of some 8Mt of sand and gravel over a period of around 32 years (based on an annual output of around 250,000tpa).

1.12 The quarry would be worked in a phased basis and allow for progressive restoration through the importation of inert materials to backfill the void; this minimises the amount of land taken at any one time. Sand and gravel would be worked from two discrete horizons; the Upper Mineral Horizon ('*UMH*'), which lies predominantly above the water table, would be worked dry whilst the Lower Mineral Horizon ('*LMH*') would be worked wet (i.e. no dewatering of the workings). The two mineral horizons are separated by a seam of boulder clay (referred to as '*interburden*') which would be used as part of the restoration scheme for the workings.

1.13 Excavated material would be processed at the quarry using a combination of screening and washing plant to produce a range of graded aggregates and sands. Processed aggregates would be dispatched from the site in HGVs. Processed aggregates would be exported via a new access constructed onto the A1057 (Hatfield Road) on the southern side of the application site.

1.14 Other ancillary development would include a weighbridge, office accommodation, fresh water and silt lagoons.

1.15 In view of the recent refusal to grant planning permission, the applicant has amended the scheme as follows:

- the erection and operation of a concrete batching plant has been removed from the proposals;
- the standoff for mineral extraction operations in the Lower Mineral Horizon (LMH) to the bromate plume (also in the LMH) will be increased from 50m to 100m;
- there will be no dewatering (pumping) of the LMH; and
- The access road from the quarry entrance will be moved by 5m to the east to allow additional acoustic screening.

1.16 Further details of the proposed development are set out in Chapter 3 below.

The Applicant

1.17 Brett Aggregates Limited (Brett) is the wholly owned subsidiary company of Robert Brett and Sons Limited (Brett Group), the Canterbury based aggregates, building materials and concrete products independent business which was established over a century ago. It is the largest independent producer of sand and gravel in the UK.

1.18 Brett manages all of its quarry, marine dredged aggregate, recycled aggregates and coated stone operations and serves Kent, East Sussex, Surrey, Berkshire, Buckinghamshire, Hertfordshire, Essex, Suffolk and London.

1.19 Brett has an enviable record of operating and restoring its quarries of which it is justifiably proud. It has achieved far more awards for the quality of its work, than any other independent company in the industry. In all, it has won over 50 awards, not only made by quarry industry associations in this country but also by European bodies concerned with care for the environment.

1.20 Brett operates an integrated management system, certified to: ISO 14001; BES 6001; and ISO 9001 at each of its sites and the proposed operations at Hatfield Aerodrome (should planning permission be granted) would be integrated into the system

ENVIRONMENTAL IMPACT ASSESSMENT

1.21 Environmental Impact Assessment ('EIA') is an important procedure for ensuring that the likely effects of a new development on the environment are fully understood and taken into account before the development is allowed to proceed. The term EIA describes a procedure that must be followed for certain types of development before they are given "*development consent*", which in the UK includes the grant of a planning permission. The procedure is a means of drawing

together, in a systematic way, an assessment of a project's likely significant environmental effects.

1.22 An ES is a report of an EIA that is required to be submitted with a planning application for major and other developments that are likely to have significant impacts on the environment. It evaluates the likely environmental impacts of the development, together with an assessment of how the severity of the impacts could be reduced.

1.23 **Appendix 1/1** within this volume provides further information on the legislative requirements regarding EIA and in particular, how the scope of the EIA has been derived.

PLANNING AND ENVIRONMENTAL PERMIT

1.24 The proposals for the importation of inert fill material would be governed by an Environmental Permit issued by the Environment Agency in addition to a planning permission. The Environmental Permit will contain a number of conditions intended to regulate the day to day management of the site with the aim of minimising the effect of the operation on the environment; it will also contain conditions regulating site management and monitoring.

1.25 Government advice on planning makes it clear that it is important to avoid unnecessary or confusing duplication. For example, National planning policy states that *"The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities*." (paragraph 188, National Planning Policy Framework).

THE SUBMISSION AND ITS STRUCTURE

1.26 The first section of this ES provides an overview of the submission and the regulatory framework in which it sits. Subsequent sections of the ES provide a description of the application site; set out its planning history; describe the development proposals; set out the relevant planning policy considerations and alternatives; and then provide individual and cumulative analysis and evaluation of the likely significant effects of the development on the human and natural environment. Where potential environmental effects are identified, mitigation strategies are secured against the impact and residual effects are assessed. As such, the ES is intended to provide the MPA with sufficient information to determine the planning application having due regard to the protection of local amenity and the environment as a whole.

1.27 This document is organised and presented in the following way:

Background Information (Chapters 1-5) – This part of the ES is descriptive in nature. It provides the reader with an overview of the application site and its surrounding environs alongside a description of the development for which planning permission is being sought. It provides an overview of the legislative requirements relating to EIA. Finally, the relevant planning policies at both a local and national level are outlined and alternatives to the proposed development are considered.

Environmental Assessments (Chapters 6-14) – For each environmental topic, a package of relevant background information and data is provided and the potential effects are considered. Where appropriate, mitigation measures are suggested and any residual effects are considered. Taking into consideration the results of the scoping exercise, the following environmental assessments have been undertaken:

- Chapter 6 Water Environment (Hydrology and Hydrogeology)
- Chapter 7 Transport
- Chapter 8 Landscape and Visual Impact
- Chapter 9 Air Quality
- Chapter 10 Noise
- Chapter 11 Ecology
- Chapter 12 Cultural Heritage
- Chapter 13 Health
- Chapter 14 Cumulative Impacts

Project Team

1.28 SLR is a multi-disciplinary environmental consultancy to *inter alia* the minerals, energy and waste management industries, and also provides advice to local authorities and the Environment Agency on strategic issues. SLR is a registered Environmental Impact Assessor Member of the Institute of Environmental Management and Assessment (IEMA) and has secured the EIA Quality Mark awarded by IEMA.

1.29 In preparing this submission package, SLR has drawn upon the expertise of an in-house team of specialists comprising planners, landscape architects and environmental scientists for the majority of the technical assessments. SLR has also worked with Andrew Josephs (of Andrew Josephs Associates) who produced the original cultural heritage assessment in the 2016 ES. SLR has also worked closely with the management teams and technical staff of Brett Aggregates Limited, as part of an iterative process, to ensure that the proposed development is practical, feasible and optimises environmental protection.

Publication

1.30 Paper copies of the ES can be obtained from SLR Consulting Ltd at the following address:

15 Middle Pavement
Nottingham
NG1 7DX

1.31 The ES, along with the other Volumes to the submission, is available in both paper and CD-ROM format, for which a charge of £250 and £25 is applicable respectively. A copy of the NTS is available free of charge on request. In addition, the application documents will also be available to download from the Hertfordshire County Council website.

STATEMENT OF COMPETENCE

1.32 The EIA Regulations introduces a new requirement for the "*developer to ensure that the environmental statement is prepared by competent experts*", with the environmental statement to be "*accompanied by a statement from the developer outlining the relevant experience and qualifications of such experts*" [refer to Regulation 5 (5) (a) and (b)].

1.33 The EIA Report has been prepared by SLR Consulting Ltd which has a specialist capability in mineral and waste planning. SLR is a member of the 'Institute of Environmental Management and Assessment' (IEMA) with an awarded EIA 'Quality Mark'. The EIA Quality Mark is a voluntary scheme, operated by IEMA through which EIA activity is independently reviewed, on an annual basis, to ensure it delivers excellence in the following areas:

- EIA Management
- EIA Team Capabilities
- EIA Regulatory Compliance
- EIA Context & Influence
- EIA Content
- EIA Presentation
- Improving EIA practice

1.34 The EIA Report has been prepared by professional consultants with appropriate skills and experience to be considered to be 'competent experts' as defined by the EIA regulations.

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INTRODUCTION

2.1 This chapter describes the existing physical and environmental characteristics of the application site and its surrounding environs. Allied to this, a number of the chapters within this volume provide descriptions of the application site in relation to particular environmental topics, providing *inter alia* 'baseline' surveys.

2.2 In this respect, Chapter 6 considers the water environment whilst Chapter 7 describes the local highway network. Chapter 8 describes the landscape character and topography of both the application site and its surroundings and Chapter 9 describes local air quality. The noise environment is described in Chapter 10, with ecological features within the application site described in Chapter 11. Finally features of cultural heritage interest are described in Chapter 12.

LOCATION

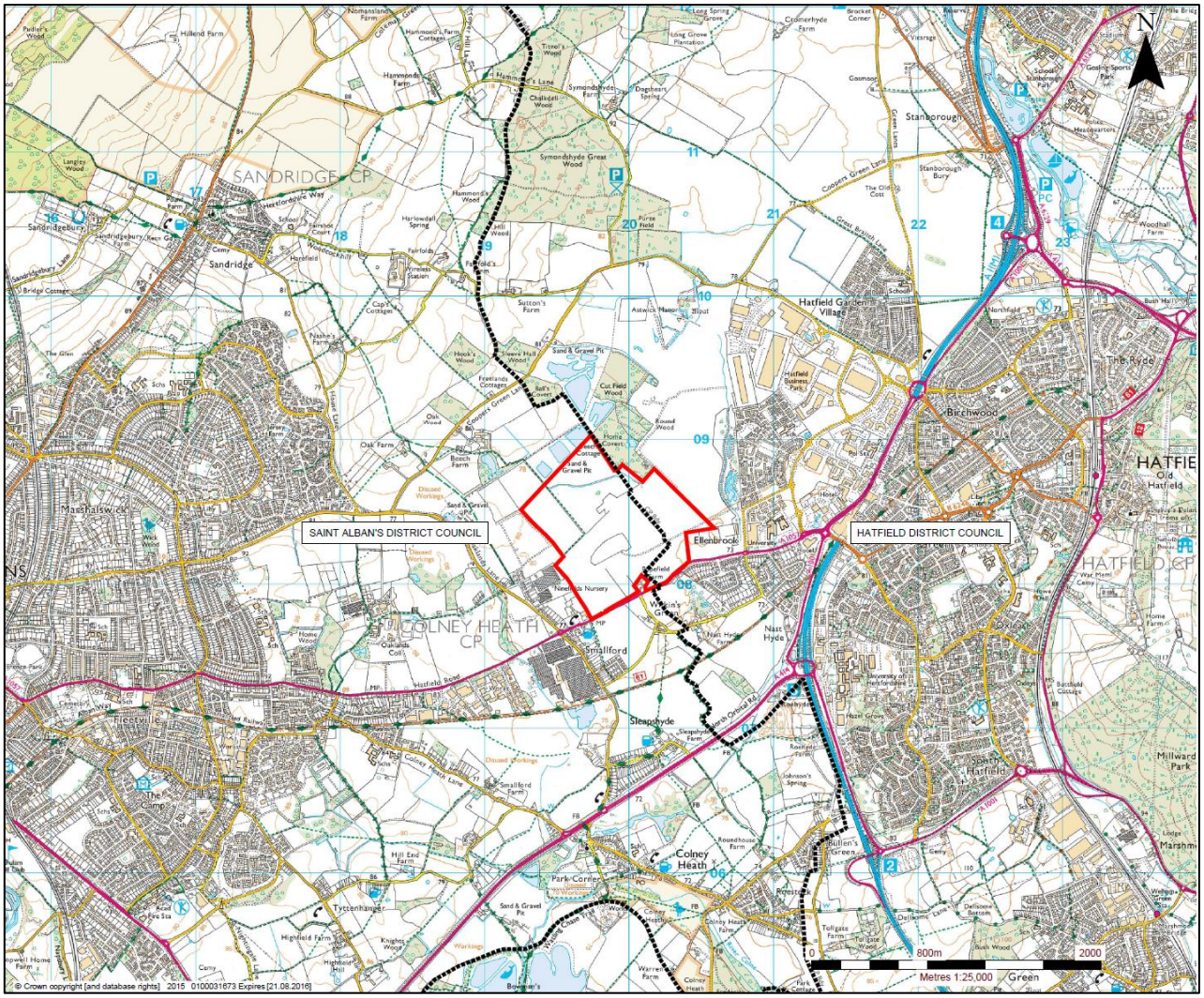
2.3 The application site is located on the north-western edge of Hatfield and to the east of St Albans on land associated with the former Hatfield Aerodrome.

2.4 It lies within an area enclosed by the A1057 (Hatfield Road/St Albans Road) to the south, Oaklands Lane to the west, Coopers Green Lane to the north and the western fringe of Hatfield to the east. For identification purposes the application site is centred on National Grid Reference (NGR) TL 199084.

2.5 In terms of local governance, the application site is located in the county of Hertfordshire and straddles the boundary between the districts of St Albans and Welwyn Hatfield (the boundary between the two districts being shown by a solid black line on Figure 2-1 with St Albans lying to the west of the line).

2.6 Figure 2-1 illustrates the location of the applications site, being an extract from **Drawing HQ 2/1.**

Figure 2-1
Site Location



SITE DESCRIPTION

Context

2.1 The application site covers an area of approximately 87.1 hectares (ha) and comprises the southern part of the former aerodrome. It is the same area as applied for in the previous planning application ref. 5/0394-16 (see Chapter 1). The application site comprises a broadly rectangular area of unoccupied land that is used for grazing, but is also crossed by a number of informal paths allowing public access. As such, the application site does not have any dominant land use at the current time following the closure of the aerodrome.

Figure 2-2
Site Context – Aerial Photograph (Google Earth Imagery dated October 2020)



2.2 The application site is bounded by the A1057 (Hatfield Road) to the south, the boundary of which is characterised by a mature hedgerow. To the north lie CEMEX's Hatfield Quarry, and more specifically a set of silt lagoons. To the west the boundary is predominantly formed by a mature hedgerow, particularly in the vicinity of the garden centre and residential development (see below), with the northern section being more open in aspect. At the north eastern corner is Home Covert, a small area of broadleaf woodland. The eastern boundary cuts across the former aerodrome to join up with the sports pitches located at the south eastern corner of the application site. The approximate extent of the application site is shown edged in red on Figure 2-2 and in more detail on **Drawing HQ 2/2**.

2.3 Within the application site a concrete roadway extends west into the centre of the application site from Albatross Way to the east; a number of other tracks also cross the application site.

2.4 A number of earth bunds and banks are present on site from the earlier aerodrome. There are some remnant hedgerows that cross the site. Since the publication of the 2016 ES the site has not changed significantly in terms of features, vegetation or use; in this respect an aerial image of the site in 2015 is provided in Figure 2-3 below (for comparison with Figure 2-2 above).

Figure 2-3
Site Context – Aerial Photograph (Google Earth Imagery dated 2015)



Topography

2.5 The ground surface falls gently from northwest to southeast across the application site as illustrated on **Drawing HQ 2/3** and described below:

- ground elevations are at their lowest between 74m AOD and 76m AOD adjacent to the A1057 at the southern edge of the application site.
- levels rise to between 77m AOD and 78m AOD) in the northwest and northeast corners of the application site.
- ground elevations are approximately 75m AOD to 76m AOD adjacent to the southwest side of Home Covert.

Land Use

2.6 Following closure of the aerodrome, in common with the adjoining land to the north, the application site does not have any formal land use. Part of the application site is used for conservation cattle grazing (thus having an agricultural connotation), with areas within the western part of the application site forming hay meadow. The application site also enjoys informal recreational uses through a network of linking permissive footpaths through the areas of

grassland and cattle grazing, suitable for walkers and cyclists[1]. Beyond the paths the ground is uneven making it difficult for walking or cycling.

2.7 A formal public footpath is routed in the vicinity of the western boundary of the application site; this path then heads in a north-easterly direction into the site, before heading north-west through the application site to the northern site boundary, where it heads towards Beech Farm. Other rights of way branch off this footpath: one passing through a new housing development (next to Radio Nursery) and another following the western site boundary.

Access

2.8 Vehicular access into the site can currently be gained off Albatross Way at NGR TL 207085. The southern boundary of the application site is formed by the A1057. As set out in Section 3 below, it is proposed that a new access would be constructed onto this road, to the west of Popefield Farm. The A1057 provides a link with the A1(M) at junction 3, together with the A414 and A1001.

Habitats

2.9 Based on the ecological assessment (Chapter 11 of the 2016 ES and this ES) the application site contains the following main habitat types (based on the UKHab classification):

Primary habitat classifications include:

- Other lowland dry acid grassland
- Other neutral grassland
- Modified grassland
- Hedgerow (Priority Habitat)
- Eutrophic standing waters
- Standing open water and canals
- Lines of trees
- Blackthorn scrub
- Bramble scrub
- Mixed scrub
- Building
- Other lowland mixed deciduous woodland
- Developed land/sealed surface

Secondary habitat classifications include:

[1] https://www.enjoystalbans.com/listing/ellenbrook-fields/

- Scattered scrub
- Scattered trees
- Scattered rushes
- Tall herb
- Ruderal/ephemeral
- Plantation
- Semi-natural woodland
- Secondary woodland
- Fresh water man-made
- Freshwater natural
- Grazed
- Bare ground
- Unmanaged
- Green lane
- Nature reserve
- Temporary water bodies
- Ditch
- Recreation ground.

Geology

Regional Geology – London Basin

2.10 The application site is located on the northern limb of the London Basin which forms an asymmetrical syncline with its axis trending southwest-northeast and plunging east. The boundary of the synclinal basin is formed by the Chilterns to the north and the North Downs to the south where the Chalk forms the predominant hard geology.

2.11 The Chalk is subdivided into Lower, Middle and Upper and is overlain in the centre of the London Basin by Paleogene rocks (Thanet Sands, Reading Beds), and the Eocene London Clay. The solid geology beneath the application site comprises the Lewes Nodular Chalk being the lowermost part of the Upper Chalk, with a characteristic hard band close to the Chalk sub crop. The solid geology is overlain by Quaternary superficial deposits comprising glacial gravels infilling valleys cut into the Lewes Nodular Chalk, with boulder clay and clay with flints across higher ground.

Local Geology – Vale of St Albans

2.12 The application site lies within the Vale of St Albans; a broad northeast to southwest orientated plain between higher land to the northwest and southeast. The higher land to the west comprises

Upper Chalk solid geology at outcrop locally with a cover of superficial drift (Clay with Flints). In contrast the higher land to southeast comprises Upper Chalk overlain by the feathering margins of the Lower London Tertiaries and some superficial drift.

2.13 The Vale of St Albans corresponds with the route of a pre-glacial water course (Proto-Thames) that is understood to have flowed northeast into East Anglia[2]. Tertiary period strata are absent beneath the application site and the Vale of St Albans and the chalk solid geology is shown sub cropping[3] beneath a sequence of glacial deposits comprising boulder clay and gravels.

2.14 Within the Vale of St Albans a number of previous studies[4,5,6] have identified three broad superficial drift units comprising an upper and lower granular formations (sands, gravels) separated by thin boulder clay. The following geological sequence is indicated to be present beneath the application site area.

Figure 2-4
Geological sequence within application site

Drift/Solid	Geological Unit
Superficial Drift	Upper Mineral Horizon (UMH)
	Boulder Clay (BC)
	Lower Mineral Horizon (LMH)
Solid Geology	Upper Chalk (Lewes Nodular Chalk)

2.15 The chalk surface contours illustrates that the application site sits within a trough or paleo-valley with the chalk surface rising up to the northwest and southeast and falling towards the northeast and the south. This feature also coincides with the watershed between the River Colne and the River Lea surface water catchments.

Hydrogeology

2.16 Groundwater in the Chalk and the LMH is regionally extensive, hydraulically connected vertically, with an east southeast flow direction beneath the application site.

2.17 The LMH and Chalk aquifer is both confined and unconfined by the overlying interburden in certain areas of the application site and during different times of the year. This is due to:

- seasonal fluctuation of piezometric water levels;
- non uniform interburden base (confining unit); and

[2] Catt J. Hertfordshire Geology and Landscape. 2010.
[3] British Geological Survey Sheet 239 Drift. Hertford. 1978.
[4] Symes D K, 1998: Sand & Gravel Assessment, Hatfield Aerodrome. On behalf of Hertfordshire County Council
[5] Cook S J. The Hydrogeology of Bromate Contamination in the Hertfordshire Chalk: Incorporating Karst in Predictive Models. EngD Thesis UCL. April 2011.
[6] Little J A & Atkinson J H. Some Engineering Properties of Anglian Tills in the Vale of St Albans. QJEG. 21. Pp183-199. 1988.

- inconsistent pumping of the Chalk groundwater plus distance from the Hatfield boreholes.

2.18 Analysis indicates that, although the LMH/Chalk aquifer becomes confined during high water level periods beneath the southern application site, there are periods (between approximately July to December) when the water level drops and the aquifer becomes unconfined in places.

2.19 The application site is located within the outer source protection zone (SPZ2) of two public water supply ('PWS') wells (Hatfield and Colney Heath) located 1,500m southeast and 2,200m south southeast from the application site, respectively. The Hatfield boreholes are not used for public supply. The Colney Heath boreholes are utilised for potable water supply.

2.20 The UMH aquifer is perched on the interburden, has been identified by SLR to be beneath the southern half of the application site and flows in a north to northeast direction. This flow direction coincides with the direction of dip of the interburden surface. The aquifer is seasonally confined and unconfined and its saturated thickness varies across the southern half of the application site between 3.0m and 0.3m.

Hydrology

2.21 The application site lies on or near what is considered to be the watershed between the River Colne catchment to the south-southwest and the River Lea to the northeast.

2.22 Two surface water streams are present on and in the vicinity of the application site:

1) Ellenbrook - which rises to the east northeast of the application site (within the remaining land associated with the former aerodrome) and flows south along the eastern perimeter of the former aerodrome site.

2) Nast - which flows onto site from the west-northwest and then flows southeast across the application site in a shallow open channel and then though a culvert beneath the former runway. It outfalls on the northern side of the A1057 before entering a culvert that passes beneath the road. Its route from the A1057 is not known but it is thought to either pass south beneath the adjacent housing estate or run east beneath the A1057 to the top of Ellenbrook Lane where a culvert outfalls into an open channel that flows south down the eastern side of Ellenbrook Lane and joins Ellenbrook as it outfalls from a culvert midway down the road.

2.23 To the west of the application site is the Butterwick Brook, which flows roughly north – south parallel with the Site's western boundary. This brook joins the Ellenbrook at Colney Heath which then joins the River Colne a further 400m downstream.

THE SURROUNDING AREA

Landscape

2.24 The broader area around the application site is typically flat. "Area 31 De Havilland Plain" within the Welwyn Hatfield Landscape Character Assessment (Hertfordshire Landscape Strategy) describes how it "*represents a subtle watershed between the Colne and the Lea. Levels vary by as*

little as 2-3m over 6km. The land rises locally to the west and south". The altitude range is describes as "*Typically around the 80m contour but falling to 70m at Ellenbrook and rising to 100m within the undulating grounds of Oakland College on the edge of St Albans*."

2.25 The Ellen Brook runs in a north to south direction approximately 300m east of the proposed mineral extraction area. As noted above, the River Nast currently runs in a culvert across the application site.

2.26 There are blocks of woodland to the north of the application site, including Home Covert, Cut Field Wood and Ball's Covert and areas of ancient woodland within 5km of the application site (Symondshyde Great Wood, Home Wood, Oak Wood, Hazel Grove and Hooks Wood).

2.27 "*Area 31 De Havilland Plain*", describes how there is very limited woodland cover, few hedgerows (except to some of the roads) and few isolated trees. The vast majority of the land has been disturbed over the last century. Some of the former mineral workings support a mix of flooded gravel pits, scrub and marshland habitats.

2.28 Whilst not a landscape designation, the application site is located within a Green Belt.

Land Use

2.29 To the south of the application site the area is rural, interspersed with small settlements, areas of woodland and the highway network; clusters of housing can be found fronting the highway network, often being developed around road junctions. An area of industrial development lies to the south of the A1057, west of Station Road (in the vicinity of Smallford). To the southwest of the application site are a garden centre (operated by Notcutts), a public house, a petrol station and a small residential area.

2.30 To the north, the area is similarly rural. Immediately to the north are a series of lagoons associated with an existing mineral working (Hatfield Quarry, CEMEX); the processing plant lies to the northwest of the application site, having its access off Oaklands Lane. Also immediately to the north is an area of woodland (Home Covert).

2.31 To the east of the application site is the urban area of Hatfield, with an industrial/distribution estate, residential development and the University of Hertfordshire campus present. Between the application site and Hatfield lie the remainder of the former aerodrome, surface water drainage infrastructure (an open drain and series of lagoons, known as Ellenbrook Linear Park) and some sports pitches and associated pavilion. An outline planning application has been lodged for a large-scale mixed use development including 1,100 new homes and supporting infrastructure including a primary school, local centre and open space within this area (application 6/2018/2768/OUTLINE).

2.32 Finally, to the west the rural aspect gives way to the urban area of St Albans.

Sensitive Receptors

2.33 Based on the MAGIC website, within 2km of the site boundary there are no:

- Areas of Outstanding Natural Beauty

- National Nature Reserves
- Sites of Special Scientific Interest
- Special Protection Areas
- Special Areas of Conservation
- Ramsar Sites
- Scheduled Monuments
- Registered Battlefields
- Registered Parks and Gardens

Land Use Designations - Ecology

2.34 Based on the MAGIC website, within 2km of the site boundary there are:

- Five areas of ancient woodland:
  - Symondshyde Great Wood
  - Home Wood
  - Oak Wood
  - Hazel Grove
  - Hooks Wood
- One Local Nature Reserve
  - Colney Heath

2.35 Based on information provided by Herts Environmental Records Centre (refer to Chapter 11 of this ES) there are 15 Local Wildlife sites within 2km of the boundary of the application site. The closest is Home Covert, which lies adjacent to the application site.

Land Use Designations - Heritage

2.36 There are several listed buildings in the vicinity of the application site. The closest (being a cluster of three) are located at Popefield Farm on the southern boundary:

- Popefield Farmhouse;
- Granary and adjoining outbuilding;
- Barn range.

2.37 Two more are located close to the southwestern corner of the application site:

- Milepost approximately 70 metres east north east of the Three Horseshoes Public House;
- Three Horseshoes Public House

2.38 Seven more listed buildings are located along Wilkins Green Lane.

Residential/Human Receptors

2.39 The nearest property to the application site is Popefield Farm, which fronts the northern side of the A1057. Further to the south is Wilkinsgreen Farm, beyond which is a small cluster of properties.

2.40 To the southwest are a number of properties on the south side of Hatfield Road and east of Station Road, with a further small row of properties located off Oaklands Lane to the west of the application site. A housing development has been established off Oaklands Lane (Pasture View) to the west of the application site, with a further small residential development (Jove Gardens) established on land to the north of the garden centre.

2.41 A small residential area lies to the southeast of the application site centred on Poplars Close, Poplar Avenue and Bramble Road (known as Ellenbrook). Other residential properties front the northern side of Wilkins Green Lane to the south of this area. A larger residential area can be found on the western edge of Hatfield, with the nearest properties being on Nimrod Drive, Flamingo Close and Walker Grove (all off Cunningham Avenue).

SITE HISTORY

2.7 Based on a review of historical maps from the period 1937 to 2011 the salient features are mentioned in Table 2-1 below.

Table 2-1
Historical Map Features Summary

Year	Site	Wider Area
1937	• The application site comprises fields and pasture. • Home Covert is as today with a small cottage, a pond and paths crossing through the woodland. • The Nast follows its current open water and culverted route. • The Ellenbrook is not recorded. • A Race Track occupies an area northwest of Popefield Farm	• East: Fields and pasture. • West: Fields and pasture. • North: Astwick Manor, fields and woodland. • South: Some housing, nursery/greenhouses and fields.
1960	• The application site is completely within the former Hatfield Airfield with the runway extending northeast to southwest across the centre of the application site, with part of the taxiway skirting the southern side of the development area. • Home Covert is an area of woodland on the northwestern boundary that appears to occupy the same area as today. • Remaining areas appear to be open and	• East: Airfield and aircraft works to the northeast • West: Woodland and fields • North: Astwick Manor, fields and woodland. • South: Housing, nursery/greenhouses and fields

Year	Site	Wider Area
	undeveloped. • The Nast is shown flowing onto site at the northwestern boundary before ending on the northern side of the runway where it enters a culvert (as today) • The Ellenbrook is not recorded.	
1975	• As 1960	• As 1960
1990	• As 1975	• As 1975
1999	• As 1960 • The outline of a small rectangular industrial area north of Home Covert is suspected to be related to aerodrome operations in the 1990s. Further examinations of historical aerial photographs of this feature are intriguing but not entirely clear. • A small area southwest of Home Covert is an aircraft parking stand with a fire training area. Further detail is shown on the historical aerial photographs • The Ellenbrook is not present	• The aerodrome works buildings have been removed and new commercial buildings are cover about 30% of the former aerodrome works.
2006	• The runway has been removed. • The taxiway remains. • The rectangular area northeast of Home Covert remains. • Ellenbrook is present in its current form.	• The runway has been removed and has been largely replaced with commercial warehouse-like buildings and some residential properties. • Aircraft works buildings southeast of the aerodrome taxi-way have been demolished and are in the process of being replaced with new commercial buildings. • Hatfield University buildings/campus is in place. • Ellenbrook balancing lagoons are in place adjacent to the application site.
2011	• The runway has been removed. • The taxiway remains. • The rectangular area northeast of Home Covert remains. • The Nast remains culverted across the application site. • The Ellenbrook is in place.	• Northeast: The aerodrome buildings have been redeveloped with additional commercial buildings. • Residential property has been built east of Ellenbrook. • Hatfield University is built to the south of the residential buildings. • Northwest: Mineral extraction and lagoons are present along the northwestern site boundary.

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INTRODUCTION

3.1 Under Regulation 18(4)(b) of the EIA Regulations (see Appendix 1-1) an ES should provide a as a minimum "*a description of the proposed development comprising information on the site, design, size and other relevant features of the development*". Schedule 4 indicates that, where relevant, the ES should provide a description of the development, including in particular:

- a description of the location of the development;
- a description of the physical characteristics of the whole development;
- a description of the main characteristics of the operational phase of the development
- an estimate of expected residues and emissions and quantities and types of waste produced during the construction and operation phases.

3.2 In addition, it is normal practice for planning applications for mineral development to be accompanied by a supporting statement that describes, inter alia, the development proposals. As such, there is an overlap in the requirements of an ES and what is considered good practice for the submission of planning applications. Accordingly, Volume 1 (Planning Statement) also includes a description of the development. This chapter sets the basis against which the EIA has been conducted.

OVERVIEW OF THE DEVELOPMENT PROPOSALS

3.3 The applicant is re-submitting a planning application for the establishment of a new quarry on land at the former Hatfield Aerodrome, being part of the allocated site referred to in the extant Minerals Local Plan ("*Preferred Area 1*", and illustrated on Inset Map 6 - refer to Chapter 4 below for further information). The proposals would involve the winning and working, together with processing for sale, of some 8Mt of sand and gravel over a period of around 30 years (based on an annual output of around 250,000tpa). In parallel with the extraction of minerals would be the importation of low permeability inert material to infill the mineral workings to facilitate the restoration of the site to a beneficial after use, combining recreation and nature consideration. The imported material would typically comprise excavation wastes from construction and engineering projects (soils, overburden, clays etc.) within the region.

3.4 In view of the recent refusal to grant planning permission, the applicant has amended the scheme as follows:

- the erection and operation of a concrete batching plant has been removed from the proposals;
- the standoff for mineral extraction operations in the Lower Mineral Horizon (LMH) to the bromate plume (also in the LMH) has been increased from 50m to 100m;
- there will be no dewatering (pumping) of the LMH; and
- The access road from the quarry entrance has been moved by 5m to the east to allow additional acoustic screening.

3.5 The quarry would be worked on a phased basis to allow for progressive restoration; this minimises the amount of land taken at any one time. Sand and gravel would be worked from two discrete horizons; the Upper Mineral Horizon ('UMH'), which lies predominantly above the water table, would be worked dry whilst the Lower Mineral Horizon ('LMH') would be worked wet (i.e. no dewatering of the workings). Above the UMH is a clayey material (referred to as '*overburden'*) on top of which is the soil horizon. The two mineral horizons are separated by a laterally continuous layer of boulder clay (referred to as '*interburden'*): the overburden and interburden would be used to control groundwater ingress and to infill the base of the workings to provide a suitable low permeability geological barrier on top of which the imported material would be placed.

3.6 Excavated material would be processed at the quarry using a combination of screening and washing plant to produce a range of graded aggregates and sands. Processed aggregates would be dispatched from the site in HGVs via a new access constructed onto the A1057 (Hatfield Road) on the southern side of the quarry.

3.7 Other ancillary development would include a weighbridge, office accommodation, electrical transformer, electrical switch-room, and small stores and maintenance building, fresh water and silt lagoons.

3.8 In order to demonstrate the acceptability of the development proposals, a comprehensive development scheme has been prepared and is described in this chapter. The scheme addresses the establishment, phased operation and restoration of the quarry together with detailing the ancillary infrastructure needed to support the operation. The development has been designed to ensure that the potential environmental impacts are avoided or minimised. This underlines the applicant's intentions and responsibilities to conduct its activities as a responsible neighbour and in a manner which is sympathetic to local amenity and causes minimal disruption to the local community. The mitigation measures identified as being necessary during the course of the EIA form part of the development proposals. In preparing the working scheme, consideration has been given to the following:

- proximity of dwellings (existing and proposed) and the likely environmental impacts in terms of noise and air quality;
- archaeological considerations
- ecological considerations;
- visual and landscape impact;
- hydrology and hydrogeology; and
- traffic generation and movements

3.9 The proposed development of the site is illustrated in Drawing Nos. HQ3/1 to HQ3/16 as follows:

- HQ 3/1 shows the overall phasing / general layout of the quarry;
- HQ 3/2 shows the entrance design;

- HQ 3/3 shows the plant site (masterplan);
- HQ 3/4 shows the plant site layout (detail);
- HQ 3/5 shows the elevations of the processing plant;
- HQ 3/6 shows the advanced works (planting);
- HQ 3/7 shows the initial site preparation works;
- HQ 3/8 shows development within Phase A;
- HQ 3/9 shows development within Phase B;
- HQ 3/10 shows development within Phase C;
- HQ 3/11 shows development within Phase D;
- HQ 3/12 shows development within Phase E;
- HQ 3/13 shows development within Phase F;
- HQ 3/14 shows development within Phase G;
- HQ 3/15 illustrates the final restoration masterplan;
- HQ 3/16 provides illustrative cross sections.

GENERAL ARRANGEMENT

3.10 The new quarry would comprise the following key elements:

- new access onto the public highway and internal hard surfaced access road (which has been moved 5m to the east from the previous proposed alignment) between the entrance and plant site;
- weighbridge and office located to the north of the new site entrance;
- plant site including processing plant, stockpiles, office and other ancillary facilities;
- peripheral screening mounds;
- infiltration lagoon; and
- mineral extraction area divided into 7 phases.

3.11 **Drawing HQ 3/1** illustrates the overall layout of the proposed quarry.

CONSTRUCTION PHASE

3.12 Initial developments associate with the establishment of the quarry would involve the following operations:

- establishment of a new site access onto A1057 and construction of internal roadways linking the access to the plant site;
- creation of mitigation ponds/habitat for translocation of great crested newts;
- stripping of soil resources from operational areas, including plant site, fresh water/silt lagoons, haul roads and initial phase of mineral extraction;
- placement of soils into screen mounds located on the periphery of the site;
- undertaking initial landscaping works, including advance planting around Popefield Farm;
- creation of temporary permissive paths within the site to retain areas for public access;
- erection of processing plant and ancillary facilities;
- excavation of freshwater and silt lagoons; and
- excavation of a recharge lagoon within the UMH.

Site Access

3.13 A new entrance off the A1057 (which runs on the southern boundary of the application site) would be constructed close to the south western corner of the application site at NGR TL 198078.

3.14 The site access is designed with a carriageway width of 8m which forms a simple priority junction with the A1057. The junction would have 15m entry and exit kerb radii and a 1 in 12 taper, designed in order to comfortably accommodate all vehicle requirements. The internal access bends would also have a centreline radius of 20m to accommodate the necessary HGV swept-paths.

3.15 From the site entrance, the internal road would be constructed from concrete (or bituminous bound material, 'asphalt') up to the plant site. At the start of the hard surfaced access road within the plant site would be a wheel wash. Approximately 200m from the site entrance would be two surface mounted weighbridges (with attendant office) along with bypass lanes and a turning area for any vehicles refused access to the site.

3.16 In order to accommodate the entrance and associated visibility splay a section of the hedgerow that bounds the site/A1057 would need to be cleared. This would be undertaken outside of the bird breeding season (taken as being March to August).

3.17 As noted above, soils would be stripped from the footprint of the site entrance and internal access road. These soils would be placed into storage mounds located on the periphery of the site, in the vicinity of the site entrance. The line of the access road follows the western edge of the extraction area, lying at least 10m to the east of a National Grid gas main. On the western edge of the access road a new drainage ditch would be cut to intercept surface water. Allied to this, a 3m high acoustic fence would be constructed to the west of the access road.

3.18 A new fence would be erected behind the line of the visibility splay, behind which would be planted a double row of hedgerow plants. In view of the need to deter unauthorised access into the site, the fence would be post and rail, with barbed wire on top.

3.19 Two sets of gates would be installed on the access road; the first would be at the site entrance (set back from the junction) with the second located on the south side of the weighbridge area.

3.20 These details are illustrated on **Drawing HQ 3/2** and also considered further in Chapter 7 of this ES, including Drawing HQ 7/1.

Plant Site

3.21 The plant site would be located to the north of the mineral extraction area and west of Home Covert (woodland), covering an area of around 11ha. The main items within the plant site would be the aggregate processing plant; stockpile of as-dug material (surge pile); aggregate stockpiles; site office/administration building; fresh water lagoon and a small silt lagoon.

3.22 Prior to commencement of the construction of the processing plant, the Nast would be diverted to a new line around northern and eastern edge of the application site. The Nast is understood to be ephemeral and have low flows of surface water.

3.23 Soils would be stripped to a depth of around 1m from the footprint of the plant site and placed into storage mounds located to the north, east and west of the plant site. As dug sand and gravel excavated from the infiltration lagoons (see below) would be used to raise levels within the plant site by around 0.5m above original ground levels.

3.24 The processing plant would be a conventional static design (as opposed to an arrangement of mobile plant) and comprise the following elements:

- feed hopper;
- primary screen;
- washing plant and main screens;
- cone crusher;
- sand plant.

3.25 **Drawing HQ3/3** shows the layout of the plant site, whilst **Drawing HQ3/4** illustrates the layout of the processing plant in more detail. **Drawing HQ 3/5** shows the elevations of the processing plant.

3.26 Ancillary to the processing would be an electrical transformer, electrical switch-room, and small stores and maintenance building. These would all be constructed from block work.

3.27 The office and welfare accommodation would be four 'portacabin' style temporary buildings. These would be used as sanitary and drying facilities, mess room, site offices and meeting room/s.

Recharge Lagoons

3.28 Although the applicant would not abstract groundwater from the LMH, it is proposed to retain both the UMH and LMH groundwater infiltration lagoons as previously designed and presented. The UML would be the primary UMH groundwater infiltration location, but it would be connected to the

adjacent LML at a high level because it makes operational sense to have the facility and option to discharge excess UMH groundwater should the need arise.

3.29 For the UML, soils would be stripped from the footprint of the lagoon (together with a narrow strip along the western and southern boundaries) and placed into storage mounds located on the periphery of the application site. Overburden would then be stripped and the underlying UMH extracted from the footprint of the lagoon: overburden would be used to form the peripheral 'seal' and ultimately internal walls to the lagoon on 3 sides, with surplus overburden material used to form the peripheral screen mounds.

3.30 For the LML, the same process would follow that described in paragraph 3.29 above, apart from the eastern lagoon boundary being fully sealed down to the upper surface of the interburden, meaning groundwater from the UMH can be dewatered within the perimeter of the LML. The excavation can then continue downward through the interburden until it exposes the surface of the LMH, at which point the excavation would stop. A manually operated high level spill-over would link the two lagoons to allow the flow of UMH groundwater into the LML. At no time would LMH groundwater flow into the UML because the water level in the LMH is over 5m lower than groundwater in the UMH.

Soil and Overburden Stripping

3.31 The sand and gravel deposit is overlain by a layer of overburden, subsoil and topsoil which varies in depth across the site. Soil stripping would be undertaken on a campaign basis (i.e. for a concentrated period lasting several weeks, as opposed to constantly throughout the year).

3.32 The soil and overburden would be stripped using a hydraulic excavator and transported across the site to the storage locations in articulated dump trucks. Soils would only be moved when they are dry and friable in order to ensure that their structures are not compromised. All soil stripping, handling and storage operations would be carried out in accordance with MAFF's Good Practice Guide for Handling Soils, published in 2000. The key points being as follows:

- no topsoil shall be removed from the site;
- topsoil, subsoil and overburden would be stripped separately;
- all soils would be handled when in a dry and friable condition by monitoring the lower plastic limit before works commence;
- topsoil, subsoil and overburden would be stored "like on like", so that for example, overburden storage areas would be stripped of soils in advance;
- loose-tipping and grading of soil materials, to specified restoration profiles, would be carried out using tracked excavator or low ground pressure bulldozer;
- no heavy wheeled earthmoving vehicles or machines to run over un-stripped or replaced soils to minimise compaction;
- following mechanical de-compaction, all stones and rocks exceeding 0.15m in any dimension and other deleterious material would be removed from the topsoil; and
- soils would be placed early enough in the year to allow grassland vegetation to be established before the winter and reduce the risk of erosion.

3.33 All topsoil stripping and other site preparation works that involve ground disturbance would be carried out with due regard to the scheme of archaeological investigation which would be agreed with the MPA.

3.34 Stripped soils would be placed into storage mounds located around the periphery of the application site. In line with best practice these would have a maximum height of 3m (to avoid compaction) compared to the 4m-5m proposed for overburden storage mounds. The outer slops of the storage mounds would have a gradient of 1:3 along the frontage to Hatfield Road, the playing fields, and adjacent to the public footpath, with gradient of 1:2 elsewhere.

3.35 **Drawing HQ 3/7** shows the areas from where soils would initially be stripped, the volumes arising and where this material would be stored.

Translocation of Great Crested Newts and Badger

3.36 As set out in Chapter 11 of this volume, Great Crested Newts have been identified in four ponds within the application site. Two of these ponds are located between the recharge lagoon and Home Covert and thus the design of the scheme seeks to avoid any disturbance to these ponds. Works would though be undertaken in close proximity, and thus a scheme of exclusion would be needed to ensure that areas to be stripped were clear of the species.

3.37 Two other ponds, located to the south of the Nast lie within the development footprint of the plant site/extraction area within Phase C. Both of these ponds would be lost to the development and thus a scheme of mitigation would be required: this would involve the creation of new ponds, (on a two for one replacement ratio) and habitat. The precise detail of the mitigation scheme would be set out in an application for a European Protected Species Licence submitted to Natural England. As part of the initial works, a scheme of exclusion would be needed.

3.38 Similarly, as identified in chapter 11, a single badger sett would need to be relocated; again the precise detail of the mitigation scheme would be set out in an application for a European Protected Species Licence submitted to Natural England.

OPERATIONAL PHASE

Overview

3.39 It is proposed to develop the mineral deposit on a phased 'cellular' basis, whereby the workings advance in a general westerly direction with progressive restoration following behind. As noted above, the phasing of the workings is illustrated on **Drawing HQ 3/1**. Each phase is anticipated to sustain production for around four years and sand and gravel would be extracted from both mineral horizons. The UMH would be progressively worked across each phase to its full depth to expose the interburden horizon, and removal of the interburden would take place in a series of smaller 'cells' to allow extraction of underlying mineral from the LMH once the UMH above each area of interburden has been removed. The depth of LMH extraction would be equivalent to the volume of acceptable site derived barrier and restoration material but at no time would it extend below 1m above the Chalk surface.

3.40 The UMH would be sealed at the perimeter of each phase with a low permeability bund wall keyed into the interburden and equipped with a back-wall drainage system. This would prevent further UMH groundwater flow into each phase. Once sealed remaining groundwater within the UMH would be pumped to the UMH recharge lagoon. The LMH layer would be excavated 'wet' (beneath water).

3.41 Following completion of mineral extraction from each LMH cell, suitable overburden and interburden (from the site) would be placed into the base of the workings to raise the operating level to above the level of the groundwater in the LMH, at which point an engineered thickness of barrier material would be installed and keyed into the surrounding interburden or previously engineered barrier material. The remaining void would be infilled with suitable onsite and imported inert restoration material.

3.42 Each phase would be worked in a similar fashion and thus a description is provided for Phase A, which is located in the south eastern corner of the application site, and this is indicative of the approach that would be taken for all later phases. As noted above, a set of drawings have been provided to show the progression of working and restoration through the seven phases.

Phase Preparation – Phase A

3.43 Each phase would be divided into sub-phases based on providing a working area capable of sustaining production for between 18 and 24 months to allow for fluctuations in market demand. Vegetation would be cleared from the initial sub-phase followed by the stripping of soils (again incorporating a narrow strip from the adjoining phase to the north to allow the construction of a cell wall). Stripped soils would be placed into storage mounds (3m in height) located on the periphery of the working area, extending the bunds previously created as part of the site preparation works adjacent to Hatfield Road. Overburden would be excavated, initially from a strip around the periphery of the phase to allow for the creation of the back-wall drainage system and placement of low permeability seal. The edge of the phase would be cut to a 1:1 slope, with the low permeability material placed in an engineered fashion to create a slope of 1:3. It is proposed to use overburden for the peripheral seal; however, should suitable clay be available for importation then this would also be imported into the site. Any surplus overburden would be used directly, or temporarily stockpiled in the working area pending placement, within the base of the mineral void following extraction of the LMH (see below).

Mineral Extraction – Phase A

3.44 The development of Phase A is illustrated on **Drawing HQ 3/8**. In view of the two mineral horizons the UMH needs to be worked first to expose a suitable area of the interburden to provide safe access to the LMH. The UMH would be worked in a conventional manner, and in a similar fashion to the recharge lagoon described above. The UMH would be partially saturated to varying degrees dependent upon phase location and season, so dewatering would be necessary using a combination of drains and pumps, with extracted water pumped to the UMH recharge lagoon.

3.45 The UMH would be excavated using a 30t or 40t hydraulic excavator, which would load the as-dug mineral onto an articulated dump truck for transport to the as-dug stockpile located on the eastern side of the plant site. Again, a fleet of four to six dumpers would be employed, depending on the haulage distance. The dump trucks would be routed on internal haul roads; initially along the eastern edge of the application site to the west of the recharge lagoons. As the excavation

progresses to depth, temporary ramps would be created to provide access for machinery and service vehicles.

3.46 The interburden would be progressively removed in cells/strips measuring approximately 100m by 30m to expose the LMH after which the LMH would be excavated 'wet'. The initial strip would be located where ground water is at its lowest and be orientated parallel to the groundwater contours. The excavation would then progress up hydraulic gradient across the phase, which for Phase A is in a westerly direction.

3.47 For the initial strip, the interburden would be temporarily stockpiled within the workings pending placement into the worked out void. In subsequent strips, the interburden would be placed directly into the void. The LMH would be extracted, again using a 30t or 40t hydraulic excavator, with the excavator sitting on a platform slightly above the mineral.

3.48 Monitoring of groundwater levels at the application site shows that they are at their lowest between July and December (i.e. the last half of the year). In view of this and to avoid the need for pumping, the LMH would be excavated by campaign for up to six months in the year (divided into two or more campaigns). As with the UMH, as dug mineral would be transferred to the plant site using articulated dump trucks (typically a fleet of up to six).

3.49 Development within subsequent phases is illustrated on **Drawings HQ3/9** (for Phase B) to **HQ 3/14** (for Phase G).

Mineral Processing

3.50 All mineral excavated at the site would be processed on site. As set out above, as-dug material would be transported from the working area and placed within a stock pile located on the eastern side of the plant site.

3.51 From the stock pile, as-dug material would be placed into the feed hopper of the processing plant by a rubber tyred loading shovel (such as a CAT 972 or Volvo L180) from where it would be conveyed into the primary screen. The primary screen would take off the oversize stone (i.e. greater than 100mm) and the fine fraction (sand) via two vibrating screens. The oversize material is stockpiled for sale/reprocessing, whilst the fine fraction is transferred to the sand plant. From the primary screen, the middle grading of material (i.e. 4-100mm) would be transferred via a conveyor to a scrubber mill and further screens within the washing plant (refer to Drawing HQ 3/2). Material passing over all the screens (i.e. too large, and generally over 20mm) is conveyed to a cone crusher where it is crushed to reduce its size and then returned via conveyor to the screens. The screens spilt off the gravel into three fractions graded by size which are conveyed to stockpiles.

3.52 Periodically, material from the stockpiles would be transferred to larger stockpiles by rubber a tyred loading shovel.

3.53 Processed aggregates would be exported from the site by HGVs; typically these would be articulated lorries or rigid bodied tippers. Each lorry would, on entry to the site, be weighed in, and then loaded by a rubber tyred loading shovel. The HGV would then pass over the weighbridge again before leaving the site.

Infilling Operations

3.54 Preliminary discussions with the Environment Agency has established that the void left from the removal of the 'LMH' and interburden should be replaced with site-won, low permeability cohesive material but could also include suitable materials imported for the formation of both geological barrier and infilling.

3.55 The rationale for placing inert low permeability geological barrier material up to the upper surface of the interburden is founded on the principle that perched groundwater within the UMH is kept separate from regional groundwater in the LMH: this is to minimise the potential for mixing of groundwater in the lower regional aquifer with local perched groundwater.

3.56 In view of this, surplus overburden and interburden would be progressively placed in the base of the mineral workings to raise basal levels; the indigenous material would be placed against the sides of the phase to above the level of the groundwater in the LMH, above which an engineered barrier of indigenous interburden/suitable overburden would be used to provide an effective seal to prevent the mixing of ground water. This engineered barrier would be keyed into the surrounding interburden or previously engineered barrier to provide a continuous seal, on top of which the imported inert material would be placed.

3.57 In order to be able to provide a suitable final landform (as illustrated on Drawing HQ 3/14) suitable inert fill materials would be imported. This material would be sourced from the construction and demolition waste sector within the region, and typically imported in 20t loads by rigid bodied tippers.

3.58 Details relating to the management and control of imported materials would be regulated through the Environmental Permit. In brief, each load imported would be inspected at the weighbridge for compliance with the waste transfer documentation. If the load is found to be inconsistent, the importing vehicle would be turned away. Once accepted, the importing vehicle would be directed to the disposal area where the load would be tipped and a further inspection undertaken. The load would then be placed within the tipping area and compacted by a tracked bladed machine (often referred to as a bulldozer, such as a CAT D6 or similar).

Hours of Operation

3.59 The quarry would operate to the following hours:

Site preparation works (stripping, bund formation); mineral extraction, restoration (including infilling), processing and dispatch of aggregates:

- 0700 hours to 1800 hours Monday to Friday
- 0700 hours to 1300 hours Saturdays

No operations on Sundays or bank holidays save for emergency repairs.

Lighting

3.60 External lighting would be required around the plant site during the winter months. Lighting would be on mounted poles. All lights would be directional in order to minimize light spill, glare and sky glow, and would be aligned to ensure that the upper limit of the main beam does not project upwards. In particular, guidance provided by the Institution of Lighting Engineers[1].

3.61 It is not proposed to excavate the sand and gravel after dusk and thus no lighting would be required within the extraction area.

Environmental Controls

3.62 The EIA process has identified a number of measures that could be employed to ameliorate the effects associated with the operation of the quarry. Some relate to operational practices to help safeguard the amenity of local resident whilst others relate to the design of the quarry (for example associated with ground water protection).

Dust

3.63 As set out in Chapter 9 (of this Volume), a number of mitigation measures are proposed to ameliorate the generation of dust from the development of the quarry. These include:

- use of water as and when necessary, particularly in the event of dry and windy weather;
- vehicles transporting soil/overburden/mineral not overloaded;
- reduction of drop heights;
- minimise double handling of material;
- phased activity to minimise the duration of activity;
- avoid soils handling during adverse weather conditions;
- optimise timing regarding weather and seeding season. Seed as soon as possible;
- soil bunds and mounds profiled to minimise windblown dust;
- temporary cessation of activities in the event of unacceptable dust emissions in the vicinity of receptor properties;
- where material contains less than 3mm in size the material should be conditioned with water before the point of discharge into the pile;
- areas around the base of the storage piles would be clearly designated to ensure passing vehicles do not disturb dusty material and the area should be kept clean and in good repair;
- location of processing operations away from the closest receptors;
- enclosure of transfer points with chutes;

[1] Guidance Note 1 for the reduction of obtrusive light 2020, Institute of Lighting Professionals. https://theilp.org.uk/publication/guidance-note-1-for-the-reduction-of-obtrusive-light-2020/

- cleaning belts with scrapers and dust catch plates;
- materials are deposited carefully into screens by reducing drop heights and the correct matching of machine;
- ensure base of stockpiles clearly marked and shielded from wind and keep moist in dry weather;
- controlled use of haul routes;
- haul routes to be regularly maintained by grading to minimise dust generation;
- speed controls of 10mph to be implemented on all haul routes;
- all vehicles exiting the site carrying material are sheeted or totally enclosed as soon as possible after loading and before leaving site; and
- wheel wash installed at the site entrance and used.

Noise

3.64 'Built in' mitigation includes the use of peripheral screen mounds at the edge of the working areas. As noted above, these would be 3m in height (for soils storage, in line with best practice) and 4m in height for the overburden storage mounds. In addition, a 3m high acoustic fence would be installed on the western side of the access road to protect properties to the west of the application site.

3.65 In addition to the noise mitigation measures incorporated into the site design, good site management practices and other specific measures would also provide additional noise mitigation. These measures (as set out in Chapter 10) would include:

- activities within the review site would be undertaken in locations where noise attenuation from existing landforms would maximise the benefit to the noise-sensitive properties;
- internal haul routes would, wherever possible, be routed such that separation distances to the noise sensitive properties is maximised;
- all haul roads would be kept clean and maintained in a good state of repair to avoid unwanted rattle and "body slap" from vehicles;
- all mobile plant used at the proposed extension would have noise emission levels that comply with the limiting levels defined in EC Directive 86/662/EEC and any subsequent amendments;
- all mobile plant and heavy goods vehicles entering the site will move in a circular pattern to minimise, as far as is practical and safe, noise from reverse warning systems;
- plant would be operated in a proper manner with respect to minimising noise emissions, for example, minimisation of drop heights and no un-necessary engine revving;
- plant would be subject to regular maintenance. All plant at the site would be fitted with effective exhaust silencers and would be maintained in good working order to meet manufacturers' noise rating levels. Defective silencers would be replaced immediately;
- plant that is used intermittently, would be shut down when not in use; and

- pumps, generators and compressors would be located behind existing screening mounds or landform, would be electrically powered and fitted with an acoustic covers where necessary. Diesel powered pumps, generators and compressors, if used, will be installed within acoustic enclosures.

Water

3.66 The operation and restoration of the quarry would be undertaken using current technical guidance, relevant Pollution Prevention Guidelines, other codes of best practice and consents, to limit the potential for contamination of both ground and surface waters.

3.67 Best practice techniques would be incorporated within the management procedures for construction and operation activities onsite in order to protect the water environment from pollution incidents. The mitigation measures can be summarised as follows:

- during construction there would be heavy plant and machinery required on site and as a result it is appropriate to adopt best working practices and measures to protect the water environment, including those set out in the Environment Agency's Pollution Prevention Guidance (PPG1);
- in accordance with PPG2 all above ground on-site fuel and chemical storage would be bunded;
- an emergency spill response kit would be maintained on site;
- a vehicle management system / road markings would be put in place wherever possible to reduce the potential conflicts between vehicles and thereby reduce the risk of collision;
- a speed limit would be imposed on site to reduce the likelihood and significance of any collisions;
- the proposed restoration scheme would also be subject to an Environmental Permit, the application for which would include appropriate measures to avoid unacceptable impact on the environment including water;
- surface water runoff would be contained within the excavation areas and all water would be discharged to a recharge lagoon, this would reduce the risk of suspended solids entering surface waters; and
- a detailed water management plan would be prepared and agreed with the Environment Agency prior to work commencing at the site.

3.68 All groundwater pumped from the UMH would be recharged back into the aquifer so that there would be no significant loss of resource. The recharge area is relatively close to the points of abstraction and it is not envisaged that there would be a significant impact on water resources in either aquifer.

3.69 Restoration of the void with imported inert material would make a barrier to groundwater flow within the UMH. A back-drain is therefore included in the design to ensure groundwater levels do not increase above historically high elevations.

3.70 The restoration operations would be operated under an Environmental Permit that would ensure activities do not pollute the water environment.

Socio Economic Issues

3.71 The quarry would have a core staff of 6 employees. This would comprise a manager, a foreman, 2 loading shovel operatives, 1 dozer operative and 1 weighbridge operative.

3.72 The number of staff would increase to 10 during earthmoving works which will be undertaken on a campaign basis. This would be over a temporary period.

3.73 Allied to this the quarry would generate a number of indirect employment opportunities associated with the haulage of aggregates/concrete and the provision of services, such as maintenance and engineering contractors, landscaping contractors. The quarry would contribute into the economy through taxes, business rates and aggregates levy contributions. The development would thus secure these employment opportunities and wider socio economic benefits into the long term.

RESTORATION PHASE

3.74 This section of the chapter details how it is proposed to restore the application site to a beneficial after-use which has the following aims:

- to progressively deliver a landscape which is similar in character and appearance to the existing Ellenbrook Fields;
- to improve overall biodiversity interest and value at the site;
- reinstate the current accessibility of the greenspace to members of the local public; and
- fulfil all engineering requirements, in terms of managing surface water and groundwater environments at the site.

3.75 The landcover would consist of broad area of gently sloping conservation grassland (from west to east), divided by hedgerows and with some complimentary wetland and pond features, as illustrated by **Drawing HQ 3/15.**

3.76 At a more local level, areas of micro-topographical and substrate variation would be included to provide habitat diversity and enhancements (e.g. a range of species-rich grassland communities). The proposed waterbodies include both shallow scrapes, ponds and a deeper waterbody at the north-eastern end of the application site.

3.77 The scheme also aims to respond to the local landscape character of "Area 31 De Havilland Plain", which extends from Cromerhyde in the north, southwards across the former Hatfield Aerodrome and up to the ground of Oaklands College on the edge of St Albans, as defined in The Welwyn Hatfield Landscape Character Assessment (2005), which *inter alia* refers to "*an extensive level plain".* This is addressed further in Chapter 8 of this Volume.

3.78 The Herts and Middlesex Wildlife Trust have several grassland-based nature reserves, including Hunsdon and Eastwick Meadows, which is one of the finest surviving unimproved grassland sites in the county. Also the local biodiversity action has targets for the recreation of neutral grassland, acid grassland and heathland; the aspiration for the restored application site is to contribute to these targets as far as is practical, either through interim management during working phases or long-term aftercare of the final restoration areas.

3.79 The proposed hedge planting and open ditch/swale layout uses the 1888 historic field pattern which existed on the application site prior to the aerodrome and other interventions, with the aim of reinstating the broader landscape setting of the Popefield Farm listed building. Some of this remnant field pattern is still present on site, whilst some has been lost.

3.80 This would also create potential linkages with the existing watercourses, hedgerows, woodland and tree belts around the perimeter of the application site.

Progressive Working and Restoration

3.81 The proposed progressive scheme of working and restoration aims to ensure that disturbance is limited and continued access is provided to Ellenbrook Fields, as far as possible.

3.82 For example the western parts would be largely undisturbed (except for the access road) until the later stages. Parking is available alongside Ellenbrook Fields at Notcutts Garden Centre to the south-west of the site on Hatfield Road, and access via the public right of way would be maintained throughout the development period, but according to certain restrictions and diversions at certain periods. Access points would be installed over the perimeter storage bunds.

3.83 The initial site preparation works are shown on **Drawings HQ 3/6** and **HQ 3/7** which shows the new site access in the south-western corner and along the western part of the application site (whilst maintaining a standoff to the gas pipeline). The plant site, stocking and lagoon areas in the north and east would be stripped of soil and overburden and temporary storage mounds would be formed around the perimeters. The stripped areas of ground would then be built up as hardstanding using the mineral within the recharge upper and lower mineral lagoons in the east.

3.84 Subsequent establishment of each Phase would follow a logical sequence broadly working from east to west and where possible with soil and overburden direct placed onto worked out and backfilled void, to final restoration levels. However it is anticipated that, particularly during Phase A, soils and overburden may also need to be placed into temporary storage.

3.85 Detail methods of forming the perimeter seals within and around each phase will be determined as the development progresses.

3.86 The estimated volumes of site derived materials available from the proposed mineral extraction area are as follows:

- Topsoil (nominal 0.3m thickness) = 160,000m^3;
- Subsoil (nominal 0.9m thickness) = 478,000m^3;
- Overburden = 582,000m^3; and
- Interburden volume = 962,000m^3.

3.87 In addition approximately 150,000m^3 of topsoil and subsoil would be stripped from the access road, plant site and stocking area and areas of temporary storage (e.g. beneath subsoil or overburden) and then reinstated at the end of the development.

Restoration Landform

3.88 The final restoration landform would be based on imported inert material to backfill the worked out mineral voids near to existing ground levels, typically between 78m AOD in the west and 76m AOD in the east, to ensure that surface water can be directed towards the existing pipe which takes the Nast along the St Albans Road West.

3.89 An overflow at 75.5m AOD would be included within the waterbody to the north-east to also drain into this existing pipe. The invert of the existing Nast culvert along the side of the road is 71.78m AOD. The scheme aims to attenuate water flows and avoid flood risk.

3.90 A detailed landform design would be produced following the granting of planning permission to ensure minimum gradients typically from 1:100 to 1:200.

3.91 Overburden and interburden clays from the site would be used to provide basal lining, sidewall barriers and capping material for the tipping operation and subsequently covered by a restoration soil profile.

3.92 Approximately 235,000m^3 of suitable material would be required for the external liner around the site perimeter; this is based on a mineral cut of 1:1 down from extraction limit through the soil, overburden and upper mineral horizon down to the top of the interburden clay and then the amount of material needed to backfill to original ground levels, with a 5m wide crest at the top and 1:3 side slopes. Of this approximately 20,000 m^3 would need to be restoration soil (which is the crest area x 1m thickness), with the rest as impermeable barrier.

3.93 A further 505,000m^3 of suitable material would be required for the 1m thick engineered barrier / capping. The restoration soil profile would then be c1.2m thickness above this layer.

3.94 Thus the available 962,000m^3 interburden volume exceeds the anticipated suitable material required for the external liner around the perimeter and the engineered barrier / capping.

3.95 The plant site, stocking and other ancillary areas would also be restored using replacement of stored restoration soil and residual mineral to create ridge and furrow landform, on average 1m in thickness.

3.96 The access road and a small car parking / turning area would be retained as hard standing for continued recreational access.

Restoration Profiles

3.97 All soil and overburden resources would be conserved and reused and therefore there would be a surplus amount of material available in comparison to those required; this is dictated mainly by the inclusion of the waterbody in the east and other ponds, scrapes and wetland areas of c8ha, which would not require any soil cover and also the use of a mixture of soil and residual mineral within 10ha of the plant site area, as part of acid grassland habitat creation area and any other preferential use of soil-forming materials as part of the target grassland habitats. The total area of disturbance requiring a restoration soil profile is c65ha and the available 788,000m^3 of site-derived topsoil and subsoil volume would be sufficient.

3.98 All soils would be either direct placed onto final restoration areas or temporarily placed into storage / perimeter screening bunds. All bunds would be grass seeded, at the earliest available opportunity following construction.

3.99 Nevertheless, any potential new soils brought to site/recovered from the tipping operations would be inspected upon delivery to ascertain their suitability and quality, and any roots, debris or other undesirable materials present removed. The Planning Practice Guidance to the National Planning Policy Framework acknowledges the potential use of soil and soil-making materials where the after-use of mineral sites involves some form of plant growth.

3.100 Materials for use in species-rich grassland areas will have chemical and physical properties assessed, to ensure they deliver low fertility yet functioning restoration substrates capable of supporting these habitats in the long term. For example, acidic or alkaline material will be set aside for the creation of distinct acidic/calcareous grassland habitat types in suitable locations.

3.101 Restoration material of intermediate nutrient status (i.e. too high for use in species-rich grassland, but not good enough for (or excess to that required for) tree planting might be best targeted to the water attenuation lagoons. Similarly especially clayey material may have a specific role in the formation of ponds in these areas.

3.102 This is summarised below, although precise characteristics will be determined in accordance with Table 1 in BS 3882:2015, as appropriate:

- multi-purpose topsoil and/or medium to high pH (5.5 to 8.5), high N, extractable P and K, clay or loams – trees & scrub, wet grassland / lagoons;
- specific purpose, low fertility topsoil and/or mid pH, low/medium N, extractable P and K, loams – neutral grassland;
- calcareous topsoil and/or high pH (7.5 to 9.0), low N, extractable P and K, clay or loam – calcareous grassland; and
- acidic topsoil and/or low pH (3.5 to 5.5), low/very low N, extractable P and K, sand or loam – acid grassland.

Restoration Phasing and Techniques

3.103 The proposed development phasing would incorporate progressive restoration and landform development, involving annual programmes of soil handling, cultivations, seeding and planting undertaken at the earliest available opportunity. The details of the restoration programme would be reviewed with the mineral planning authority on an annual basis.

3.104 Compaction of the restoration soil layer would be avoided throughout all soil handling operations, as follows:

- stripping, loose-tipping and grading of soil materials, to specified profiles, would be carried out using tracked excavator or bulldozer in accordance with MAFF's Good Practice Guide for Handling Soils, published in 2000; and
- soil would only be handled when in a suitably dry and friable condition by reference to the lower plastic limit.

3.105 The only exception to the prevention of compaction within the restoration soil profile might be some localised areas to encourage wetter conditions and opportunities for marshy grassland species within the overall grassland mosaic. The permanent ponds will be lined with clay/compacted base and sides, with associated boggy margins.

3.106 Contrasting soil units would be recovered, stored and replaced separately. For example by the use of geotextile separator or the recovery of *in-situ* units before the construction of storage bunds.

Restoration After-uses and Techniques

3.107 Table 3-1 below compares the areas of existing and proposed land cover areas for the application site. This is also considered further as part of a Biodiversity Net Gain calculation which is set out in Appendix 11/1 to this Volume.

3.108 In addition around 1km hedgerows would be planted as part of the reinstated historic field pattern, in conjunction with the 2km advance planting undertaken at the outset of the development.

3.109 Approximately 0.6km of public right of way would be reinstated along its original route and permissive access paths would also be returned along similar routes to existing. Approximately 1ha access road and a small car parking area / site offices would be retained for recreational purposes.

Table 3-1
Site Summary Areas

Land-cover	Existing Site 2015 (ha)	Proposed Restoration Scheme (ha)
Grassland	84.9	72.4
Scrub	(Not measured, included in grassland above)	3
Woodland Planting		1
Waterbodies / Ponds / Wetland		8.5
Hardstanding / Parking Area and Access Tracks	1 (estimated area of former runways, etc)	1
	85.9	85.9

3.110 The restored surface would be initially cultivated to a fine tilth prior to drilling or broadcasting of the appropriate conservation grass seed mix (which would be based on substrate variation and characteristics to be determined) and sown to a low rate, typically of approximately 3-5g/m^2. In places this may be limited to bents and fescues and sown to allow a diverse sward to develop through natural colonisation.

3.111 If practicable seed material from a suitable donor site nearby may be used to aid species diversification, following consultation with the local Wildlife Trust or Natural England.

3.112 The proposed tree and shrub species mixtures for hedgerows and any other areas of advance planting would reflect the natural distribution of native trees and shrubs described by the Forestry Commission[2] and also the nature of the restoration substrate, which would be inspected and assessed prior to planting.

3.113 All plants would typically be well-grown nursery stock as seed-raised transplants, 1+0 (1 year old transplant) up to 60cm in height, depending on species. All species will be derived from stock of local origin, as defined by the Forestry Commission's "Regions of provenance and seed zones in Great Britain".

3.114 All plant handling and planting operations will comply with relevant clauses of CPSE 'Handling and Establishing of Landscape Plants' (obtainable from the Horticultural Trades Association).

3.115 There is an area of open water in the north-east of the site that would benefit waterfowl and wader species. This would be achieved by constructing the with relatively steep banks of c1:3, to minimise the extent of marginal plant growth and omitting any perimeter tree and shrub planting.

Aftercare

3.116 The restored site would be closely monitored throughout the 5 year aftercare period so that the most suitable management regime could be defined on an area-by-area basis. An aftercare management plan would also be formulated in consultation with the MPA.

3.117 The management plan would consist of both an outline scheme, submitted at the outset that would provide the overall objectives for the management of the site and the main management operations, and an annual, detailed scheme that would be submitted to the planning authority in the autumn of each aftercare year. It is also proposed that an aftercare meeting would be held on an annual basis to discuss the condition of the site and to agree the aftercare requirements for the following growing season.

3.118 For all areas, requirements for secondary treatments would be reviewed on an annual basis throughout the aftercare period, in order to identify and remedy any localised problems. For example the following conditions would be assessed and remedied where necessary (to methods agreed with the local planning authority): differential settlement, land drainage, vegetation failure, stones/stone-picking.

3.119 Fertiliser requirements would also be assessed on an annual basis throughout the aftercare period.

3.120 It is acknowledged that under the provisions of the Weeds Act 1959, it is the responsibility of all occupiers of land, whether used for agriculture or not, to control injurious weeds so that they do not spread. For all areas, weeds would be controlled by the appropriate application of herbicides by a certified competent person, according to manufacturer's instructions or, in areas of grass, by cutting or grazing.

[2] Creating New Native Woodlands, Rodwell & Pattersen (1999), Forestry Commission Bulletin 112

3.121 The new grassland mosaic would be mown twice during the first season to increase tillering. Cuttings would be removed from site where necessary to prevent the cut material suppressing germination and to remove a potential source of nutrients that might otherwise enrich the substrate and encourage colonisation by competitive grassland and ruderal species.

3.122 It may be necessary to apply brashings and/or further seed in subsequent seasons to aid the establishment of target species. This would be carried out as part of the September to November maintenance visits.

3.123 Grazing with sheep would be introduced as soon as appropriate, according to stocking densities to be agreed determined.

3.124 All new tree and hedgerow plants would be protected and maintained to a 1m diameter weed free condition. Plants, guards and canes which have become loose, over-tight or broken would be re-firmed and adjusted on an annual basis.

3.125 The general aims of the water body management would be to improve water quality, increase biodiversity and enhance amenity and appeal. Monitoring of the waterbody will be as follows:

- Water quality would be assessed by identifying concentrations and sources of pollutants (nutrients);
- Biodiversity would be assessed by carrying out surveys for aquatic plants, zooplankton and invertebrates;
- Amenity and appeal of the lakes would be assessed by visual inspection, to include erosion, odour, plant and animal deaths; and
- Freshwater algae would be monitored in particular, excessive accumulations of foams, scums and discolouration of the water. The Environment Agency would be contacted for advice in the event of algae bloom appearing on the site in response to the threat to wild and domestic animals, fish and humans.

3.126 All planting/seeding failures would be replaced on an annual basis, during the first two years of aftercare, to ensure 100% maintenance to the agreed densities/land cover. All replacements would use plants of the same species or other such species as may be agreed with the local planning authority. If abnormal plant or tree failure persists then investigations and proposals for the remedying of site conditions would be prepared and agreed with the local planning authority.

3.127 Reinstatement of footpaths and public access would also take place during the aftercare period, when it is considered safe to do so and where it won't be detrimental to the establishment of the habitats and land cover.

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INTRODUCTION

4.1 When undertaking EIAs and preparing an ES, it is conventional practice to carry out a review of relevant planning policy. This is not an express requirement of the EIA Regulations, but the exercise acts as a useful checklist in terms of environmental topics considered in the EIA, and allows the conclusions reached by the EIA/ES to be assessed against planning policy objectives and requirements.

4.2 It is considered that this approach identifies and isolates the key environmental issues associated with a particular development, and assists in arriving at a judgement of the overall merits of the development balanced against its environmental effects. In this respect, it is not the role or purpose of the ES to set out the planning balance, but to objectively consider those policies relevant to the scheme being assessed.

4.3 Policies in the Development Plan will conventionally seek to safeguard environmental interests, and will aim to resist developments which are likely to give rise to significant adverse environmental and amenity effects.

4.4 This chapter will set out the context of the main national and local planning policies relevant to the development at Hatfield Aerodrome. Chapter 4 within the Planning Statement (Volume 1) provides an assessment of how the proposed development complies with the relevant policies in the Development Plan.

LEGAL BACKGROUND

4.5 Schedule 4 to the EIA Regulations does not make any specific reference to the inclusion of an assessment of planning policy. However, Chapter 6 of the former DTLR Good Practice Guide on the preparation of an ES included a section on '*Policies and Plans'.* Paragraph 6.1 states that "*An ES should include a section on policies and plans which are relevant to the environmental assessment of the development in question".* The objective of this is to "*demonstrate how these policy guidelines have been taken into account in developing the project and compiling the ES, and to provide a picture of the decision-making context in which the environmental impacts will be evaluated."*

4.6 It can be seen that there is some ambiguity between the Regulations and the guidance provided by the Government. However, it is clear from the published guidance that the Government is committed to a plan led system, with the Development Plan forming the basis of all planning decisions. Accordingly, policies and plans play an important role in determining any planning applications. Therefore, in the spirit of the guidance, this chapter provides an overview of the policies that have been considered in undertaking the EIA.

NATIONAL POLICY

General

4.7 National Planning Policy guidance is set out in the National Planning Policy Framework (NPPF). The NPPF was accompanied by a 'Technical Guidance' document but has since been revoked and replaced by the internet based Planning Practice Guidance (PPG).

4.8 In terms of land use planning constraints, the application site is not located within a National Park or Area of Outstanding Natural Beauty (AONB). Neither does it directly impinge upon any ecological designations of international or national importance; however, it is located within a Green Belt. Allied to this, as noted from Chapter 2 there are no internationally or nationally designated sites of ecological or archaeological importance within 2km of the boundary of the application site. It is noted that there are the following designations within 2km of the proposed mineral workings:

- Ancient Woodland;
- Local Nature Reserve;
- Local Wildlife sites; and
- Listed Buildings.

4.9 As a result, many sections of national guidance are not relevant to the planning application.

THE NPPF

4.10 The NPPF (updated in 2019) does not change the fundamental premise of Section 38(6) of the Planning and Compulsory Purchase Act 2004. Paragraph 2 clearly states that:

> *"Planning law requires that applications for planning permission must be determined in accordance with the development plan, unless material considerations indicate otherwise"*

4.11 It goes on to add that the NPPF must be taken into account in the preparation of local and neighbourhood plans, and is a material consideration in planning decisions.

4.12 Beyond the general principles of the plan-led system, sustainable development and the approach to decision making, much of the main guidance relates to the development of the built environment. Those parts relevant to the proposed development are considered within the subsequent sections.

Sustainable Development

4.13 At the heart of the NPPF is a presumption in favour of sustainable development, for which three overarching objectives are identified:

- an economic role - contributing to building a strong, responsive and competitive economy, by ensuring that sufficient land of the right type is available in the right places and at the right time to support growth and innovation; and by identifying and coordinating development requirements including the provision of infrastructure;

- a social role - supporting strong, vibrant and healthy communities, by providing the supply of housing required to meet the needs of present and future generations; and by creating a high quality built environment, with accessible local services that reflect the community's needs and support its health, social and cultural well-being; and

- an environmental role - to protect and enhance the natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

4.14 These roles should not be undertaken in isolation, because they are mutually dependent. To achieve sustainable development, economic, social and environmental gains should be sought jointly and simultaneously through the planning system.

Green Belt Policy

4.15 National planning policy on the approach to the Green Belt within both plan-making and decision-taking is set out in Section 13. The protection of the Green Belt is a component of the purpose of the planning system to contribute to the achievement of sustainable development.

4.16 Paragraph 137 indicates that the Government attaches great importance to Green Belts. The fundamental aim of Green Belt policy is to prevent urban sprawl by keeping land permanently open; the essential characteristics of Green Belts are their openness and their permanence.

4.17 Inappropriate development is, by definition, harmful to the Green Belt and should not be approved except in very special circumstances. However, at paragraph 150, the NPPF identifies certain operations that are not inappropriate in the Green Belt provided they preserve its openness and do not conflict with the purposes of including land within it. These include mineral extraction and engineering operations.

Mineral Policy

4.18 Paragraph 209 of the NPPF re-states the long established concept that "*Minerals can only be worked where they naturally occur*[1]*"*.

4.19 All mineral proposals also need to be considered in the light of paragraph 211 of the NPPF, and in particular, those aspects which are relevant to the EIA are:

- ensure that in granting planning permission for mineral development that there are no unacceptable adverse impacts on the natural and historic environment, human health or

[1] Paragraph 13 Minerals Policy Statement (MPS) 1

aviation safety, and to take into account the cumulative effect of multiple impacts from individual sites and/or from a number of sites in the locality;

- ensure that any unavoidable noise, dust and particle emissions and any blasting vibrations are controlled, mitigated or removed at source, and establish appropriate noise limits for extraction in proximity to noise sensitive properties;

- provide for restoration and aftercare at the earliest opportunity to be carried out to the highest environmental standards, through the application of appropriate conditions, where necessary. Bonds or other financial guarantees to underpin planning conditions should only be sought in exceptional circumstances.

Environmental Considerations

4.20 The NPPF, together with the Planning Practice Guidance, sets out the overarching national policy and associated guidance respectively aimed at protecting the environment and local communities. This is further considered under the heading of '*Protection of the Environment*'

THE DEVELOPMENT PLAN

Legislative Background

4.21 The PCPA 2004 reformed the development plan system, replacing Local Plans with a requirement to produce a Local Development Framework (LDF). The LDF would comprise a portfolio of Development Plan Documents (DPDs). With the introduction of the Localism Act 2011, the Local Development Framework is to be replaced by Local Plans.

4.22 To maintain continuity in the Development Plan system during transition to the LDFs (and Local Plans), arrangements were put in place for the existing adopted Structure Plan and the Minerals, Waste and District Local Plan policies to be 'saved'. In this respect the Secretary of State's saving direction dating 22 March 2010 provides that all the policies in the Minerals Local Plan were saved until such time as they are superseded by the emerging Minerals Local Plan.

4.23 At the local level, the statutory Development Plan currently comprises the following documents:

- Hertfordshire Minerals Local Plan Review 2002 – 2016 (adopted March 2007);

- Waste Core Strategy and Development Management Policies Document (adopted November 2012);

- Waste Site Allocations 2011 – 2026 (adopted July 2014);

- City and District of St Albans District Local Plan Review (adopted 1994, Reviewed 2020);

- Welwyn Hatfield District Plan (adopted 2005).

4.24 Hertfordshire County Council is in the process of replacing the 2007 Mineral Local Plan Review. In January 2019 the council published the 'Proposed Submission Draft of the Minerals Local Plan', with the consultation period closing on 22 March 2019.

4.25 The district Local Plans cover all matters involving the development or other use of land, with the exceptions of minerals and waste developments which by virtue of the Town and Country Planning (Prescription of County Matters) (England) Regulations 2003 fall to be considered against the Minerals Local Plan and Waste Local Plan respectively. The main considerations therefore relate to the general policies, and those aimed at safeguarding the environment, and thus are addressed within the sub-section "*Protection of the Environment*".

4.26 The following paragraphs consider each of the documents that currently comprise the Development Plan highlighting the key policies that are applicable to the proposed development and the EIA.

Minerals Local Plan (Adopted)

4.27 The prime purpose of the planning application is to secure the release of new mineral reserves to ensure that a steady supply of aggregates can be provided to the local construction market.

4.28 In terms of the strategic polices, Chapter 3 provides, through **Policy 1**, that the county will ensure that adequate supplies of aggregates are available and will seek to maintain an appropriate landbank throughout the Plan period. **Policy 2** then provides the framework for considering the need for releasing new mineral reserves. Neither of these are relevant to the EIA, but have a bearing on the consideration of the planning application.

4.29 The MLP seeks to identify areas from where sand and gravel should be extracted to maintain supplies throughout the plan period and beyond. Section 3.4 of the MLP, culminating in **Policy 3** identifies three sites, including the application site.

4.30 **Policy 5** seeks to avoid the sterilisation of mineral reserves, encouraging prior extraction where possible. The Preferred Area 1 includes land to the north which is being considered for housing development.

4.31 The cumulative impact of mineral workings, be it simultaneous or successive, is addressed through **Policy 11**.

4.32 Section 4.4 of the MLP addresses the reclamation of mineral workings. Paragraph 4.4.2 recognises that traditional schemes of agricultural restoration may not always be appropriate and should not be seen as the only option. It cites biodiversity is a suitable option and advises that cognisance is given to both the UK and Hertfordshire Biodiversity Action Plans. **Policy 13** indicates that the council will not allow land worked for minerals to become derelict or remain out of beneficial use. Applications for mineral extraction are to be accompanied by a detailed and comprehensive restoration scheme. This also reflects the provisions of **Policy 14** which requires restoration schemes to have a sustainable after-use. The policy sets out ten criteria that need to be considered.

4.33 Linked to the restoration of mineral workings, including the application site, is the use of inert materials to infill the void left once the mineral has been removed. Paragraph 4.5.1 indicates:

> *"… The level of restoration needs to be addressed on a site-specific basis as restoration to a lower level than the original may be more appropriate than restoration to pre-extraction/original levels. The landscape character assessment and the provisions of Policy*

18 (ii) (form of restoration) will be considered when determining the appropriate levels for any restoration."

4.34 The supporting text recognises that infilling mineral workings as part of a restoration scheme is not without its problems, potentially increasing the area of disturbance at any one time or duration of operations. It also refers to potential environmental issues; however, these are mainly in relation to infilling with non-hazardous wastes, as opposed to inert materials. **Policy 15** indicates that "*The reclamation of mineral workings with waste will only be permitted where it can be demonstrated that the disposal of waste is necessary to achieve the restoration proposals*". The policy goes on to add that timescales to achieve the restoration should be appropriate and that there is "*a sufficient total quantity of fill likely to be available to ensure restoration at the required rate*".

4.35 Finally **Policy 18** sets out fifteen criteria that are to be taken into account to control mineral workings, and in particular, the potential impacts on the environment or local communities.

4.36 The MLP also contains a number of polices aimed specifically at protecting various facets of the environment and amenity of local communities. This is further considered under the heading of '*Protection of the Environment'* below.

Waste Core Strategy and Development Management Policies

4.37 The Waste Core Strategy and Development Management Policies DPD (WCS) was adopted in November 2012 and covers the period between 2011 and 2026. The WCS sets out the county council's strategic vision, overall spatial strategy and development management policies for waste planning in Hertfordshire. In addition it contains the policies needed to implement these objectives and detailed development management policies that will be used to make decisions on waste planning applications and used in the determination of applications for other local developments that could have waste implications. In the context of the planning application, it is material to the proposals to import inert materials to facilitate the beneficial restoration of the workings.

4.38 The vision for the WCS is set out in Chapter 2 and indicates that waste management facilities "*will be well designed, appropriately sized and sensitively located so that they reduce the environmental and social impacts, meet the needs of communities and businesses, and seek enhancement of the locality*". The vision goes on to add that facilities will be located as close as practicable to the origin of waste.

4.39 **Policy 1** provides an overarching policy that seeks to make provision for dealing with waste management in the county by providing the capacity and facilities to meet the waste management needs of communities and businesses in Hertfordshire and an agreed apportionment from outside the county for pre-treated waste.

4.40 **Policy 1A** and associated paragraphs 4.27 to 4.31 provide for sustainable development, as required within the NPPF

4.41 **Policy 4** and the supporting text at paragraphs 4.44 to 4.57 address landfill. It acknowledges (at paragraph 4.44) that landfill lies at the bottom of the waste hierarchy, but will still have a role to play through the Plan period, be it a diminishing role. In considering opportunities, paragraph 4.48

comments that there are more opportunities for inert waste to be disposed of in landfill within Hertfordshire (than non-hazardous wastes) given the reduced pollution potential. It goes on to refer to the preferred areas identified in the MLP (see above) commenting that they may be suitable for inert waste disposal as part of their restoration. In this context, the paragraph refers to the Sustainability Appraisal[2] undertaken for the WCS which concluded that the use of mineral voids for disposal of waste by landfill is a sustainable option because it limits the need to transport waste outside the county and also reduces the land-take that would be needed for new landfill sites.

4.42 In terms of a policy approach for landfill, paragraph 4.56 indicates that the policy will only allow landfill as a last resort and each proposal will be dealt with on a case by case basis, whilst paragraph 4.57 adds that mineral voids suitable for inert landfill will be safeguarded to help ensure Hertfordshire deals with its own waste as much as possible. This is reflected in **Policy 4** where it provides:

> *"Proposals …for new landfill sites will only be granted planning permission as a last resort where it can be demonstrated that the residual waste has already undergone extensive treatment and there are no other suitable means of disposal".*

4.43 The policy goes on to identify constraints relating to the water environment and then refers to providing details of pre-treatment, which principally relates to non-hazardous waste streams, given the fifth criteria which refers to energy recovery. Such aspects are not pertinent to the importation of inert fill materials for restoration of mineral workings. The policy also includes a requirement to consider the visual impact of a proposal and its impact upon landscape character. The final part of the policy indicates that for proposals for the disposal of waste and restoration with inert material, planning permission will only be granted where:

- the land is derelict or degraded;
- it would result in significant other environmental benefit;
- it can be demonstrated where applicable, that it is necessary to achieve restoration for mineral voids; and
- it can be demonstrated that it will not give rise to unacceptable implications to human health, amenity, landscape and the environment.

4.44 Policy 4 concludes by stating:

> *"Reclamation proposals should ensure that the site is restored to a state that is of equal or greater environmental or agricultural value than the previous land use."*

4.45 **Policy 7** sets out the general criteria for assessing applications outside of identified locations. The supporting text recognises that sites may come forward that are not specifically allocated. In this context, the policy indicates that proposals will need to demonstrate how the proposal contributes to the overall spatial strategy for waste management within the county.

[2] Sustainability Appraisal Report, September 2010, produced by Land Use Consultants

4.46 **Policy 11** is an overarching policy that sets out the general criteria for assessing waste planning applications, having regard to a number of environmental aspects.

4.47 Finally, **Policy 14** refers to 'buffer zones' indicating that proposals should incorporate an appropriately defined buffer zone in order to safeguard sensitive land-uses. It then sets out four criteria that can be used to define the buffer zone.

Waste Site Allocations Document

4.48 The Waste Site Allocations Document was adopted in July 2014. It allocates eight sites specifically for waste management uses and identifies a number of '*Employment Land Areas of Search*'. The application site is not one of the allocated sites. However, paragraph 3.13 recognises that there may be unforeseen circumstances that could affect the delivery of sites and **Policy WSA2** indicates that planning permission will be granted for waste management uses outside of the identified locations where they accord with Policy 7 of the WCS.

Emerging Minerals Local Plan

4.49 The merging Minerals Local Plan (eMLP) plan acknowledges that minerals are a limited natural resource and can only be extracted where they are found (para 5.8). It adds that "*at present, primary aggregates are the main source of mineral. The Plan aims to reduce, as far as practicable, the quantity of material required, then to use as much secondary and recycled mineral in development as possible. The Plan looks to secure the remainder of mineral demand through primary, landwon mineral from designated extract*".

4.50 Key messages from the Plans Vision include:

- continue to provide a steady and adequate supply of sand and gravel to enable local economic growth and support wider and national supply obligations. This will be achieved by permitting sand and gravel reserves within Hertfordshire for extraction;
- supply of naturally occurring mineral resources will be conserved for future generations by employing the sustainable use of minerals and utilising the supply of alternative materials in construction projects.
- High quality restoration and subsequent management of mineral sites will be carried out as early as possible to conserve and enhance the character and quality of Hertfordshire's landscape and environments. Opportunities for outdoor recreation, net gain in biodiversity, improved agricultural land and water management will be delivered.

4.51 This vision is translated into eight objectives (Obj1 to Obj8); The first three relate to sustainable supply of minerals reflecting the first two bullet points above. Obj4 promotes/encourages sustainable transport of minerals, with Obj5 seeking to "*protect people from harm, positively contribute to local residents' health and the natural, built and historic environments*". Obj8 is also similar to Obj5 by providing benefits for health and wellbeing through positively planned restoration which improve and enhance the county's green infrastructure offer for recreation and physical activity. Obj7 also relates to restoration indicating that proposals should "*positively contribute to the natural, built and historic environments with high quality, progressive and expedient restoration to achieve a beneficial after-use. The after-use will protect and enhance the environment, including agricultural land, landscape and biodiversity improvements*". Finally, Obj6 relates to climate change.

4.52 Turing to the policies **Policy 4** is the key policy to note as it relates to the future provision of sand and gravel during the plan period. The policy opens by stating that "*Provision for Hertfordshire's apportionment contribution will be met by the identification of Specific Sites and Preferred Areas*". In relation to specific sites, Hatfield Aerodrome is listed as 'Specific Site 1'.

4.53 From the Site Profile in Appendix 3 in the eMLP it comments on environmental considerations noting:

- Restoration and aftercare of the site should be consistent with any existing legal agreement and the Hatfield Aerodrome Supplementary Planning Guidance;
- Proposals will require an extensive plan of groundwater level and quality monitoring before, during and after the working to protect the water supply. The Bromate plume will need to be assessed and shown that it will not be spread either vertically or laterally as a result of proposed works. This is of particular importance for proposals which extend below the water table or into the lower mineral horizon; and
- Developments associated with the mineral extraction should be designed and positioned appropriately to prevent conflict with the purposes of the Green Belt.

4.54 Chapter 12 of the eMLP addresses the Green Belt. The opening paragraph states the intentions of the NPPF in relation to Gren Belts, but notes "… *With over half of Hertfordshire designated as Metropolitan Green Belt, the need to protect the Green Belt is an important local consideration*." Paragraph 12.2 adds "*Taking into account the temporary nature of mineral extraction and associated development, the NPPF deems mineral extraction 'not inappropriate' within the Green Belt, provided it preserves the openness of the Green Belt and does not conflict with the purposes of including land in Green Belt. Minerals working can therefore be accommodated within the Green Belt provided that the associated developments, including buildings and processing machinery, are designed and positioned appropriately to prevent conflict with the purposes of the Green Belt*". At paragraph 12.4 the eMLP recognises that there is also an opportunity to enhance beneficial use of land in the Green Belt following the restoration. Mineral extraction proposals that are restoration-led can be used to enhance Hertfordshire's Green Belt.

4.55 These matters are encapsulated in **Policy 12** which provides a positive approach to development in the Green Belt, indicating that *"Proposals for mineral extraction and associated development in the Green Belt will be permitted subject to the development complying with national Green Belt policy and other policies set out in this Plan*." It goes on to add "*Proposals must site machinery to preserve the openness of the Green Belt and prevent conflict with the purposes of including land in the Green Belt throughout the duration of mineral operations*". The final part of the policy relates to restoration with proposals "*should preserve the openness of the Green Belt and where possible enhance the beneficial use of the Green Belt and improve the character and appearance of the countryside".*

4.56 Finally, **Policy 13** addresses Cumulative impact indicating that providing a positive approach where cumulative impact would not result in unacceptable adverse impacts on the environment of an area or on the amenity or health of a local community. The policy indicates that this can be "*either in relation to the collective effects of different impacts of an individual proposal or in relation to the effects of a number of developments occurring either concurrently or successively*". This policy is similar in effect to Policy 11 in the adopted MLP considered above.

PROTECTION OF THE ENVIRONMENT

4.57 Both the NPP and the Development Plan contain specific policies on safeguarding and protecting the environment, covering all aspects such as the countryside; the natural environment; built and cultural heritage; agriculture; and landscape. They also set out policies aimed at minimising the loss of amenity through pollution. In this respect, **Policy 17** in the MLP provides an overarching framework for safeguarding critical capital and other important environment assets. These are defined in paragraph 4.8.2 of the MLP and include European and nationally designated sites for nature conservation; Local Nature Reserves and wildlife sites; protected species (either by law or identified in the UK BAP); nationally important heritage assets and identified landscapes of high historic value. Allied to this, **Policy 18** (MLP) also addresses amenity aspects that may arise through noise or degradation of air quality or water environment. In the WCS, **Policy 11** is similarly an overarching policy covering landscape, ecology and the historic environment.

4.58 The following paragraphs provide a brief overview of those policies aimed at protecting the environment. To recap, the various documents that constitute the Development Plan are abbreviated as follows:

NPPF	National Planning Policy Framework
MLP	Hertfordshire Minerals Local Plan
WCS	Waste Core Strategy and Development Management Policies
WHDP	Welwyn Hatfield District Plan
SADP	St Albans District Local Plan Review

Landscape

4.59 Section 15 of the NPPF, "*Conserving and enhancing the natural environment*", sets out criteria that are relevant to landscape. These include the protection of valued landscapes in a manner that is commensurate with their statutory status or identified quality in the development plan, recognition of the intrinsic character and beauty of the countryside and maintaining the character of undeveloped coast.

4.60 In paragraph 176 it is stated that "*Great weight should be given to conserving and enhancing landscape and scenic beauty in National Parks, the Broads and Areas of Outstanding Natural Beauty which have the highest status of protection in relation to these issues*". It also set out that "*the scale and extent of development within these designated areas should be limited"* and that *"planning permission should be refused for major development other than in exceptional circumstances and where it can be demonstrated that that the development is in the public interest*" .

4.61 At a county level, in addition to the policies addressing restoration (Policy 13) and after-use (Policy 14) the MLP at **Policy 12** indicates that mineral proposals will be required to take account of existing and, where appropriate, historic landscape character and maintain its distinctiveness. Planning applications may be refused where there is significant local landscape intrusion and loss

of important landscapes or distinctive landscape features. It goes on to add that proposals will be expected to respect landscape character; ensure any distinctive features are protected; and be accompanied by landscape conservation, design and management measures that both strengthen the character and enhance the condition of the landscape. Allied to this, **Policy 18** also requires a consideration of visual intrusion and impact on the local landscape.

4.62 As noted above, **Policy 11** in the WCS covers *inter alia* the siting, scale and design of waste management developments in the context of the surrounding landscape character and that the landscaping and screening of the site is designed to effectively mitigate the impact of the proposal.

4.63 The key landscape-related policy in the WHDP is **Policy R28** which recognises the importance of historic parks and gardens and the contribution these make to the landscape, and seeks to promote the preservation and maintenance of this resource.

4.64 The SADP policies relating to landscape include **Policy 74** which seeks to protect existing landscape features such as trees and hedgerows. This policy also requires new landscaping with the use of native trees and shrubs and the retention or creation of wildlife corridors. **Policy 104** seeks to protect and conserve landscape quality throughout the District

4.65 These policy issues have been taken into consideration within the Landscape and Visual Impact Assessment of this Volume which is reported in Chapter 8 of Volume 2.

Natural Environment

4.66 Relevant paragraphs in the NPPF are 180 to 182. These paragraphs provide that:

180. When determining planning applications, local planning authorities should apply the following principles:

a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;

b) development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest;

c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists; and

d) development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to incorporate biodiversity improvements in and around developments should be encouraged, especially where this can secure measurable net gains for biodiversity.

181. The following should be given the same protection as habitats sites:

a) potential Special Protection Areas and possible Special Areas of Conservation;

b) listed or proposed Ramsar sites; and

c) sites identified, or required, as compensatory measures for adverse effects on habitats sites, potential Special Protection Areas, possible Special Areas of Conservation, and listed or proposed Ramsar sites."

4.67 As noted above **Policy 17** in the MLP seeks to protect a range of ecological designations, including sites of European, national and local importance, along with protected species. The policy recognises that the degree of protection will be commensurate with the status of the designation according to their international, national or local importance. Under the policy, planning permission will not be permitted where "*it would result in the permanent loss or damage or significant and irreversible change to those particular characteristics and features that define the special quality of critical capital or other environmental assets*". It also adds that proposals for mitigation, where appropriate, should be included that will provide for the maintenance and enhancement of critical capital or other environmental assets, including where temporary loss would occur.

4.68 Allied to this, **Policy 9** provides that, where appropriate, proposals provide opportunities to contribute to the delivery of the national, regional, and local biodiversity action plan targets. Conversely, proposals that "*prejudice the delivery of these targets or would result in the loss of, or damage to habitats and/or species will not be supported."*

4.69 In the WCS **Policy 17** provides protection to sites of international and national importance, indicating that planning permission will be permitted where it can be demonstrated that they would not have an irreversible adverse impact on the designation. The policy indicates that such assets should be conserved and where possible opportunities sought to enhance them. In a similar vein, **Policy 18** indicates that planning permission will be granted where it can be demonstrated a development would not have an irreversible adverse impact on the character, appearance, ecological, geological and amenity value of Regional and Local Sites and Features of importance. The policy adds that such assets should be conserved and where possible opportunities sought to enhance them. Where there are unavoidable negative impacts, adequate mitigation measures should be proposed to address such impacts and/or compensation provided for their replacement. **Policy 19** seeks to protect and safeguard Hertfordshire's diversity of natural environmental assets. It firstly requires consideration to be given to provide opportunities to contribute to the delivery of the national, regional and local Biodiversity Action Plan targets. It also seeks to protect and enhance existing woodland, trees and hedges through improved management and new planting, including management, over the long-term. Finally, as noted above, **Policy 11** in the WCS also covers *inter alia* ecological aspects, with parts iv) and v) relating to wildlife habitats and the natural environment. In this context development proposals should not have an adverse impact upon such interests, either through the development or operational phases.

4.70 The WHDP contains a number of policies to protect the natural environment. **Policy R11** is an overarching policy that seeks to protect and enhance biodiversity, and requires new development to positively contribute to biodiversity. **Policy R13** gives protection to Sites of Special Scientific

Interest (SSSI), and **Policy R14** gives protection to Local Nature Reserves. **Policy R15** covers all regionally important wildlife sites. **Policy R17** recognises the importance of trees, woodlands and hedgerows to biodiversity and to the landscape, and requires new development to protect and retain existing trees, woodland and hedgerows wherever possible and replant using locally native species.

4.71 The SADP contains one key saved policy relating to nature conservation. **Policy 106** affords protection to SSSI, Nature Reserves and other sites which have conservation value, and states that conditions will be imposed to protect the special features of the site from adverse effect.

4.72 The nature conservation value of the application site, together with consideration of any ecological designations in the vicinity of the application site is addressed at Chapter 11 of Volume 2.

Historic Environment

4.73 Relevant guidance can be found at paragraphs 189 to 208 in Section 16 of the NPPF

4.74 Paragraph 194 recognises that heritage assets are an irreplaceable resource and the need to conserve them in a manner appropriate to their significance. Paragraph 194 states:

"In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance".

4.75 In terms of assessing the potential impacts a development may have on cultural heritage assets, paragraphs 199 to 208 are relevant.

4.76 As noted above **Policy 17** in the MLP seeks to protect a range of historic and heritage designations. The policy recognises that the degree of protection will be commensurate with the status of the designation according to their international, national or local importance. Under the policy, planning permission will not be permitted where "*it would result in the permanent loss or damage or significant and irreversible change to those particular characteristics and features that define the special quality of critical capital or other environmental assets*". It also adds that proposals for mitigation, where appropriate, should be included that will provide for the maintenance and enhancement of critical capital or other environmental assets, including where temporary loss would occur.

4.77 In the WCS **Policy 17** provides protection to sites of international and national importance, indicating that planning permission will be granted where it can be demonstrated that the proposal would not have an irreversible adverse impact on the designation. The policy indicates that such assets should be conserved and where possible opportunities sought to enhance them. In a similar vein, **Policy 18** indicates that planning permission will be granted where it can be demonstrated a development would not have an irreversible adverse impact on the character, appearance, ecological, geological and amenity value of Regional and Local Sites and Features of importance. The policy adds that such assets should be conserved and where possible opportunities sought to enhance them. Where there are unavoidable negative impacts, adequate mitigation measures should be proposed to address such impacts and/or compensation provided

for their replacement. As noted above, **Policy 11** in the WCS also covers *inter alia* heritage aspects, with parts iv) and v) relating to the built and historic environment. In this context development proposals should not have an adverse impact upon such interests, either through the development or operational phases.

4.78 The WHDP policies on the historic environment are set out in the District-wide Policy section. **Policy R28** relates to the protection of historic parks and gardens and has already been acknowledged. **Policy R29** affords protection to sites and assets of archaeological potential and actual importance.

4.79 The SADP policies relating to the historic environment include **Policy 83**, giving protection to listed buildings, and three policies relating to archaeology. **Policy 109** affords protection to Scheduled Monuments as listed in the policy; and **Policy 110** gives similar protection to archaeological sites, also listed in the policy. **Policy 111** lists a number of archaeological sites where development would not normally be refused but the assets should be investigated prior to disturbance (a "recording condition").

4.80 Consideration of any archaeological designations in the vicinity of the application site is addressed at Chapter 12 of Volume 2.

Water Environment

4.81 Guidance formerly contained in PPS25 is now found within paragraphs 152 to 173 of the NPPF, together a complete section on flood risk contained in the web-based PPG (paragraphs 7-001 to 7-078).

4.82 Again, **Policy 17** in the MLP seeks to safeguard *inter alia* the water environment. In this respect parts iv) and v) of the policy are relevant. Part iv) indicates that proposals that adversely affect the water environment will not be permitted unless appropriate measures can be imposed to mitigate any harmful effects. Part v) restricts development that would increase the risk of flooding or have a material negative impact on the storage or flow capacity of the floodplain.

4.83 Within the WCS **Policy 16** provides protection to inter alia the water environment indicating that proposals should not have a negative impact on the water environment unless appropriate measures can be imposed to mitigate harmful effects.

4.84 The WHDP contains a number of policies to protect the water environment, particularly in terms of flood protection and protection of the water resource. **Policy R7** affords protection to surface water and ground water quality, and encourages the use of sustainable drainage systems. **Policies R9 and R10** cover the protection and conservation of water resources and water quality.

4.85 The SADP policies on the water environment are principally concerned with flood protection and surface water management. **Policy 84** seeks to reduce the risk of flooding and ensure proper catchment management. **Policy 84A** covers drainage infrastructure to avoid flooding.

4.86 These policies have been considered as part of the hydrological and hydrogeological assessments that are reported in Chapter 6 of Volume 2.

Transport

4.87 At the national level paragraphs 104 to 113 in Section 9 of the NPPF are relevant. All developments that generate significant amounts of movement should be required to provide a Travel Plan and be supported by a Transport Statement or Transport Assessment[3]. Plans and decisions should take account of whether:

- appropriate opportunities to promote sustainable transport modes can be – or have been – taken up, given the type of development and its location;
- safe and suitable access to the site can be achieved for all users; and
- any significant impacts from the development on the transport network (in terms of capacity and congestion), or on highway safety, can be cost effectively mitigated to an acceptable degree.

4.88 Paragraph 111 then adds that development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe.

4.89 In the MLP, **Policy 16** is relevant. This policy provides that development will only be permitted where the traffic movements likely to be generated by the development would not have an unacceptable impact on highway safety, the effective operation of the road network, residential amenity or the local environment.

4.90 In the WCS, **Policy 9** considers "*sustainable transport*" indicating that waste management facilities should be well located in relation to the strategic road network. **Policy 13** (again in the WCS) reflects Policy 16 in the MLP, indicating that permission will be granted where it is demonstrated that HGV movements would not have a significant adverse impact on highway safety; effective operation of the highway network; amenity; human health; and the historic and natural environment. The policy also adds that:

> "*Applicants must demonstrate, by a detailed transport appraisal, that the safest and least environmentally damaging methods of transporting waste are both practically achievable and will be used to minimise road miles and where appropriate, utilise more sustainable modes of transport such as by rail and water*".

4.91 In the context of public rights of way, **Policy 18** in the MLP and **Policy 15** in the WCS are relevant. Both require that good quality, safe and convenient temporary alternative provision is made and long-term reinstatement or suitable replacement of rights of way is secured where it is not possible to safeguard and existing route.

4.92 The WHDP policies on transport are contained in the section on Movement (section 6). **Policy M2** requires developers of proposals which may generate significant traffic to carry out transport assessments to demonstrate measures that are proposed to minimise traffic movements and minimise the impact on the local transport network. **Policy M3** requires developments that

[3] Paragraph 113, NPPF

exceed certain criteria to also have a Green Travel Plan in place. **Policy M14** sets out the expectations in terms of parking provision for new development.

4.93 Further WHDP policies relevant to this subject are contained in the section on policies specific to rural areas. **Policy RA25** gives protection to public rights of way and states that the council will work with others to improve the public rights of way network. This protection extends to bridleways (Policy RA26) and greenways (Policy RA27). **Policy RA28** seeks to limit development which would have an adverse effect on rural roads and nearby properties.

4.94 The SADP Review Policies 34 and 35 are key District Council policies on highways considerations and development control. Where a development is likely to give rise to significant levels of additional traffic or a new access onto the public highway, **Policy 34** sets out a range of considerations aimed at minimising the adverse impact of the development on the local highway network, including road safety, capacity and environmental impact. **Policy 35** requires highway improvements under certain circumstances to avoid adverse impacts. **Policy 39** sets out the criteria relating to off-road parking provision associated with new development.

4.95 Transport considerations have been assessed and presented in Chapter 7 of Volume 2.

Pollution and Amenity of Local Communities

4.96 Pollution issues are set out in paragraphs 174 and 183 to 188 of the NPPF. Paragraph 174 refers to preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability.

4.97 Paragraph 185 provides that "*decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation".

4.98 Finally, paragraph 188 notes that LPAs should focus on whether the development itself is an acceptable use of the land, and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. Local planning authorities should assume that these regimes will operate effectively.

4.99 Guidance can also be found in the web based Planning Practice Guidance. Firstly, the guidance addresses the ability to comply with the noise criteria is set out in the Planning Practice Guidance

(paragraphs 019 to 022[4]). Secondly, the ability to adequately control and mitigate dust emissions is set out in the Planning Practice Guidance at paragraphs 023 – 032[5].

4.100 In the MLP, the only relevant policy is Policy 18 which requires consideration to be given to noise and air quality.

4.101 In the WCS, air quality is addressed in Policy 16, where a development should not significantly degrade the quality of air (particularly from dust and emissions).

4.102 In the WHDP, policies are included to protect the amenity of local communities. **Policy R18** covers air quality, **Policy R19** covers noise emissions and **Policy R20** covers light pollution. All three policies seek to control unacceptable levels of emissions and require the developers to put forward measures to minimise levels of air emissions, noise and light pollution.

4.103 In the SADP, the only 'saved' policy relating to the protection of local amenity is **Policy 80**, which seeks to minimise the adverse effects of floodlighting on neighbouring properties.

4.104 The need to minimise impacts upon the environment and local amenity have been a key consideration of the design process. These issues have been addressed within separate Chapters of the ES (Volume 2), namely Chapters 9 and 10.

[4] Reference ID: 27-019-20140306 to 27-022-20140306
[5] Reference ID: 27-023-20140306 to 27-032-20140306

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INTRODUCTION

Legislative Requirement

5.1 Alternatives are considered in the context of Regulation 18(3)(d) and paragraph 2 of Schedule 4 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017. Firstly, Regulation 5(2)(d) sates that an EIA Report should include:

> *"a description of the reasonable alternatives studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment."*

5.2 Paragraph 2 of Schedule 4 expands upon this by adding that the information to be provided (where appropriate[1]) should include "*A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.*".

5.3 Guidance contained in the Planning Practice Guidance portal comments[2] that "*the 2017 Regulations do not require an applicant to consider alternatives. However, where alternatives have been considered, paragraph 2 of Schedule 4 requires the applicant to include in their Environmental Statement a description of the reasonable alternatives studied (for example in terms of development design, technology, location, size and scale) and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects*".

5.4 The main purpose of considering alternatives within an EIA is to consider whether any alternative designs have been considered as part of the process. This could relate to operational practices or phasing of the development for example. Whether a site/land is suitable for limestone extraction is a fundamental consideration of the Development Plan; as such the consideration of alternative sources of limestone is set out in the Planning Statement.

ALTERNATIVES CONSIDERED

5.5 Few alternatives were considered as part of the original 2016 EIA. The design evolution involved the following changes:

- changing the location of the recharge lagoons to the eastern boundary (from the southern boundary);
- opting for a traditional static mineral processing plant, with screens and crusher housed within clad enclosures;

[1] Regulation 18(3)(f) indicates that information contained in Schedule 4 is to be provided where relevant to the specific characteristics of the development.
[2] Paragraph: 041 Reference ID: 4-041-20170728

- leaving two ponds on the periphery known to contain great crested newts *in situ*; and
- altering the restoration strategy from a heavily biodiversity lead scheme to one involving more public access.

5.6 In December 2014 Brett presented to the Environment Agency (EA) a phased site layout placing infiltration lagoons for the UMH and LMH aquifers near the southeast boundary of the site parallel to the A1000. In the EA's email response to Brett's initial proposal (Ally Thomas, 12 March 2015) a request was made for a critical appraisal of options (including adjacent land) for the LMH Lagoon on the basis of practicality and that it should not potentially expand the bromate plume any further than its currently defined location. The EA comments did not specifically relate to the originally proposed UMH lagoon since no bromate is anticipated in the water discharge but SLR has nevertheless reviewed the UMH lagoon as well as well as the LMH lagoon. The review identified that locating the lagoons on the eastern boundary offered several advantages.

5.7 Whist mobile processing plant would have a lower profile (typically being between 4m and 5m in height) it was considered that cladding the screens and crusher would offer more attenuation for dust and noise emissions. Given that the site is well screened, together with the peripheral bunding proposed, it was considered that the change to the processing plant would not have a significant effect. This has been borne out through the Landscape and Visual Impact Assessment (refer to Chapter 8).

5.8 In relation to the two ponds, originally it was proposed to construct a screen bund over them; however, discussions with the projects ecologist indicated that it would be better if they could be left in-situ. Given the location in relation to Home Covert, the removal of bunding in this area would not have any significant effect on the scheme.

5.9 Finally, the restoration strategy was amended following the comments made at a public exhibition (refer to the Statement of community Engagement) where great value is placed by the local community on public access.

5.10 As part of the 2021 EIA work, given that the proposals are a re-submission of the 2016 scheme then no additional alternatives have been considered. Notwithstanding this, it should be noted that the applicant has amended the scheme as follows:

- the erection and operation of a concrete batching plant has been removed from the proposals;
- the standoff for mineral extraction operations in the Lower Mineral Horizon (LMH) to the bromate plume (also in the LMH) will be increased from 50m to 100m;
- there will be no dewatering (pumping) of the LMH; and
- The access road from the quarry entrance has been moved by 5m to the east to allow additional acoustic screening.

5.11 Whilst the option exists to delete one or more of the above changes, this has not been considered as part of the EIA as it would result in an overall reduction in the quality of the scheme; the effect

of such an option would bring the scheme in closer alignment with the previous scheme which has previously been considered through the 2016 ES.

5.12 Finally, the option exists for the 'do-nothing' option whereby proposals to extract sand and gravel are dropped. This would mean that the application site remains in its current state and that 8Mt of sand and gravel are not worked, having an impact on supplies of aggregates within the county and wider region. The implications of this are considered in Chapter 5 of the Planning Statement.

5.13 The MPA has asked whether it would be possible to use field conveyors for transferring extracted sand and gravel to the processing plant. Such an option is best employed where the extraction area is some distance from the processing plant, as is the case with the adjacent Hatfield Quarry, where the extraction area is around 3.5km from the processing plant. Conveyors also work best when extraction is constant throughout the year, with the extracted mineral transferred to a 'surge pile' which in turn is fed (by gravity) into the processing plant. This would not be as effective where extraction takes place over part of the year; it would not be possible to employ a surge pile and so the mineral would need to be handled by loading shovels in the plant site to create the stockpile of as-dug material.

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INTRODUCTION

6.1 This chapter of the ES details the local hydrology and hydrogeology of the application site and the surrounding area. It also identifies possible hydrogeological and hydrological impacts associated with the proposed development, details of which have been set out in Chapter 3 above.

6.2 The assessment is based on the hydrological and hydrogeological regimes and the specific mitigation measures which have been incorporated into the design of the scheme.

ASSESSMENT METHODOLOGY

Approach

6.3 The assessment has involved the following:

- detailed desk study to establish current baseline hydrological and hydrogeological conditions.
- identification of possible measures to avoid and mitigate any adverse impacts resulting from the proposed development; and
- evaluation of the residual significance of these impacts by consideration of the sensitivity of the baseline features of the application site and the potential magnitude, following mitigation.

6.4 The desk top study was undertaken in order to:

- describe the geological, hydrological and hydrogeological setting.
- identify flooding risks; and
- identify sensitive hydrogeological and hydrological features which may potentially be impacted by the proposed development.

6.5 The extent of the desk top study was based on professional judgment.

Policy Context

6.6 The proposals for the development of the application site have had regard to technical guidance, relevant Guidance for Pollution Prevention, and other codes of best practice in order to limit the potential for contamination of ground and surface waters, the potential for flooding to be caused by the development, and other potential impacts on the water environment. The development of the application site would therefore be in accordance with the following:

European Legislation

6.7 The key piece of European Legislation that protects the UK's water environment is the Water Framework Directive (2000/60/EC). This Directive protects all elements of the water cycle and seeks to enhance the quality of groundwaters, surface waters, estuaries and coastal waters.

National Legislation and Policy

6.8 Key national legislation and policy relevant to this proposed development includes:

- Environmental Permitting (England and Wales) Regulations 2016
- Environment Act 1995
- the Agency's (the Agency) statutory obligations over the management and control of pollution into water
- the Agency's Groundwater Protection Policy, March 2017 (https://www.gov.uk/government/collections/groundwater-protection)
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 in England and Wales
- Flood and Water Management Act, 2010
- National Planning Policy Framework, Published by Department for Communities and Local Government, 19 February 2019; and
- National Planning Policy Framework and Relevant Planning Guidance29th November 2016 (Planning practice guidance - GOV.UK (www.gov.uk).

Local Planning Policy and Strategy

6.9 As noted from Chapter 4 above, the main local planning policy documents include:

- Hertfordshire County Council (2007). Hertfordshire Minerals Local Plan Review 2002- 2016; and
- Hertfordshire County Council (2012). Hertfordshire Waste Development Framework: Waste Core Strategy & Development Management Policies Development Plan Document 2011-2026.

6.10 Details of the relevant planning policies that relate to the water environment are set out in Chapter 4.

Good Practice Guidance

6.11 Relevant UK guidance on good practice for construction projects is detailed in the following documents:

- Control of Water Pollution from Construction Sites - Guide to Good Practice, CIRIA 2002; and
- Environmental Good Practice on Site C650, CIRIA 2005.

6.12 The Pollution Prevention Guidelines (PPG), which were officially withdrawn on the 17th of December 2015, and their replacement guidance series Guidance for Pollution Prevention (GPPs) identified below, provide environmental good practice guidance for England that are related to the site activities:

- GGP1 1: Understanding your environmental responsibilities - good environmental practices (October 2020)
- GPP 2: Above Ground Oil Storage Tanks (January 2018)
- GPP 3: Use and Design of Oil Separators in Surface Water Drainage Systems (April 2006)
- GPP 4: Treatment and disposal of wastewater where there is no connection to the public foul sewer (November 2017)
- GPP 5: Works and maintenance in or near water (February 2018)
- GPP 13: Vehicle washing and cleaning (April 2017)
- GPP 21: Pollution incident response planning (July 2017)
- GPP 22: Dealing with spills (October 2018)
- GPP 26: Safe storage - drums and intermediate bulk containers (February 2019)

6.13 Guidelines for surface water management and flood risk assessment are as follows:

- The SuDS Manual (Report C753). CIRIA, 2015
- National Planning Policy Framework, department for Communities and Local Government (last updated June 2019)
- CIRIA Report C624, Development and flood risk – guidance for the construction industry (October 2004)
- BS8533:2017, Assessing and managing flood risk in development – Code of Practice (December 2017)
- Department for Environment, Food & Rural Affairs and Agency (2015). Flood risk assessment: local planning authorities (at https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities); and
- Planning Policy Guidance, Ministry of Housing, Communities & Local Government, Flood Risk and Coastal Change (2014) (https://www.gov.uk/guidance/flood-risk-and-coastal-change).

Information Sources

6.14 The following sources of information have been consulted in order to characterise the geology, hydrogeology, and hydrology of the area within and surrounding the application site:

- BGS online maps (www.bgs.ac.uk/data/mapViewers/home.html) for details of geology and borehole logs
- British Geological Survey / the Agency (1997) The Physical Properties of Major Aquifers in England and Wales, Technical Report WD/97/34
- The Agency Website (www.environment-agency.gov.uk) for details on aquifer classification, source protection zones, groundwater vulnerability, flood risk and Water Framework Directive classifications for groundwater and rivers

- Institute of Hydrology Flood Estimation Handbook Webservice, Map - FEH Web Service (ceh.ac.uk)
- Ordnance Survey website for 1:25,000 scale explorer map (https://www.ordnancesurvey.co.uk)
- Emap Groundsure reports of application site including FloodInsight, GeoInsight and Enviroinsight reports
- C Fitzpatrick, 2010, The Hydrogeology of Bromate Contamination in the Hertfordshire Chalk: Double-Porosity Effects on Catchment-Scale Evolution;
- SLR Consulting Ltd (November 2014) Hatfield Aerodrome Mineral Development Site - Site Investigation, Ref 406.01009.00064; and
- SLR Consulting Ltd (2013 through May 2021) Baseline Groundwater Quality Data Tables
- SLR Consulting Ltd (September 2018) Pumping Test Assessment Report, as incorporated into the abstraction licences applications (July 2018 422.01009.00211)
- SLR Consulting Ltd (January 2020) Groundwater and Water Management Plan v5, subsequently varied August 2021 (v.6)

Scoping and Consultations

6.15 As noted from Chapter 1 above, a scoping opinion was requested from the MPA and issued on the 19 November 2015. Discussions have been held with the Agency over a period of 5 years to help develop a working plan that would be acceptable to the EA. There have been ongoing discussions with the Agency and Affinity dating from the original submission of the application until 2020. A further scoping opinion was sought in May 2021, which was issued by Hertfordshire County Council on 14 July 2021.

Significance Criteria

6.16 A qualitative risk assessment methodology has been used to assess the significance of the potential effects associated with the proposed development. Two factors have been considered using this approach: the sensitivity of the receiving environment and the potential magnitude of impact, should that potential impact occur.

6.17 This approach provides a mechanism for identifying the areas where mitigation measures are required and for identifying mitigation measures appropriate to the risk presented by the scheme. This approach also allows effort to be focused on reducing risk where the greatest benefit may result.

6.18 Criteria for determining the significance of effects are provided in Table 6-1, Table 6-2 and Table 6-3 below. Effects of 'major' and 'moderate' significance are considered to be 'significant' in terms of the EIA Regulations.

6.19 The sensitivity of the receiving environment (i.e., the baseline quality of the receiving environment as well as its ability to absorb the impact without perceptible change) is defined in Table 6-1.

Table 6-1
Sensitivity Criteria for Water Environment Receptors

Sensitivity	Definition
Very High	• International importance. • Receptor with a high quality and rarity, regional or national scale and limited potential for substitution / replacement.
High	• National importance. • Receptor with a high quality, local scale, and limited potential for substitution / replacement; or • Receptor with a medium quality and rarity, regional or national scale and limited potential for substitution / replacement.
Medium	• Regional importance. • Receptor with a medium quality and rarity, local scale and limited potential for substitution / replacement; or • Receptor with a low quality and rarity, regional or national scale and limited potential for substitution / replacement.
Low	• Local importance. • Receptor with a low quality and rarity, local scale. • Environmental equilibrium is stable and is resilient to changes that are greater than natural fluctuations, without detriment to its present character.

6.20 The criteria that have been used to assess the magnitude of the impacts are defined in
6.21 Table 6-2.

Table 6-2
Magnitude of Impact Criteria and Definitions

Magnitude	Criteria	Definition
Major	Results in loss of attribute.	Fundamental (long term or permanent) changes to hydrology, hydrogeology, and water quality, such as: • Wholesale changes to watercourse channel, route, hydrology, or hydrodynamics. • Changes to the application site resulting in an increase in runoff with flood potential and also significant changes to erosion and sedimentation patterns. • Major changes to the water chemistry or hydro-ecology. • Major changes to groundwater levels, flow regime and risk of groundwater flooding.
Moderate	Results in impact on integrity of attribute or loss of part of attribute.	Material but non-fundamental and short to medium term changes to hydrology, hydrogeology and water quality, such as: • Some fundamental changes to watercourses, hydrology or hydrodynamics. Changes to application site resulting in an increase in runoff within system capacity. • Moderate changes to erosion and sedimentation patterns. • Moderate changes to the water chemistry of surface runoff and groundwater. • Moderate changes to groundwater levels, flow regime and risk of groundwater flooding.
Minor	Results in minor impact on attribute.	Detectable but non-material and transitory changes to hydrology, hydrogeology, and water quality, such as:

Magnitude	Criteria	Definition
		• Minor or slight changes to the watercourse, hydrology, or hydrodynamics. • Changes to application site resulting in slight increase in runoff well within the drainage system capacity. • Minor changes to erosion and sedimentation patterns. • Minor changes to the water chemistry of surface runoff and groundwater. • Minor changes to groundwater levels, flow regime and risk of groundwater flooding.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect the use/integrity.	No perceptible changes to geology, hydrology, hydrogeology and water quality, such as: • No impact or alteration to existing important geological environs. • No alteration or very minor changes with no impact to watercourses, hydrology, hydrodynamics, erosion and sedimentation patterns. • No pollution or change in water chemistry to either groundwater or surface water. • No alteration to groundwater recharge or flow mechanisms.

6.22 The sensitivity of the receiving environment together with the magnitude of the impact defines the significance of the potential effect, as identified in

6.23

6.24 Table 6-3.

Table 6-3
Significance of Potential Effect

Magnitude of Impact	Sensitivity			
	Very High	High	Medium	Low
Major	Major	Major	Moderate	Minor
Moderate	Moderate	Moderate	Moderate	Minor
Minor	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

6.25 The characteristics of the impacts are described in terms of direct/indirect, temporary (reversible)/permanent (irreversible), together with timescales (short, medium, long term). These terms are defined within Chapter 1 of this Volume.

Baseline Conditions

6.26 The following hydrogeological and hydrological regime is considered below:

- Regional geology;
- Local geology;
- Aquifer characteristics;
- Recharge mechanisms;

- Groundwater levels and flow,
- Water abstraction and use;
- Groundwater quality;
- Catchment overview;
- Surface water flows;
- Surface water quality; and
- Flood risk.

6.27 The hydrogeological and hydrological data have been used to develop a conceptual site model.

Geology

Regional Geology

6.28 The solid geology beneath the application site comprises undifferentiated Lewes Nodular Chalk Formation and Seaford Chalk Formation. This dips to the south-east and is underlain by undifferentiated Holywell Nodular Chalk Formation and New Pit Chalk Formation.

6.29 The application site lays within the Vale of St Alban's, a broad northeast to southwest orientated plain between higher land to the north-west and south-east. The chalk on the higher land to the west is overlain by superficial drift Clay with Flints deposits. In contrast the chalk on the higher land to the south-east is overlain by the Lambeth Group and London Clay, and other drift.

6.30 The Vale of St Albans corresponds with the route of a peri-glacial water course (Proto-Thames) that is understood to have flowed northeast into East Anglia. Overlying the chalk in this area and at the site is the Lowestoft Formation, comprising a sequence of glacial deposits including boulder clays and sands and gravels. A thin tract of alluvium associated with the former alignment of a surface water course known as the Nast also crosses the site.

6.31 Extracts of the geological maps are shown on Drawing HQ 6/1 and HQ 6/2.

Local geology

6.32 A number of site investigations and studies have been undertaken at the site between c. 1994 and present. Drawing 6/3 is a site plan with the location of previous and current boreholes and groundwater monitoring wells, and the alignment of a geological cross section.

6.33 Four broad superficial drift units above the chalk comprise an upper and lower granular formation (sands, gravels referred to as the UMH and LMH respectively), separated by boulder clay, referred to as Interburden (IB), all overlain by a gravelly clay overburden. This corresponds to the Lowestoft Formation described in the regional geology of the area.

6.34 The geological sequence including depths are summarised in

6.35 Table 6-4.

Table 6-4
Application Site Geology

Drift/Solid	Depth (m)	Geological Unit	Description
Superficial Drift	0.1 – 5.7	Overburden – Clay, Sand, Gravel	Variable mixture of clay, sand and gravel, sometimes in discrete lenses
	2.2 – 11.8	Upper Mineral Horizon (UMH)	Slightly gravelly sand.
	6.2 – 14.2	Interburden - Boulder Clay (BC)	Stiff grey or orange, brown clay with occasional gravel
	8 – 18.3	Lower Mineral Horizon (LMH)	Sand and sandy gravels
Solid Geology	+8 - 18.3	White Chalk Sub-Group	White chalk with flints

6.36 A detailed geological cross section across the application site and nearby boreholes is shown on Drawing HQ 6/4. The alignment of the section is shown on Drawing 6/3 with borehole logs in Appendix 6/1.

6.37 Previous sand and gravel quarries in the Hatfield area have generally been restored via landfill and there are landfills to the immediate north of the application site. All landfills within a 2km radius of the application site are shown on Drawing HQ 6/5.

Hydrogeology

Aquifer Characteristics

6.38 The Glacial Drift Deposits of sand, gravel, and clay, (Overburden, UMH and LMH) are classified by the Agency[1] as Secondary (undifferentiated) Aquifers.

6.39 This classification combines Secondary A and Secondary B Aquifers which cannot be distinguished due to the variable characteristics of the geology. Secondary A Aquifers are described as *"permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers."* and Secondary B Aquifers are described as *"lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering."*

6.40 The small band of alluvium associated with the Nast, which correlates to the current route of the Nast including a culverted section, is classified by the Agency as a Secondary A Aquifer.

6.41 The Chalk is classified as a Principal Aquifer; it is a laterally continuous water body and an important regional supply of potable water as well as supporting base flow in rivers. The aquifer is generally unconfined where the chalk outcrops to the northwest of the application site although where

[1] Magic Map Website (Accessed August 2021) https://magic.defra.gov.uk/

valleys cut into the chalk the aquifer can be locally confined beneath infilling of low permeability superficial drift deposits.

6.42 The Chalk has high matrix porosity but low matrix permeability, with flow mainly occurring through fractures and fissures (secondary permeability), often associated with traceable hard bands.

6.43 Groundwater in the Chalk and the Lower Mineral Horizon (LMH) is regionally extensive and in hydraulically continuity. It is possible that weathering of the upper parts of the chalk have reduced the vertical hydraulic connection between the strata.

6.44 The UMH groundwater is a perched aquifer, resting on the IB (boulder clay) which separates the two mineral horizons and is laterally continuous across the application site and is in hydraulic connection with the alluvium referred to above (Paragraph 6.36). The Overburden rests upon the UMH and consists of clay, silt, sand and gravels and covers the majority of the application site.

The hydrogeological characteristics of the geological strata at the application site and surrounding areas range across 3 orders of magnitude based on literature derived values in presented in

Table 6-5.

- Upper Mineral Horizon – 0.864 to 864m/d
- Lower Mineral Horizon – 8.64 to 8,640m/d

6.45 A 3-day constant discharge pumping test was undertaken in the UMH and the LMH in May-June 2018. A transmissivity between 78 and 84m^2/d was calculated for the UMH from which a hydraulic conductivity of approximately 19m/d has been derived.

6.46 The LMH rests on the chalk and groundwater is in hydraulic continuity across the two geological units. A transmissivity of approximately 800m^2/d was calculated for the LMH using a partial penetration solution that incorporated the underlying productive chalk aquifer. The bulk hydraulic conductivity is approximately 13m/d but is highly variable and sensitive to the 60m assumed aquifer thickness and physical characteristics of the chalk (fissures and fractures) as well as highly permeable sand and gravel zones in the LMH.

6.47 The application site is located within the Total Catchment Zone (SPZ3) and Outer Source Protection Zone (SPZ2) of two public water supply well fields (Hatfield and Colney Heath) located 1,500m south-east and 2,200m south south-east from the application site, respectively (Drawing 6/5). The SPZ2 zone is defined as the 400-day travel time but must have a minimum radius of 250 or 500m around the source depending on abstraction volume.

6.48 The public water supply wells are currently being used for containment of a regional bromate plume so abstracted water is not used for public water supply.

Table 6-5
Hydrogeological Characteristics of Geological Units

Geological Unit	Hydrogeological Characteristics	Groundwater Vulnerability and Aquifer Productivity
Overburden	Comprises clay, silt, sand and gravel deposits with limited thickness. The lithology is mixed and also occurs in discrete lenses therefore permeability is variable depending on grain size and sorting but is generally considered to be low.	Secondary Aquifer (Undifferentiated)
Upper Mineral Horizon (UMH)	Variable lithology (clays, sands and gravels) but largely sands with occasional gravel and clay lenses. Typical hydraulic conductivity 1 x 10^{-5} to 1 x 10^{-2}m/sec[2] (note the on-site pumping test recorded a value of 2.2 x 10^{-4}m/sec so within this range)	Secondary Aquifer (Undifferentiated)
Interburden (Boulder Clay)	Glacial Boulder Clay thought to be laterally extensive and is typical over-consolidated glacial boulder clay. The top of the boulder clay dips eastwards across the application site and laboratory tests have provided a permeability of 5x10^{-11}m/s.	Secondary Aquifer (Undifferentiated)
Lower Mineral Horizon (LMH)	Predominantly sandy gravel with lenses of sand and occasional lenses of clay. Typical hydraulic conductivity 1 x 10^{-4} to 1 x 10^{0}m/sec[2]. Note that a transmissivity of c.800m²/day was estimated from the on-site pumping test, which is highly influenced by the underlying chalk aquifer.	Secondary Aquifer (Undifferentiated)
Lewes Nodular Chalk Formation (Base of the Upper Chalk)	White chalk with flints. Groundwater storage and flow is associated with secondary porosity and permeability due to fractures and karstic features. Literature gives transmissivity values for the Colne valley in the range of 1,500-3,000m²/day[3], however, it is noted that repeated freezing and thawing during peri glaciation shattered the chalk in the wider valleys and produced a thick soft weathered layer of chalk. The weathered chalk hydraulic conductivities are estimated to be between 10^{-4} to 10^{-2} m/day[4] with vertical hydraulic conductivities likely to be around 10% of the horizontal values. Weathered soft chalk has been recorded on site and whilst the Chalk and LMH are thought to be in hydraulic continuity, the presence of the weathered chalk causes a lower permeability layer at the interface.	Principal Aquifer

Recharge Mechanisms

6.49 The Agency has provided rainfall data (2010-2012) for a rainfall gauge at Mill Green, approximately 4km east- north-east of the application site. This data indicates that annual rainfall ranges between 456mm and 811mm, with an annual average of approximately 616mm.

6.50 The Institute of Hydrology (Webservice, Map - FEH Web service,ceh.ac.uk);) reports that the Seasonally Adjusted Average Annual Rainfall (SAAR) at the application site is 662mm.

[2] Freeze A and Cherry J. A (1979) Groundwater pp604
[3] BGS 1997, The Physical Properties of Major Aquifers in England and Wales. WD/97/34
[4] C Fitzpatrick, 2010, The Hydrogeology of Bromate Contamination in the Hertfordshire Chalk: Double-Porosity Effects on Catchment-Scale Evolution

6.51 Groundwater recharge to the Chalk strata occurs where bedrock is exposed at or just below the surface, which occurs approximately 1.5km to the northwest of the application site.

6.52 Recharge to the UMH is thought to be incidental rainfall, infiltration from the Butterwick Brook to the west of the application site, and surface water infiltration from discharges originating offsite to the north.

Groundwater Levels

6.53 The Agency has provided groundwater elevations for three chalk boreholes in the region, the locations of the borehole close to the application site are shown on Drawing HQ 6/5. The data are summarised in Table 6-6 and a hydrograph is included in Appendix 6/2.

Table 6-6
Regional Chalk Groundwater Elevations

Borehole	Period	Groundwater Elevation (mAOD)				Range (m)	Location (km)
		No.	Min	Mean	Max		
Orchard Garage	1988 – 2011	260	73.97	77.05	81.60	7.63	2.5 NW
Mymms Park	1986 – 2015	271	58.76	61.44	66.51	7.75	3.7 SW
Shaws Corner	1986 – 2015	301	75.96	77.09	78.73	2.77	7.6 N

6.54 A review of the data shows that, over the monitoring period, the highest groundwater levels in all three boreholes were recorded in 2001, however, North Mymms and Shaws Corner boreholes show similarly high groundwater elevations in 2014.

6.55 Groundwater levels within the UMH, LMH and Chalk are routinely recorded from monitoring wells on and adjacent to the application site by manual water level dipping during sampling events and using automatic level recording instruments installed in selected wells. Monitoring well locations are shown on Drawing HQ 6/3. Hydrographs are included in Appendix 6/3. **Error! Reference source not found.** is a summary of minimum, maximum and average water elevations.

Table 6-7
Groundwater Elevations (Aug 2013 – April 2021)

Horizon	Borehole	Groundwater Elevation (mAOD)				
		Count	Minimum	Mean	Maximum	Range (m)
Upper Mineral Horizon (UMH)	BH101	39	71.84	73.75	75.84	4.01
	BH102	39	74.02	75.27	77.28	3.26
	BH103	38	72.59	74.22	76.77	4.19
	BH104	39	71.86	72.79	74.61	2.76
	BH105	6	72.50	72.93	74.46	1.96
	BH105x	28	70.55	71.58	72.44	1.89
	BH106	39	71.37	72.44	73.90	2.53
	BH107	31	73.15	74.46	76.90	3.76
	BH108	28	71.01	71.89	73.64	2.63
	FT101	37	72.98	74.35	76.42	3.45
	FT102	39	72.94	74.45	76.86	3.92
	FT103	36	72.99	74.40	76.83	3.84

Horizon	Borehole	Groundwater Elevation (mAOD)				
		Count	Minimum	Mean	Maximum	Range (m)
Lower Mineral Horizon	BHA	33	71.62	72.50	73.87	2.26
	BHC	25	71.16	71.89	72.65	1.50
	BHD	26	70.91	71.89	72.87	1.95
	BHE	32	71.28	72.31	73.64	2.37
	BHF	26	73.46	75.13	78.51	5.05
	BHH	21	72.90	74.70	76.71	4.96
	BHI	5	72.98	73.68	75.43	2.44
	BHJ	21	71.79	72.38	73.16	1.37
	BHK	23	73.14	74.20	75.36	2.22
	GMW101	5	74.59	75.63	76.50	1.92
	GMW102	6	74.49	74.76	74.95	0.46
	GMW103	16	72.28	73.36	75.07	2.79
	GMW103 L	15	70.78	72.39	74.96	4.18
	GMW104	15	72.22	73.38	75.09	2.87
	GMW105	12	71.79	73.04	76.55	4.76
	GMW106	15	70.38	71.50	73.96	3.58
	GMW107	16	74.05	75.52	76.43	2.38
	GMW108	11	75.33	76.25	76.74	1.41
	GMW109	16	73.73	75.38	76.50	2.77
	GMW110	15	71.25	71.42	72.33	3.81
	GMW111	15	71.55	72.19	73.20	1.65
	GMW112	16	72.53	73.74	75.17	2.64
	GMW113	16	73.32	74.53	75.65	2.33
	GMW114	15	74.61	75.25	76.41	1.80
	BH306 U	15	71.18	71.70	72.39	1.21
	BH307 U	13	70.57	71.71	72.42	1.85
	BH101	38	65.21	66.45	68.36	3.15
	BH102	37	67.06	68.95	71.55	4.49
	BH103	37	67.28	69.35	71.68	4.41
	BH104	37	66.31	67.96	70.26	3.95
	BH105	38	65.46	67.35	69.42	3.96
	BH106	39	63.50	64.68	66.53	3.03
	BH107	27	66.71	67.75	69.62	2.91
	BH108	27	66.27	68.16	71.70	5.43
	BH201S	28	65.88	66.98	68.73	2.85
	BH201D	28	65.75	66.90	68.62	2.87
	BHB	34	63.29	64.55	66.67	3.39
	BHG	31	67.55	69.27	71.63	4.08
	BH301 L	12	68.45	69.51	72.69	4.24
	BH302 L	15	68.73	69.73	72.85	4.12
	BH305 L	14	68.32	69.31	72.56	4.24
Chalk	BH101	39	65.21	66.41	68.36	3.15
	BH102	38	67.04	68.89	71.50	4.47
	BH103	37	67.28	69.50	71.87	4.59
	BH104	38	66.24	67.87	70.20	3.96
	BH105	36	65.88	67.50	69.39	3.51
	BH106	39	63.28	64.65	66.54	3.26
	BH107	27	66.69	67.76	69.62	2.92
	BH108	28	66.28	67.68	69.65	3.38
	BH301 C	11	68.44	69.52	72.68	4.24
	BH302 C	15	68.76	69.76	72.91	4.15
	BH305 C	14	68.31	69.29	72.56	4.25

Note: BH101-BH108, 301, 302 and 305 are nested wells. Suffix indicates the monitored horizon

6.56 A review of the groundwater level data indicates the following groundwater levels at the application site:

- Highest recorded groundwater elevation:
  - UMH – 76.25mAOD (GMW101) on west boundary and 76.5mAOD (GMW109) on CEMEX boundary
  - LMH – 72.85mAOD (BH302L) northwest of application site
  - Chalk – 72.91mAOD (BH302C) northwest of application site
- Lowest recoded groundwater elevation:
  - UMH – 71.25mAOD (GMW110) southeast of application site
  - LMH – 63.29mAOD (BHB) east of application site
  - Chalk – 63.28mAOD (BH106C) southeast of application site

6.57 The UMH is unconfined for most of the year and depends on the presence or absence of overburden and the seasonal fluctuation of groundwater levels.

6.58 Groundwater levels in the LMH and the Chalk in the nested wells are at the same elevation and closely correlate indicating that the LMH and Chalk are in hydraulic continuity.

6.59 The highest recorded groundwater levels in all aquifers during the monitoring period occurred in March 2014 and April 2021 when they reached similar elevations. Lowest groundwater levels were recorded in November 2017 and August 2019.

Groundwater Flow

6.60 Groundwater level contours (piezometric surface) for the UMH (2019 & 2021) and the LMH and Chalk in 2021 are shown on Drawings HQ6/6 through HQ6/9.

6.61 Groundwater flow beneath the mineral development site within the UMH is broadly west to east with a hydraulic gradient of c.0.004 which drops to c.0.006 when water levels are naturally lower in the perched aquifer.

6.62 Drawing HQ6/6 also illustrate that groundwater flow from CEMEX is occurring across the northernmost site corner into the proposed mineral processing area and into Home Covert. This local feature appears to be related to shallow water infiltration from CEMEX silt lagoons, but also from a surface discharge pipe located at SW11 as shown on Drawing HQ6/6.

6.63 It is noted that the highest groundwater levels recorded in the UMH in March 2014 and 2021 were close to ground level along the southwest side of Home Covert where a lack of stream bed and culvert maintenance in this part of the site contributes to water ponding and backing up.

6.64 Groundwater flow within the LMH and Chalk is north-west to southeast across the application site and is being influenced by the Affinity Water plc (Affinity) Bishops Rise chalk aquifer boreholes located c.1.6km east-southeast of the site (Drawing HQ6/5). The hydraulic gradient is approximately 0.001.

6.65 The LMH and Chalk aquifer beneath the site is on occasion confined or unconfined both spatially and temporally. This is due to:

- seasonal fluctuation of piezometric water levels,
- non uniform elevation of the IB horizon (confining unit),
- variation in abstraction rates, and distance from the Bishops Rise abstraction boreholes.

Groundwater Quality

6.66 Brett has built a groundwater quality data base for the three aquifer units beneath the site and adjacent land spanning the period 2013 to 2021 for bromate and bromide, and from 2013 to 2019 for other analytes.

6.67 Monitoring data spanning this period is presented in tabular form in Appendix 6/5.

Bromate

6.68 The Agency are monitoring a regionally extensive plume of bromate dissolved in the chalk aquifer that extends southeast from its source in Sandridge (4km northwest of the site).

6.69 The natural flow path of the bromate plume in the chalk extends northwest to southeast from Sandridge towards the northern end of the Aerodrome, heading toward the River Lea.

6.70 Affinity has been actively pumping the chalk aquifer to capture the plume for several years which is causing the plume to veer to the south, departing from its natural course. The plume location has been stable for several years in its location east of the Application site during a relatively low natural groundwater level period, as illustrated on Drawing HQ 6/8 (October 2019 data).

6.71 The southern edge of the plume in the chalk and to a lesser extent the overlying LMH is present beneath the northern corner of the application site, as defined by BH301 Chalk and BH104 Chalk. This area forms part of the proposed mineral processing area and is not a mineral extraction area.

6.72 The southern perimeter of the bromate plume in the LMH sits further northeast than in the chalk. Drawing HQ 6/9 (April 2021) illustrates the location of the bromate plume edge in the LMH northeast of the Application boundary.

6.73 A summary of bromate detections in **onsite** boreholes is given below. The complete bromate testing set is included in Appendix 6/5.

- UMH - Sporadic trace level detections have been recorded in monitoring wells installed in the UMH, but nothing consistent or at a significant level.
- LMH - Sporadic, trace level detections have been measured in several LMH monitoring wells, however, the most consistent has been from BH104 but none exceeded the Drinking Water Standard (DWS)

- Chalk - Sporadic, trace level detections have been recorded in several chalk monitoring wells, the most consistent being BH104 and BH301 but none exceeded the DWS.

6.74 A summary of bromate detections in offsite boreholes is given below:

- UMH - There have been sporadic trace level detections in monitoring wells installed in the UMH, but nothing consistent or at a significant level.
- LMH - There have been bromate detections more than the DWS in five offsite monitoring wells to the east of the Site (BH105, 108, 201, 305 and BH B)
- Chalk - There have been bromate detections in excess of the DWS in 3 offsite monitoring wells (BH105, 108 and 305 – note that BH201 and BH-B referenced above do not monitor the chalk aquifer)

6.75 In summary the bromate plume is considered stable in both the chalk and the LMH due to the intervention of containment pumping by Affinity.

Other Analytes

6.76 A high-level summary of analyte detections across a broad range of chemical testing suites is presented in Table 6-8 and

6.78 Table 6-9, once again splitting On-Site and Off-Site sampling locations, and by aquifer unit.

On Site Monitoring Data

6.79 Slightly elevated concentrations of metals (iron, manganese, nickel) have been recorded in groundwater in the north, northwest, and west side of the site in all three aquifer units being monitored.

6.80 Inorganic compounds, particularly ammoniacal nitrogen is elevated relative to background in the same site areas. These areas are noted to be hydraulically down-gradient of historic offsite landfills.

6.81 There is no evidence of significant on-site impacts to groundwater in all three aquifer units from organic compounds (petroleum hydrocarbons, solvents, pesticides etc.

Off Site Monitoring Data

6.82 Brett installed five UMH, four LMH and three chalk aquifer monitoring wells east of the application site. The primary purpose of the wells was to delineate the edge of the bromate plume, but analysis was also undertaken for metals, inorganics, and organic compounds.

6.83 Impacts to groundwater quality was identified in the UMH aquifer from several metals, chromium, cadmium and traces of nickel and zinc (BH105X, 108, 306) and from chlorinated solvents in the same wells plus BH307.

6.84 Impacts to groundwater quality were identified in the LMA from the same metals stated above, plus solvent in BH105, 108 and 201.

6.85 Impacts to groundwater quality were identified in the chalk from cadmium, chromium, and solvents in BH105 and 108.

6.86 These offsite detections are unrelated to the application site and would not significantly impact upon mineral operations. The source of these analytes is not defined.

Water Framework Directive

6.87 The Water Framework Directive requires that natural water bodies achieve a 'good' status by 2027 in accordance with its chemical, ecological and physical condition based on several 'supporting elements'. New schemes that could compromise achievement of goals are contrary to the Directive. Appendix 6/6 is a WFD compliance assessment report.

6.88 The WFD Compliance Assessment assessed aspects of the development relating to river diversion, groundwater quality and dewatering, against ecological and chemical status and determined the likelihood of significant effect to be low based on mitigation measures identified within the ES, the Flood Risk Assessment (App 6/9) and Hydrogeological Risk Assessment (HRA, submitted with the environmental permit application December 2016 ref. 422.01009.00140/HRA).

6.89 The WFD Compliance Assessment report concluded that none of the four WFD Objectives would be compromised by the proposed scheme.

Table 6-8
On Site Monitoring Wells

Upper Mineral Horizon	Analyte	Monitoring Wells	Location
Metals	Iron	GMW104, GMW105, GMW107	NW Site Boundary
	Manganese	BH103, GMW104, GMW105, GMW107	
		BH102, GMW113, GMW114	West site boundary
		BH-A	East/Lagoons area
	Nickel	BH102	West site boundary
Inorganics and MNA parameters	Ammoniacal Nitrogen	BH102, GMW103	NW site boundary
TPH, EPH, GRO, BTEX	None Detected	-	-
VOCs, SVOCs, Phenols, Pesticides	VOC solvent. Trace	BH-A	East/Lagoon area
Lower Mineral Horizon	**Analyte**	**Monitoring Wells**	**Location**
Metals	Iron	BH302	NW site boundary
	Manganese	BH301, BH302, GMW103	North and NW site boundary
		BH102, BH103	West site boundary
	Nickel		
Inorganics and MNA	Ammoniacal Nitrogen	BH102, BH103, BH302	West and north site boundary
TPH, EPH, GRO, BTEX	None identified	-	-
VOCs, SVOCs, Phenols, Pesticides	None Identified	-	-
Chalk	**Analyte**	**Monitoring Wells**	**Location**
Metals	Iron,	BH102, BH302	West and north site boundary
	Manganese,	BH102, BH103, BH301, BH302	
	Nickel	BH302	
	Zinc	BH102	
Inorganics and MNA	Ammoniacal Nitrogen	BH103, BH302	
	Nitrate	BH102	
TPH, EPH, GRO, BTEX	None identified	-	-
VOCs, SVOCs, Phenols, Pests'	None Identified	-	-

Table 6-9
Off Site Monitoring Wells

Upper Mineral Horizon	Analyte	Monitoring Wells	Location
Metals	Chromium	BH105X, BH108	Off site and hydraulically down gradient of Home Covert Wood
	Cadmium	BH108 Trace	
	Manganese	BH306	
	Nickel	BH108 Trace	
	Zinc	BH108 Trace	
Inorganics and MNA	Non-significant	-	
TPH, EPH, GRO, BTEX	None identified	-	
VOCs, SVOCs, Phenols, Pest'	VOC solvent	BH105X, BH108, BH306, BH307	
Lower Mineral Horizon	**Analyte**	**Monitoring Wells**	**Location**
Metals	Chromium	BH105, BH108	Off site and hydraulically down gradient of Home Covert Wood
	Cadmium	BH108	
	Manganese	BH108, BH305	
	Nickel	BH108	
	Zinc	108 Trace	
Inorganics and MNA	Non-significant	-	
TPH, EPH, GRO, BTEX	None identified	-	
VOCs, SVOCs, Phenols, Pest'	VOC solvents	BH105, BH108, BH201	
Chalk	**Analyte**	**Monitoring Wells**	**Location**
Metals	Chromium	BH105, BH108	Off site and hydraulically down gradient of Home Covert Wood
	Cadmium	BH108	
Inorganics and MNA	Non-significant	-	
TPH, EPH, GRO, BTEX	None identified	-	
VOCs, SVOCs, Phenols, Pesticides	VOC solvents	BH105, BH108 Trace	

Hydrology

Catchment Overview

6.90 The application site and surrounding area are shown on Drawing HQ 6/4 and 6/5. The general topography shows the western boundary of the application site at an elevation of c. 79-78mAOD and the ground falls slightly to the north, east and south with the lowest point at the southeast corner next to the A1057 at around 74mAOD.

6.91 Demolition of the former aerodrome runway, however, which was orientated southwest to northeast across much of the central part of the application site and crossed the eastern site boundary, causes localised high ground associated with this feature up to 83m AOD.

6.92 The application site and immediate area is situated within the headwaters of the River Colne catchment. The River Lea catchment is to the northeast and east of the application site.

6.93 The River Colne flows east to west and is approximately 1.8km to the south of the application site at its closest point. The River Lea flows northwest to east and is approximately 3.3km to the northeast of the application site at its closest point.

Site and Surrounding Surface Water

6.94 The Nast flows seasonally (ephemeral) in an open channel in a southeast direction across the northern part of the application site (the proposed mineral processing area) as shown on Drawing HQ 6/6 and 6/7.

6.95 The Nast originates within the application site close to the northwest boundary and is understood to receive surface water runoff from land and ponds to the immediate north of the application site, as well as from shallow groundwater when seasonal levels rise high enough.

6.96 An unnamed ditch within Home Covert Wood is sourced from a water discharge pipe from CEMEX at its boundary with Home Covert wood (SW11 on Drawing HQ6/6 and 6/7). There is no flow typically between April and Oct/Nov but when discharge is occurring it flows to the south along the western side of Home Covert until it combines with flow from the Nast.

6.97 The Home Covert dich continues south and discharges to a culvert passing beneath the former airfield runway, but a lack of stream bed maintenance in this area causes water to pond and back up so water does not reach the culvert. The intended culvert route crosses the eastern part of the application site and University playing fields, and daylights on the northern side of the A1057 Hatfield Road.

6.98 The Ellenbrook is a stream east of the site that is culverted beneath the University of Hertfordshire De Havilland Campus. The culvert is exposed 20m southeast of the A1057/Ellenbrook Lane roundabout which then returns to culvert as it flows south along the eastern side of Ellenbrook Lane. The Ellenbrook then meanders to the River Colne in a general southwest direction in an open channel once it is clear of the urban area.

6.99 The Nast culvert on the northern side of the A1057 Hatfield Road discharges to the Ellenbrook on Ellenbrook Lane.

6.100 A tributary (man-made channel) of the Ellenbrook north of the A1057 roundabout aligns with the eastern side of the former Aerodrome at c. 200m east of the application site at its closest point.

6.101 The tributary channel is mostly fed by storm water lagoons associated with nearby housing and is predominantly dry upstream of the storm water lagoon discharge into the channel. The invert level of the channel is typically higher than the UMH groundwater level (based on BH-C data on the Application site), so shallow groundwater is therefore not discharging to the tributary channel.

6.102 Other water bodies in the area comprise:

- Lagoons from previous mineral workings to the immediate north of the site and a small stream
- A roadside lagoon adjacent to the southern boundary of the site parallel to Hatfield Road (A1057) located west of Popefield Farm entrance,
- Butterwick Brook approximately 0.5km to the southwest of the application site at its closest point. The brook flows south and joins the Ellenbrook c. 1.5km south of Smallford.

Surface Water Levels

6.103 The Agency website shows no surface water monitoring points within a 2km radius of the application site.

6.104 Surface water monitoring has been undertaken by SLR since August 2019, the locations are shown on Drawing HQ 6/5. Water levels have been taken monthly for the first year followed by quarterly although no flow data has been gathered. Results are summarised in Table 6-10 below and shown in full in Appendix 6/7.

Table 6-10
Surface Water Elevations (August 2013 – March 2017)

Monitoring Location	Water Elevation (mAOD)					
	Count	Dry	Min	Mean	Max	Range (m)
SW1	19	12	75.229		75.402	0.173
SW2	19	0	71.98	72.44	>72.74	0.76
SW3	19	8	74.27	74.69	74.99	0.715
SW4	22	0	73.66	73.85	74.04	0.409
SW5	22	0	73.20	73.34	73.50	0.295
SW6	22	0	71.36	71.45	71.57	0.21
SW7A	21	13	71.83	71.88	71.93	0.101
SW7B	21	15	71.90	71.91	71.91	0.013
SW8	16	0	77.24	77.41	>77.60	0.26
SW9	19	13	73.81	73.93	74.30	0.56
SW10	7	6	-	-	-	-
SW11	5	4	-	-	76.69	-

6.105 A review of data shows the Nast (SW1), the culvert beneath the former runway (SW9) and the discharge from the site to the Ellenbrook (SW7A and SW7B) is predominantly dry throughout the monitoring period supporting its ephemeral status.

6.106 The surface water management pond for Ellenbrook Park appears to be providing a small amount of baseflow into the Ellenbrook tributary. The greatest ranges of water level fluctuation occur within an onsite pond and the upstream Ellenbrook tributary.

Surface Water Quality

6.107 The Water Framework Directives River Basin Management Plan indicates that the 2019 ecological status of the Upper Colne and Ellenbrook (Waterbody ID GB106039029820) was 'moderate'. The watercourse is considered to be at risk. It is noted that the Agency designate only the culverted arm of the Ellenbrook and not the Ellenbrook tributary.

6.108 The chemical quality of the Upper Colne and Ellenbrook was assessed as "fail" in the most recent assessment round of 2019 due to the presence of Polybrominated diphenyl ethers (PBDEs) and Perfluoro-octane sulphonate (PFOS).

6.109 The Nast is not included in the Water Framework Directives River Basin Management Plan. However, it is noted the Agency classify the Nast within the culvert on the application site as a main river and extend this main river up the Home Covert ditch, even though there is no natural flow supplying the ditch from the north. The two Ellenbrook sources are not considered to be main rivers up-gradient of the A1057 roundabout.

6.110 Surface water monitoring data for selected determinants for the period August 2013 to May 2019 are summarised in Table 6-11. Monitoring locations are shown on Drawing HQ 6/5. Results for all tested determinants are included within Appendix 6/8.

6.111 The network of surface water monitoring locations is divided into streams along flow route or ponds or lagoons.

- Nast – SW1, SW9, SW10, SW7A and SW7B
- Upstream Ellenbrook – SW3, SW5 (upstream of SW balancing lagoon, and downstream of Ellenbrook and balancing lagoon mixing)
- Downstream Ellenbrook - SW6 (after Nast has mixed with Ellenbrook)
- Storm water balancing lagoon discharge - SW4 (prior to mixing with Upper Ellenbrook)
- Home Covert Ditch - SW11 (discharge from Cemex prior to mixing with Nast)
- On site Lagoon – SW2 (Upper Mineral Aquifer (UMA), immediately south of home Covert)
- Home Covert Pond (offsite) - SW8
- Ephemeral Pond by Fire Training Area – SW12 (LMA)

6.112 A review of data in Table 6-11 can be summarised as follows:

- Bromate – two isolated trace level detections in Ellenbrook tributary at offsite locations SW3 and SW6.
- Ammoniacal nitrogen concentrations that are elevated above the relevant UK EQS in the upstream Nast (SW1 – maximum 2.5mg/l) and an offsite pond in Home Covert wood (SW8) – maximum 4.3mg/l)
- Metals – cadmium, chromium, iron, manganese, and lead exceed EQS in SW1 (1 event) and trace levels of cadmium in SW2 (UMA pond) and SW3 (Ellenbrook tributary)

6.113 The surface water quality monitoring data to date indicates that most locations record a calcium-bicarbonate type water typical of chalk areas, as illustrated on Figure 6-1.

6.114 The piper diagram illustrates that SW4 and SW5 represent a different sodium-chloride based hydrochemistry (rather than bicarbonate) – this is due to the water feeding the Ellenbrook being mainly rainfall runoff from adjacent housing estates and roads rather than shallow groundwater.

6.115 Despite the above most of the water quality results are comparable upstream and downstream, although it is noted the water quality in the ponds varies slightly from the watercourses. This is due to the ponds being predominantly ephemeral and groundwater fed.

Table 6-11
Surface Water Quality – Determinants and Environmental Quality Standards/DWS

Location		Bromate	Bromide	Bicarb Alkalinity	Ammoniacal Nitrogen	Cadmium	Chromium	Iron	Manganese	Lead	Zinc
Freshwater EQS/DWS		0.01	-	-	0.3	0.00008	0.0047	1	0.0012	0.012	0.0109
SW1 – Upstream Nast	Count	5	5	4	4	4	4	4	2	4	4
	Min	<0.0005	0.12	200	0.13	<0.00003	<0.002	0.027	0.086	<0.0004	0.0034
	Max	<0.0005	0.2	260	**2.5**	**0.00019**	**0.0059**	**2.4**	**0.23**	**0.0055**	0.023
	Mean	<0.0005	0.164	223	0.778	0.00006	0.0017	0.669	**0.158**	0.0017	0.0096
SW2 – Pond onsite	Count	9	9	3	4	4	4	3	-	4	4
	Min	<0.0005	0.018	110	0.033	<0.00003	<0.002	0.073	-	<0.0004	0.003
	Max	<0.0005	0.058	150	0.16	**0.00015**	0.00028	0.34	-	0.0022	0.0015
	Mean	<0.0005	0.034	130	0.086	0.00025	0.0002	0.228	-	0.0007	0.0025
SW3 – Upstream Ellenbrook	Count	7	7	3	3	3	3	3	-	3	3
	Min	<0.0005	0.025	140	0.049	<0.00003	<0.002	0.074	-	0.0021	0.0062
	Max	0.0018	0.082	230	0.07	**0.00014**	0.00031	0.28	-	0.0033	0.0097
	Mean	0.0002	0.054	193	0.059	0.00004	0.00017	0.15	-	0.0028	0.008
SW4 – SUDs Pond offsite	Count	13	13	3	4	4	4	4	-	4	4
	Min	<0.0005	0.025	87	0.11	<0.00003	<0.002	0.023	-	<0.0004	0.012
	Max	<0.0005	0.362	89	0.37	<0.00003	0.0001	0.15	-	0.002	**0.034**
	Mean	<0.0005	0.165	88	0.29	0.000015	0.00016	0.101	-	0.0011	0.024
SW5 – Midstream Ellenbrook Tributary	Count	13	13	3	3	-	-	-	-	-	-
	Min	<0.0005	0.025	89	0.076	-	-	-	-	-	-
	Max	<0.0005	0.274	120	0.31	-	-	-	-	-	-
	Mean	<0.0005	0.147	103	0.225	-	-	-	-	-	-
	Count	13	13	3	3	-	-	-	-	-	-

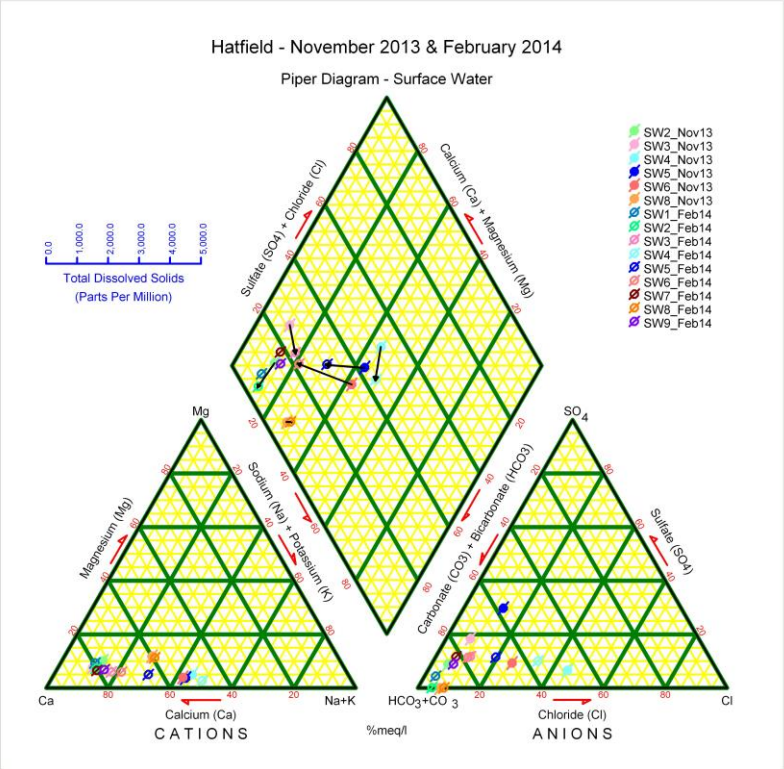
Location		Bromate	Bromide	Bicarb Alkalinity	Ammoniacal Nitrogen	Cadmium	Chromium	Iron	Manganese	Lead	Zinc
Freshwater EQS/DWS		0.01	-	-	0.3	0.00008	0.0047	1	0.0012	0.012	0.0109
SW6 – Downstream Ellenbrook	Min	<0.0005	0.025	82	0.069	-	-	-	-	-	-
	Max	0.0014	0.274	170	0.23	-	-	-	-	-	-
	Mean	0.021195	0.14	113	0.153	-	-	-	-	-	-
SW7A – Pipe Outfall into ditch next to A1057	Count	4	4	3	3	-	-	-	-	-	-
	Min	<0.0005	0.025	180	0.06	-	-	-	-	-	-
	Max	<0.0005	0.144	250	0.19	-	-	-	-	-	-
	Mean	<0.0005	0.08	217	0.113	-	-	-	-	-	-
SW8 – Home Covert Pond offsite	Count	9	9	3	4	-	-	-	-	-	-
	Min	<0.0005	0.025	37	**1.16**	-	-	-	-	-	-
	Max	<0.0005	0.094	87	**4.3**	-	-	-	-	-	-
	Mean	<0.0005	0.04	83	3.07	-	-	-	-	-	-
SW9 – Midstream Nast	Count	3	3	1	1	-	-	-	-	-	-
	Min	<0.0005	0.038	170	0.21	-	-	-	-	-	-
	Max	<0.0005	0.093	170	0.21	-	-	-	-	-	-
	Mean	<0.0005	0.071	170	0.21	-	-	-	-	-	-
SW- 10	Count	-	-	-	-	-	-	-	-	-	-
	Min	-	-	-	-	-	-	-	-	-	-
	Max	-	-	-	-	-	-	-	-	-	-
	Mean	-	-	-	-	-	-	-	-	-	-
SW-11 - Home Covert Ditch (Cemex)	Count	3	3	4	2	-	-	-	-	-	-
	Min	<0.0005	0.08	140	0.08	-	-	-	-	-	-
	Max	0.0006	0.24	190	0.05	-	-	-	-	-	-
	Mean	0.000156	0.135	170	0.21	-	-	-	-	-	-

Location		Bromate	Bromide	Bicarb Alkalinity	Ammoniacal Nitrogen	Cadmium	Chromium	Iron	Manganese	Lead	Zinc
Freshwater EQS/DWS		**0.01**	**-**	**-**	**0.3**	**0.00008**	**0.0047**	**1**	**0.0012**	**0.012**	**0.0109**
SW- 12 - Pond by former FTA	Count	3	3	2	3	-	-	-	-	-	-
	Min	<0.0005	0.03	41	0.6	-	-	-	-	-	-
	Max	<0.0005	0.066	53	1.6	-	-	-	-	-	-
	Mean	<0.0005	0.048	47	1.6	-	-	-	-	-	-
SW- 14 Home Covert Ditch (upstream of Nast)	Count	1	1	1	1	-	-	-	-	-	-
	Min	<0.0005				-	-	-	-	-	-
	Max	<0.0005	0.11	91	2.1	-	-	-	-	-	-
	Mean	<0.0005	0.11	91	2.1	-	-	-	-	-	-

Notes:

Environmental Quality Standards (EQS)
UK Drinking Water Standards (DWS)
Figures in bold exceed relevant standards.
SW7B and SW10 were dry during sampling events, therefore no data
FTA – Fire Training Area.

Figure 6-1
Piper Diagram of Surface Water Quality in and around Hatfield Aerodrome



6.116 The Groundsure report lists one active licensed discharge within 1km of the application site boundary the details of which are in

6.117 Table 6-12.

Table 6-12
Licensed Discharges within a 1km radius of the application site

Drawing ID	Consent Number	Location	Grid Reference	Purpose	Distance from Site (m)
D1	CTWC.3104	Beech Farm, Coopers Green	519030 208920	Sewage Discharges – Final/Treated	433 NW

Flood Risk

6.118 Potential sources of flooding to the application site have been considered and assessed in the FRA provided in Appendix 6/9.

6.119 The primary flood risk associated with the proposed development is from fluvial flooding, from the Nast, and overland flow, conveyed from the slightly higher ground adjacent to the north and east of the Site.

6.120 However, no works are proposed within the area shown to be at risk of fluvial flooding. The proposed works are therefore considered to lie in Flood Zone 1. Moreover, based upon the low vulnerability of the proposed development land uses, any localised and shallow ponding of surface

water towards the fringes of the application site poses minimal impact upon the function of the application site.

6.121 A summary of the potential sources of flooding and a review of the potential risk posed by each source at the Site is presented in Table 6-13.

Table 6-13
Potential Sources of Flood Risk

Potential Source	Potential Flood Risk at the Site	Reason
Fluvial flooding	Yes	Application site located partly in within Flood Zone 2.
Tidal flooding	No	Inland location.
Overland flow flooding	Yes	Potential higher ground adjacent to the west and northwest of the application site
Flooding from rising / high groundwater	No	Elevated terrain and lack of historic evidence suggest that groundwater emergence poses no flood risk to the Site. Any flooding associated with excavating below ground level would be managed through pumping.
Flooding from artificial drainage systems	No	Floodwater from surcharging sewers in the vicinity of the application site is likely to follow the general topography and drain towards the Ellenbrook. Therefore, flows would not accumulate to a sufficient depth to give rise to a flood risk.
Flooding due to infrastructure failure	No	The Site is not reliant upon any flood defence infrastructure; therefore, no flood risk is posed by failure of infrastructure. Moreover, EA mapping confirms that the Site is not located in an area identified at risk of flooding from a reservoir.

Designated Ecological Site

6.122 Details of the ecology of the site and including the location of sites designated for their ecological value (SSSI's, SPA's etc.) are given in the ecology chapter of the ES (Chapter 11). There are five water dependant designated ecological sites within 2km of the site, a Local Nature Reserve and four Local Wildlife Sites. A summary of the sites is given in Table 6-14.

Table 6-14
Water Dependant Ecological Sites

Reference	National Grid Ref.	Name	Direction and Distance from Site Boundary (km)	Description of Water Dependant Habitat
68/040	TL 176 096	Jersey Farm Estate Houses Lane	1.6 NW	Pond

Reference	National Grid Ref.	Name	Direction and Distance from Site Boundary (km)	Description of Water Dependant Habitat
68/015	TL 185 081	Oaklands Gravel Pit	0.7 SW	Flooded gravel pit with wetland
68/003	TL 193 068	Smallford Pit	0.6 S	Seasonal wet hollows
69/003	TL 202 064	Sleapshyde Gravel Pit	1.1 S	Open water and wet neutral grassland
69/001	TL 201 058	Colney Heath*	1.8 S	Marshy grassland

Note: * Also designated as Local Nature Reserve.

6.123 In addition to these sites an ecological survey undertaken as part of the baseline assessment has identified five ponds (P1, P3, P5, P6 and P9) that support a great crested newt population, four of which are within the application site boundary. Further details and plans showing the locations of ecological features can be found in the ecology chapter of the ES.

PROPOSED DEVELOPMENT

6.124 The proposed development is described in detail in Chapter 3 of this volume and summarised below:

- building of a mineral processing plant and excavation/construction of infiltration lagoons.
- excavation of mineral from 7 phases (A-G).
- infilling with inert materials; and
- restoration to recreational/conservation land.

6.125 The proposals would involve the winning and working of c. 8Mt of sand and gravel over a period of around 30 years (based on an annual output of around 250,000 tpa). In parallel with the extraction of minerals, low permeability inert material would be the used to infill the mineral workings and facilitate restoration of the site. The inert material would be site derived IB and overburden supplemented with imported material typically comprising excavation waste from construction and engineering projects (soils, overburden, clays etc.) within the region.

6.126 Phasing and restoration drawings (including cross sections) are shown on Drawings HQ 3/6 to 3/12. The quarry would be worked on a phased basis to allow for progressive restoration. Sand and gravel would be worked from the two discrete horizons described above. The UMH is overlain by a clayey material (referred to as 'overburden'), above which is the soil horizon. The two mineral horizons are separated by a laterally continuous layer of boulder clay (referred to as 'IB'): the overburden and IB would be used to control groundwater ingress and to infill the base of the workings (i.e. the excavated LMH and IB) to provide a suitable low permeability geological barrier on which the imported material would be placed within the void of the UMH and overburden.

6.127 Two infiltration lagoons, an UML and a LML would be constructed to manage water discharge during operation of the application site.

6.128 The mineral would be extracted, and each phase backfilled using a staged approach. Each phase would be isolated from the UMH by the construction of perimeter bunds before the UMH is worked. This would involve local dewatering of the UMH to allow the bund to be constructed in a dry

excavation. A back-drain would be installed behind the bund to reduce the maximum historically recorded groundwater level by 1m in order to maintain the stability of the bund prior to restoration.

6.129 When the bund is complete the UMH in the relevant phase would be dewatered and worked dry and the IB used as a working platform to wet dig the LMH.

6.130 Careful monitoring of groundwater levels in the LMH would be required in advance of working the LMH in each phase, together with sharing of data and reviews with the Agency, HCC and Affinity as set out in the GWMP.

6.131 Once the mineral has been excavated the phases would be progressively restored. The LMH void would be backfilled with site derived materials and an engineered geological barrier with a minimum thickness of 1m formed from site derived clay and keyed into the remaining overburden/phase perimeter bunds. The remaining void adjacent to the IB and LMH with be restored with imported material typically comprising excavation waste from construction and engineering projects (soils, overburden, clays etc.) within the region.

6.132 Each phase would take approximately 4 years to work with phases being worked progressively, moving east to west (see Drawing HQ 3/1).

6.133 Details of the restored landform are shown on Drawing HQ 3/11. It is proposed that back-drains to phases E and G would be retained as a 500mm deep open channel to intercept groundwater levels exceeding that monitored in the Spring of 2014, 2020 and 2021 and extended as shown on Drawing No. HQ 3/10. This drain would discharge to swales on site and then to the recharge lagoons in the UMH. This would prevent groundwater levels from rising above historical levels.

6.134 The working of the site would involve the management of groundwater and surface water. Estimates of the volumes that would need to be managed and the capacity of the recharge lagoons are presented in Appendix 6/10 and summarised in Table 6-15.

Table 6-15
Potential Water Volumes

Source of Water	Volume Range m^3/d	Discharge Location
1) **Dewatering discharge for clay buttress construction**	55 - 350	UMH/LMH Lagoon
2) **Phase Back Drain Flow**	110 - 360	UMH/LMH Lagoon
3) **UMH groundwater in storage and rainfall within each phase**	110 -150	UMH/LMH Lagoon
4) **Back-drain discharge from restored site**	200 – 1,300	UMH Lagoon
5) **UML Recharge Capacity**	725 – 1,400	UMH Lagoon
6) **LML Recharge Capacity**	6,000+	LMH Lagoon
7) **Restored UML Recharge Capacity**	1,300 – 2,000	UMH Lagoon

ASSESSMENT OF POTENTIAL IMPACTS

6.135 This sub-section identifies the potential impacts of the proposed development on the hydrogeological and hydrological environments prior to mitigation. It also assesses the likelihood of occurrence of each identified impact. The results of this assessment are summarised in Table 6-16
. It should be noted that the significance of the impact has been assessed as described in Table 6-2.

6.136 The proposed design and operation of the application site would incorporate measures to mitigate potential impacts on the water environment. These measures are not included in the initial assessment of impacts so that they can be explicitly stated in the mitigation section of this chapter of the ES.

6.137 In this assessment the sensitivity of the potential receptors is designated as follows:

- UMH Groundwater – Medium sensitivity as it is of local to regional importance only.
- LMH and Chalk Groundwater – High sensitivity as it is of national importance for water supply.
- Surface Water (Nast and Ellenbrook) – Medium sensitivity as it is of local to regional importance only, is frequently culverted and is urban in character.

Groundwater

Groundwater Quality

6.138 During construction, operation, and restoration of the proposed mineral extraction work there is the potential for adverse impacts on the groundwater quality within the UMH and LMH/Chalk aquifers, unless mitigation measures are adopted.

6.139 Construction and operation present a risk of impact to groundwater quality via direct emission into one or both aquifers from accidental spillage of raw materials, uncontrolled surface water run-off entering the active phase, fuel, and lubricants from storage and from the vehicles moving around the application site. The magnitude of the potential impact is 'moderate' for both the UMH and LMH/Chalk and therefore the significance of potential effect would be 'moderate' for both aquifers.

6.140 There is a potential for groundwater in the UMA and the LMA to mix during construction. The LMA/Chalk to the northeast of the site is impacted by bromate, which does not occur in the UMA beneath the site. Therefore, the magnitude of impact for the UMA groundwater to enter the LMH/Chalk aquifer is **'minor'**. This gives a potential effect of '**minor**' significance.

6.141 The magnitude of impact created by LMA/Chalk groundwater entering the UMA aquifer is '**high**' due to the risk of bromate contamination levels. Monitoring results, however, indicate that bromate occurrence on site in the LMA/Chalk is restricted to the northeast corner of the site beyond the active mineral working area; detections are inconsistent, and are at low trace level concentration. Bromate concentrations in the LMA in the northernmost corner of the mineral processing area could experience a marginal increase if LMA/Chalk groundwater levels fall lower than recorded on site so far. The potential effect would be of '**moderate**' significance so mitigation would be required.

6.142 Partial replacement of granular LMH with site won cohesive material could cause a marginal increase in groundwater head in the LMA at the hydraulically up-gradient side of the filled site. During high groundwater levels, the LMA pressure head could exceed the top of the IB but the

vertical migration pathway would be restricted by the AGB. Additionally, groundwater flow approaching from the northwest side of the site has not been impacted by bromate during the most extreme groundwater level 'lows' in the past and is even less likely to be impacted during groundwater highs which is when the LMA head could be above the upper surface of the IB. If levels were to rise then the potential effect to UMA water quality would be **'minor'**.

6.143 The application site would be restored with site derived cohesive materials and imported inert waste above the AGB. Although inert waste should not produce a leachate it is recognised that percolating water could be affected, which if leakage occurs could impair groundwater quality. The potential magnitude of any impact is '**moderate**' and hence the significance of any effect on groundwater quality in the UMH and LMH/Chalk is rated as '**moderate**'.

6.144 By design, lagoon operation would mix water from the UMA and the LMA. The sensitivity of LMA water mixing with UMA in the UMA is water is as described in Paragraph 1.134 ('**High**') but the risk of it occurring is reduced to '**minor**' by design of the lagoons and by always maintaining a downward vertical gradient from the UMA to LMA, for instance:

- The LMA groundwater head has always been >3m below the top of the IB
- The maximum fill elevation for the LML would be set below the lowest groundwater level recorded in the UMA at the location of the LML
- The UML sidewalls would be sealed around the whole LML
- Groundwater quality would be tested in advance of discharge
- Operation of the LML overflow would be subject to stakeholder approval.

Groundwater Levels and Flow

6.145 During construction and operation of the site there is the potential to impact on groundwater levels and flow direction within the UMH and LMH/Chalk.

6.146 Construction and operational phases of the development would require temporary dewatering of the UMH at various stages and times of the year, including:

- construction of the recharge lagoons
- installation of phase perimeter bunds in the UMH
- installation of back-drain to reduce maximum water levels behind the bund, and
- dewatering of the UMH so it can be worked dry to gain access to the IB and the LMH.

6.147 The impact of dewatering activities on water resources in the UMH is considered **'moderate'** and therefore the significance of the effect is **'moderate'**.

6.148 During operation, the UMH perimeter bunds would create a barrier to groundwater flow within the UMH that could cause groundwater levels to rise and locally alter flow direction. During certain seasons, groundwater within the UMH is close to the ground surface and the barrier effect could result in local groundwater flooding. The magnitude of the impact of increased water levels in the UMH is **'moderate'** giving a significance of effect of **'moderate**' so mitigation would be required.

6.149 After the removal of the mineral from the LMH the void would be backfilled with onsite material from the overburden and IB. As stated in Paragraph 6.135 this is a lower hydraulic conductivity than the mineral and could locally alter groundwater levels and flow directions in the LMH. However, given that at least 1m of unworked LMH would be left in place and the underlying Chalk is in

hydraulic connection with the LMA, the impact on water levels and flow directions in the LMA would be '**minor**' and the overall significance of any effect is also '**minor'**.

6.150 The UML would be used to return water to the UMA during various operational phases of the site including bund construction, disposal of incident rainfall and back drain water flow. The performance of the UML is dependent upon the physical properties of the aquifer, location and scale, and groundwater level at the time of discharge. Groundwater level is a seasonal variable, and the potential magnitude of impact is '**moderate**' and the significance of effect is rated as '**moderate**'.

Surface Water

Surface Water Quality

6.151 Without the incorporation of mitigation measures the proposed mineral extraction works, including processing plant, and restoration works have the potential to impact on the quality of surface water from the following potential runoff sources:

- Accidental spillage of raw materials, fuels, and lubricants from the processing plant and from the vehicles moving around the application site
- Increase in suspended solids in runoff
- Runoff impacted by hydrocarbon compounds from the weighbridges and vehicle movement areas; and
- Impacted runoff from the management and handling of waste materials.

6.152 Short term, hydrocarbon pollution from untreated runoff associated with roads and car parking areas could cause issues for surface water quality without suitable mitigation.

6.153 Accidental release of raw materials, fuels, other liquids, and runoff during the construction and operation of the processing/recycling facility with the potential to cause an impact to surface water.

6.154 Overall, the magnitude of impact associated with the construction and operation of the facility is considered '**moderate**' due to ground disturbance associated with construction or hydrocarbon pollution from vehicles over a relatively short timeframe. The potential effect significance is therefore considered '**moderate'** so further mitigation is required.

6.155 There is potential for surface water to entrain suspended solids during construction and landscaping activities associated with the restoration scheme owing to surface runoff from working areas and soil stockpiles. The magnitude of impact is **'moderate'** and the potential significance of the effect is therefore considered to be '**moderate**'.

Surface Water Flow Regime

6.156 The restoration scheme would involve the infilling of the mineral void with inert materials and covering with restoration soils, thereby potentially increasing the rate and volume of surface water because of the proposed development.

6.157 In the absence of mitigation, the magnitude of impact due to a potential change in the flow regime and increase in flood risk, both within and outside the application site boundary, is considered '**major'**. This assessment reflects the area of the application site occupied by the capped waste. The potential effects are considered '**moderate**' and further mitigation is required.

6.158 The Nast is an ephemeral stream and would be diverted along the northern and eastern perimeter of the mineral processing area (Drawing HQ 6/6) to enable construction of the proposed processing plant. Flow from the Nast would enter a new culvert constructed along the western side of the infiltration lagoons, like the route of the existing culvert. As the diverted reach is relatively short, flow conveyed along the Nast is expected to be low and the magnitude of impact is considered '**negligible**' resulting in an overall significance of '**negligible**'.

6.159 **Table 6-16** presents a summary of potential impacts associated with the proposed development and identifies where mitigation measures are required to reduce potential impacts to acceptable levels.

Ecological Sites

6.160 The nearest water dependent designated ecological sites are between 0.7 and 1.8km from the site boundary. As dewatering of the UMH (see details below) is spatially constrained and low permeability bunds would isolate its impact it is unlikely to significantly affect the identified sites.

6.161 There are ponds within and close to the development site which are undesignated but support a population of great crested newts. These are ephemeral ponds that dry in the summer period when water levels in the UMH fall. Pumping from the UMH would take place in the summer months when groundwater levels are low and ponds are dry, and on a limited scale to allow the installation of clay bunds. Water pumped to facilitate bund construction would be recharged back into the UMA.

6.162 The clay bunds would prevent the drawdown of groundwater levels outside of the mineral phase extraction area during the excavation of sands and gravels from the UMH. The magnitude of impact on water dependant ecological features would be '**minor**' resulting in an overall '**minor**' significance.

Table 6-16
Summary of Unmitigated Potential Impacts

Potential Impact	Spatial and Temporal Impact	Magnitude of Impact	Sensitivity of Receptor	Potential Effect	Mitigation Required?
Groundwater Quality					
UMH Aquifer					
Spillage of pollutants, oils, fuels etc. and uncontrolled surface water	Local, Short Term (Adverse)	Moderate	Medium	Moderate	Yes
Mixing of LMH/Chalk groundwater and UMH groundwater	Local, Short Term (Adverse)	Major	Medium	Moderate	Yes
LMA water entering the UMA via the lagoons	Local, Short Term (Adverse)	Moderate	High	Minor	Yes (by design)
Potential contamination from restoration landfill	Local, Long Term (Adverse)	Moderate	Medium	Moderate	Yes
LMH/Chalk Aquifer					
Spillage of pollutants, oils, fuels etc.	Local, Short Term (Adverse)	Moderate	High	Moderate	Yes
Mixing of UMH groundwater with LMH/Chalk groundwater	Local, Short Term (Adverse)	Minor	High	Minor	No
Interception of bromate contaminated groundwater	Regional, Short Term (Adverse)	Major	High	Major	Yes
Barrier to groundwater flow	Local, Long Term (Adverse)	Minor	High	Minor	No
Potential contamination from restoration landfill	Regional, Long Term (Adverse)	Moderate	High	Moderate	Yes

Potential Impact	Spatial and Temporal Impact	Magnitude of Impact	Sensitivity of Receptor	Potential Effect	Mitigation Required?
Groundwater Levels and Flow					
UMH Aquifer					
Dewatering reduces groundwater levels and changes flows	Local, Short Term (Adverse)	Moderate	Medium	Moderate	Yes
Barrier to groundwater flow	Local, Short Term (Adverse)	Moderate	Medium	Moderate	Yes
LMH/Chalk Aquifer					
Barrier to groundwater flow	Local, Long Term (Adverse)	Negligible	High	Negligible	No
Surface Water Quality					
Contaminated runoff entering surface waters during construction phase	Regional, Short Term (Adverse)	Moderate	Medium	Moderate	Yes
Suspended solids entering surface water	Regional, Short and Long Term (Adverse)	Moderate	Medium	Moderate	Yes
Surface Water Flow Regime					
Flooding from increased runoff	Local, Short, and Long Term (Adverse)	Major	Medium	Moderate	Yes
Management of shallow groundwater adjacent to UML	Local, Short, and Long Term (Adverse)	Moderate	Moderate	Moderate	Yes
Diversion of the Nast	Local, Short, and Long Term (Adverse)	Negligible	Medium	Negligible	No
Water Dependant Ecological Sites					

Potential Impact	Spatial and Temporal Impact	Magnitude of Impact	Sensitivity of Receptor	Potential Effect	Mitigation Required?
Reduction in water levels	Local, Short, Term (Adverse)	Minor	Medium	Minor	No

PROPOSED MITIGATION MEASURES

6.163 Mitigation measures to address potential impacts detailed in Table 6-16 are described below. These measures either reduce the likelihood of an event occurring or reduce the magnitude of the consequences if the event does occur. The reduction in likelihood is reflected in the overall rating of significance. It should be noted that several of the mitigation measures proposed below would have a positive effect on more than one potential impact.

6.164 Several operational mitigation measures and best available techniques have been incorporated into the scheme design, which would reduce the potential risks identified to ground and surface water.

Groundwater and Surface Water Quality

Spillages and Contaminated Runoff

6.165 The operation and restoration of the quarry would be undertaken using current technical guidance, relevant Pollution Prevention Guidelines, other codes of best practice and consents to limit the potential for contamination of both ground and surface waters.

6.166 Best practice techniques would be incorporated within the management procedures for construction and operation activities onsite to protect the water environment from pollution incidents. The mitigation measures can be summarised as follows:

- Heavy plant and machinery would be required on site during construction and as a result it is appropriate to adopt best working practices and measures to protect the water environment, including those set out in the Guidance for Pollution Prevention (GPP1)
- In accordance with GPP2 all above ground on-site fuel and chemical storage would be bunded
- An emergency spill response kit would be maintained on site
- A traffic management system / road marking would be put in place wherever possible to reduce the potential conflicts between vehicles and thereby reduce the risk of collision
- A speed limit would be imposed on site to reduce the likelihood and significance of any collisions
- The proposed restoration scheme is subject to an Environmental Permit which includes appropriate measures to avoid unacceptable impact on the environment including water; and
- Surface water runoff would be contained within the excavation areas and all water discharged to a recharge lagoon; this would reduce the risk of suspended solids entering surface waters.

6.167 A groundwater and water management plan has been prepared and agreed with the Agency and Affinity (Version 5). An updated version (V6) is included in Appendix 6/10.

6.168 The combined effect of the measures above would significantly reduce the likelihood of pollutants, including suspended solids, being discharged from the application site, such that the magnitude of impact is reduced to 'minor' and the potential effect is 'minor' for both surface and groundwaters.

Mixing of Aquifer Waters

6.169 There would be no pumping of LMA groundwater and therefore no LMA groundwater discharge so the risk of LMH groundwater mixing with UMH groundwater is extremely low.

6.170 The engineering design being proposed would isolate and keep separate the LMA and the UMA through the placement of an artificial geological barrier (AGB) that would in essence replace the IB. The AGB would be keyed into the IB at the outer edge of each phase maintaining the vertical separation of the UMA and the LMA.

6.171 A side wall barrier resting upon the IB at the flanks of each phase would complete the lateral seal and isolate the void above the AGB from the UMA beyond its boundary. Placement of the AGB and sidewall barrier would be monitored in accordance with a Construction Quality Assurance Plan (CQA) approved by the Agency.

6.172 The LMA piezometric surface may be within or just above the upper surface of the IB during extreme groundwater level situations for the two western phases (Phases E and G). The operational plan is to not undertake any excavation of the IB whenever groundwater in the LMA exceeds or could exceed the IB surface. Therefore, the risk of LMA mixing with UMA groundwater is maintained at low.

6.173 There is a provision for discharge of excess UMA groundwater into the LML and therefore the LMA. This discharge and would only be undertaken following discussion and agreement by the stakeholders of the GWMP (Appendix 6-10). Design and operation of the lagoons has been described in Paragraph 6.137 and no further mitigation measures are required.

Interception of Bromate Contaminated Water

6.174 Groundwater in the LMA/Chalk to the northeast of the site is impacted by bromate at low levels resulting from a historical release.

6.175 As there would be no pumping of groundwater from the LMA the potential for drawing impacted groundwater into the site is low.

6.176 Extreme seasonal groundwater level lows and stable pumping of groundwater by Affinity has been experienced in recent years and has not resulted in plume migration onto the mineral site, nevertheless, a 100m excavation standoff from the closest known bromate impacted groundwater monitoring well (BH104) would be implemented in the LMH to further mitigate against lateral plume migration.

6.177 Wet digging of mineral from the LMH, however, could create short lived local changes in groundwater levels which could conceivably induce a local hydraulic gradient towards the site. The significance of this potential effect is mitigated to a 'minor' significance by the following design and operational measures:

- The groundwater in the LMH in the proposed mineral extraction area is not impacted by bromate and the location and direction of plume migration is parallel to rather than towards the excavation areas

- The 100m standoff from BH104 for LMH excavation, as described above
- The lagoons located would be constructed early in the site development and their operation would form a hydraulic barrier with flow being directed towards the east, thereby isolating Phase A and B from the offsite plume
- Infilling of the LMH in Phase A and B with low permeability material would form a barrier to flow from the eastern side of the site further reducing a pathway for bromate migration reaching the mineral site, and
- A GWMP to be agreed with the Agency and Affinity prior to works commencing includes a comprehensive water level monitoring system and groundwater quality monitoring programme, as well as a mechanism for stakeholder engagement in advance of and during mineral works. Together this would ensure that mitigation measures described above are effective and if not, to agree contingency actions, as necessary.

Contamination from Restoration Operations

6.178 The restoration operations would be operated under an Environmental Permit that ensures activities do not pollute the water environment. The phases would be lined with a minimum thickness of 1m of clay with a maximum hydraulic conductivity of 1 x 10^{-7}m/s.

6.179 A hydrogeological risk assessment (HRA) has been undertaken as part of the application for an Environmental Permit to demonstrate that essential and technical precautions and requisite surveillance would be undertaken to ensure the installation complies with the Environmental Permitting Regulations 2016.

6.180 The potential impact has been assessed in detail and mitigation provided as set out the hydrogeological risk assessment that accompanied the successful permit application for the restoration of the site with inert materials (December 2016, ref. 422.01009.00140/HRA). Mitigation reduces the significance of any effect to 'negligible'

Groundwater Levels and Surface Water Flow

Groundwater Flow

6.181 Groundwater abstracted from the UMA during Phase preparation would be used for mineral processing and managed via silt/water recycling lagoons in the processing plant site, with any excess recharged back into the UMA via the UML

6.182 Table 6-15 presents approximate water volumes generated during various operational phases together with recharge lagoon capacity. Calculations behind the estimates are presented in Appendix 6/10.

6.183 The results presented in Table 6-15 indicate that there is a scenario whereby a recharge capacity shortfall of c.15% could be realised in the UML. This could occur if the initial three water discharge sources listed in Table 6-15 occur simultaneously during an extreme high UMA groundwater level (excluding abstraction for mineral washing).

6.184 Reconfiguring of the Nast in the mineral processing area, and management of drainage channels including the replacement of the Nast culvert would all result in improvements to drainage in the vicinity of Home covert.

6.185 Although the UML capacity shortfall could be absorbed by operational adjustments, as a responsible operator Brett wishes to increase its available infiltration capacity by at least 150% of that determined for the UML in order that they can operate the site during periods of lagoon maintenance or for any other unforeseen circumstance. The infiltration capacity of the LMH lagoon more than compensates for the UMH lagoon.

6.186 Data presented in Table 6-15 demonstrates that groundwater can be managed at the site and the significance of the effect given this mitigation is reduced to 'minor'.

6.187 Restoration of the void with imported inert material would create a barrier to groundwater flow within the UMH. A back-drain is therefore included in the design to ensure groundwater levels do not increase above historically high elevations. Groundwater from the back-drain would be used in the same manner described above (for mineral processing), with any excess discharged to the UMA/LMA lagoons reducing the significance of the impact to 'minor'.

6.188 On completion of the site the back-drain in phases E and G would be maintained as an open channel to manage groundwater levels in the long term. The drain would be modified to be an open channel and would be linked into the surface water swales and ponds ultimately discharging to an enlarged UMA recharge lagoon.

Surface Water Flooding

6.189 A flood risk assessment has been prepared and is presented in Appendix 6-9. With reference to Section 3, the application site would be restored to approximately 76.0m AOD following extraction works with a slope in a general north-easterly direction towards the infiltration lagoon. The infill would potentially increase surface water runoff rates.

6.190 It is proposed that surface water runoff be discharged offsite using a 2-tier approach. Surface water runoff would be intercepted by a network of lined swales and ponds before discharging to the infiltration lagoon in the east of the site. All of these features provide an element of water storage and hence delay the discharge for surface water from the site, reducing flood risk.

6.191 However, if the water level within the infiltration lagoon reaches 74.5m AOD, it is proposed that an overflow be provided into the Nast at the southeast boundary of the application site, albeit attenuated to the 100% AEP greenfield runoff rate of 117.5 l/s for the application site (c.85.94ha). This would be achieved using a flow control device (orifice plate, hydrobrake or similar).

6.192 The above measures would significantly reduce the likelihood of surface water flooding, such that the magnitude of impact is reduced to 'minor' and the potential significance of any impact also to 'minor'.

RESIDUAL EFFECT

6.193 A summary of the potential impact of the development after consideration of mitigation measures is given in Table 6-17. This demonstrates that the implementation of appropriate preventive

measures and mitigation significantly and appropriately limits the identified hazards to surface water and groundwater from the proposed site activities to acceptable levels.

6.194 Overall, it is concluded that, with respect to groundwater and surface water, there would be no significant residual effects of the proposed development after inclusion of the identified mitigation measures.

Table 6-17
Summary of Mitigated Impacts and Residual Effects

Potential Impact	Spatial and Temporal Impact	Magnitude of Impact	Significance of Impact	Mitigated Magnitude of Impact	Mitigated Significance of Impact
Groundwater Quality					
Spillage of pollutants, oils, fuels etc, and uncontrolled surface water runoff to UMH	Local, Short Term (Adverse)	Moderate	Moderate	Minor	Minor
Mixing of LMH/Chalk groundwater and UMH groundwater	Local, Short Term (Adverse)	Major	Moderate	Minor	Minor
LMA water entering the UMA via the lagoons	Local, short term, (Adverse	Moderate	Moderate	Minor	Minor
Potential contamination of UMH and LMH from landfilling	Local, Long Term (Adverse)	Moderate	Moderate	Negligible	Negligible
Interception of bromate contaminated water	Regional, Short Term (Adverse)	Major	Major	Minor	Minor
Spillage of pollutants, oils, fuels etc., and uncontrolled surface water runoff to LMH/ Chalk	Local, Short Term (Adverse)	Moderate	Moderate	Minor	Minor
Groundwater Levels and Flow					
Dewatering reduces groundwater levels and change flows in the UMH	Local, Short Term (Adverse)	Moderate	Moderate	Minor	Minor

Barrier to groundwater in UMH	Local, Short Term (Adverse)	Moderate	Moderate	Minor	Minor

Surface Water Quality and Flow					
Contaminated runoff entering surface waters during construction phase	Regional, Short Term (Adverse)	Moderate	Moderate	Minor	Minor
Suspended solids entering surface water	Regional, Short Term (Adverse)	Moderate	Moderate	Minor	Minor
Flooding from increased runoff	Local, Short and Long Term	Major	Moderate	Minor	Minor
Management of shallow groundwater adjacent to UML	Local, Short, and Long Term (Adverse)	Moderate	Moderate	Minor	Minor

CONCLUSIONS

6.195 The groundwater and surface water regimes at the application site have been assessed with reference to information held by the BGS, the Agency, Affinity, the Local Authority, and others, and by the consideration of site-specific investigations and reports for the application site.

6.196 The potential impacts of the proposed development upon the hydrogeological and hydrological environments have been identified and assessed, and where appropriate, mitigation measures have been accommodated into the design of the proposed development.

6.197 The operation and restoration of the application site would be undertaken using current technical guidance, relevant Pollution Prevention Guidelines, other codes of best practice and consents, to limit the potential for contamination of both ground and surface waters. Best practice techniques would be incorporated within the management procedures for construction and operation activities onsite in order to protect the water environment from pollution incidents.

6.198 Groundwater encountered during the works would be returned to the UMA via a recharge lagoon, with an additional contingency lagoon that discharges to the LMA, if required.

6.199 A hydrogeological risk assessment has been completed to assess the proposed restoration of the site with imported inert wastes. The risk assessment has confirmed that the proposed development of the quarry (and the backfilling of the void) would not have a significant effect on the water quality. No additional mitigation measures are therefore required over and above the technical precautions that are proposed for the construction and management of the site.

6.200 Groundwater in the LMA/Chalk to the northeast of the site is impacted by bromate from an offsite historical source. There is to be no pumping of groundwater from the LMA so there is no potential for actively drawing the plume towards the site, although wet digging could have a minor but insignificant effect.

6.201 It is unlikely, but if LMA/Chalk groundwater levels fall below the lowest historically recorded levels on site then this could affect the location of the plume edge. Nine years of monitoring results, however, indicate the plume is stable but precautionary measures incorporated into the design and operation of the site mitigate this risk which would not be significant.

6.202 All groundwater pumped from the UMH would be recharged back into the UMH aquifer via the UML with the option for discharge into the LML if needed. There would therefore be no significant loss of resource. The recharge area is relatively close to the points of abstraction, and it is not envisaged that there would be a significant impact on water resources.

6.203 Restoration of the void with imported inert fill may result in a local rise in groundwater levels, but this would be mitigated by a perimeter back drain to manage water levels during historically high groundwater periods during the operational and restored phases of the site.

6.204 A flood risk assessment has been prepared to assess the risk that the development itself would be affected by flooding or would exacerbate flood risk elsewhere. Mitigation measures are presented to ensure flood risk is not significantly increased. This includes the recharge of water back into the aquifer during the operational and restored phases of the development.

6.205 A Water Framework Directive compliance assessment has been undertaken and is included as an appendix to the ES. This concludes that the proposals would not have a significant impact on the objectives of the WFD.

6.206 Overall, it is concluded that there would be no significant residual effects to groundwater and surface water from the proposed development after inclusion of the identified mitigation measures.

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INTRODUCTION

7.1 This chapter of the ES considers the potential environmental effects related to the movement of vehicles associated with the operation of the proposed quarry at Hatfield Aerodrome.

7.2 Consideration is given to existing and future traffic levels, to the routing of vehicles on the surrounding highway network and to the resultant capacity and environmental impacts of site generated traffic. The chapter concludes with a summary of the assessments undertaken and an overview of the mitigation measures proposed. It should be noted that the effects on air quality associated with vehicle emissions is addressed in Chapter 9 of this volume.

7.3 A Transport Chapter was included within the 2016 ES. This was followed by a supporting Transport Chapter Addendum (August 2016) and a Transport Chapter 'Response to Opus' (September 2016) which provided further information and clarification on subjects highlighted following consideration of the initial planning application submission. This chapter updates the previous ES Chapter, based on the revised proposals, and includes the information contained within the subsequent supporting reports.

Proposed Development Summary

Current Site Usages and Recent History

7.4 The application site has been described in Chapter 2 of the ES. It covers an area of around 87.1ha and comprises the southern part of the former Hatfield Aerodrome. Drawing HQ 2/2 (Chapter 2) shows the extent of the application site along with the extent of the extraction area. It comprises an area of open unoccupied land that is partly used as public open space and grazing.

7.5 A concrete roadway extends west into the centre of the application site from Albatross Way to the east; a number of other tracks also cross the application site.

Proposed Development

7.6 The proposals, which have been described in Chapter 3 of this Volume, would involve the winning and working, together with processing for sale, of some 8Mt of sand and gravel over a period of around 32 years (based on an annual output of around 250,000tpa). The proposed development would also include processing facilities located in the northern part of the application site.

7.7 Processed aggregates would be exported, and inert fill materials imported, via a newly constructed access off the A1057 on the southern side of the quarry.

7.8 An internal road would run between the new site access off the A1057 to the processing facilities at the north of the site, routeing along the western boundary.

7.9 Processed aggregate would be exported from the site via HGVs of an appropriate size and nature; said HGVs would be weighed both on ingress and egress of the site.

7.10 The quarry would be worked on a phased basis to allow for progressive restoration. As such, in addition to the export of aggregate, restoration materials would also be imported to the application site.

7.11 For clarity, pertinent to transport, the proposals have amended the previous scheme as follows:

- The concrete batching plant previously proposed has been removed; and
- The access road from the quarry entrance has been moved slightly to the east; this does not affect the position of the junction onto the A1057.

Hours of Operation

7.12 The quarry would operate to the following hours:

- 0700 hours to 1800 hours Monday to Friday;
- 0700 hours to 1300 hours Saturdays; and
- No operations on Sundays or bank holidays save for emergency repairs.

Staff

7.13 The quarry would have a core staff of 6 employees. This would comprise 1 manager, 1 foreman, 2 loading shovel operatives, 1 dozer operative and 1 weighbridge operative.

7.14 The number of staff would increase up to 10 during earthmoving works which will be undertaken on a campaign basis. This would be over a temporary period.

7.15 For the purposes of any impact assessment a workforce of 10 has been assumed.

CURRENT TRANSPORT POLICY

7.16 The type and location of this development requires the Transport Assessment to give full regard to the current planning policy framework. This chapter considers the following national and local planning policy guidance in the context of highways and transport issues pertinent to the proposed development. In this respect consideration has been given to:

- National Planning Policy Framework (NPPF);
- National Planning Practice Guidance;
- Hertfordshire Local Transport Plan; and
- Hertfordshire Minerals Local Plan Review.

7.17 It should be noted that planning policies relevant to the EIA are also set out in Chapter 4 above.

National Planning Policy Framework

7.18 The NPPF was published on 27th March 2012 (updated in 2021) as part of the Government's reforms to make the planning system less complex and more accessible, with its primary intent to be one of encouraging sustainable patterns of growth.

7.19 It is relevant to note that the NPPF objectives of transport policy '*…have an important role to play in facilitating sustainable development but also in contributing to wider sustainability and health objectives*'.

7.20 In this context, it is relevant to note that the NPPF states "*Development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe*" (paragraph 109).

National Planning Practice Guidance

7.21 The National Planning Practice Guidance was published in 2014 and states that there are limitations to minerals as they can only be worked on where they naturally occur. Minerals are in demand but are limited resources and therefore need to be managed. This applies on a national and local level and highlights the importance of combining the two. It suggests that the environmental impacts of mineral extraction need to be considered, including the impact of traffic and the need for the investigation of traffic impacts. It also suggests that the site of extraction should be restored to make it suitable for beneficial after-use.

7.22 It acknowledges the need for extraction of aggregates to meet demand but manage supplies in the chapter 'Planning for Aggregate Minerals'. It highlights the importance of managing markets to meet national and local demands but retaining an understanding of the stocks.

7.23 Demands for aggregates are predicted to rise due to the increase in population expected; the proposed quarry at the site would provide important sand and gravel supplies to the local market within the region as well as some national sales. Supplying the local market would help to reduce the need to transport material from further afield.

Hertfordshire Local Transport Plan 4

7.24 The Hertfordshire LTP4 was adopted in 2018 and sets out Hertfordshire County Council's plan for the transport network from 2018 to 2031.

7.25 The following text has been reproduced from the LTP4 Executive Summary:

'*This plan accelerates the transition from a previous transport strategy that was largely car based to a more balanced approach which caters for all forms of transport and seeks to encourage a switch from the private car to sustainable transport (e.g. walking, cycling and passenger transport) wherever possible*.'

7.26 The vision for Hertfordshire is as follows: '*We want Hertfordshire to continue to be a county where people have to opportunity to live healthy, fulfilling lives in thriving, prosperous communities*.'

7.27 The foundation of the LTP4 is a set of nine objectives across three 'themes', Prosperity, Place and People. The strategy necessary to deliver these objectives is based on the following four principles:

- Application of technology;
- Cost effectiveness;
- Integrating land use and transport planning; and
- Encouraging modal shift and active travel.

7.28 The nine objectives of the plan are as follows:

- Improve access to international gateways and regional centres outside Hertfordshire;
- Enhance connectivity between urban centres in Hertfordshire;
- Improve accessibility between employers and their labour markets;
- Enhance journey reliability and network resilience across Hertfordshire;
- Enhance the quality and vitality of town centres;
- Preserve the character and quality of the Hertfordshire environment;
- Reduce carbon emissions;
- Make journeys and their impact safer and healthier; and
- Improve access and enable participation in everyday life through transport.

7.29 The following excerpt concerns the management of Freight and Logistics on the strategic highways infrastructure within Hertfordshire:

'*A key aspect of managing traffic on the network is managing the movement of freight and logistics vehicles. Effective freight and logistics operations are important to local and national economy, we therefore aim to support these operations but in a way that does not compromise the natural environment and quality of life for residents*.'

7.30 The plan has evolved from the previous version to placing more emphasis on the need to make use of the existing road network and not the building of more roads.

7.31 It explains that the movement of goods within Hertfordshire is primarily by road and that the Primary Road Network is designed to cater for high flows of HGVs, however, due to the nature of the market and location of final destination for these vehicles this often means HGVs have to use local roads and pass through residential areas which can have major impacts on the environment and congestion.

7.32 Where possible alternative methods of transport should be used, such as rail and water freight. However the council appreciates that this has its limitations and may be unsuitable for new developments due to the lack of infrastructure and capacity problems for passenger services on the rail network. Consequently, the focus of the plan is to concentrate on minimising the impact of road traffic.

7.33 The document states that the council will encourage HGVs to use the Primary Road Network. As the site of the proposed development at Hatfield Aerodrome is adjacent to the A1057 which has a direct connection with the A1, a motorway which runs north to south between Peterborough and London, this suggests the site is located in a suitable location to utilise the existing road network. Furthermore the A1 is recognised as part of the County's Primary Road Network.

7.34 Due to the lack of rail and water infrastructure near to the site and the increasing demand for rail services from local residential areas, such as St. Albans and Hatfield, this means it would be unsuitable and unrealistic for these freight methods to be used for the proposed development as it would require the extensive development of new infrastructure.

Hertfordshire Minerals Local Plan Review 2002-2016

7.35 A section within the Hertfordshire Minerals Local Plan Review discusses the implication of transport associated with a mineral extraction development. If this is not suitable then the development would be permitted when traffic movements generated from site operations *'…would not have an unacceptable impact of highway safety, the effective operation of the road network, residential amenity or the local environment*' (p40). It states that proposals which utilise non-road transport will be supported. It highlights that there is a high amount of HGV traffic generated from such sites related to transporting the material from the site to a processing plant and then from the plant to the customer. Where possible this is expected to be reduced as much as possible by means of internal haul routes or preferably conveyor belts. It suggests that transport related to the quarry operations should utilise major roads within the region and avoid local roads and residential areas as much as possible. However it states that this is often limited due to the restriction that minerals can only be worked where they naturally occur. The route from the proposed development would utilise the A1057 and A1 which are both regarded as suitable for HGV use as they are considered a distributor and primary road of the county, respectively.

7.36 A review of the plan reveals that it is necessary to consider sites suitable for mineral extraction within the County to help meet the growing demands for materials. Within this review the proposal site for the quarry, at Hatfield Aerodrome, is identified as a 'Preferred Area' implying that the site is highly suitable for the proposed development.

EXISTING CONDITIONS

7.37 This section of the chapter discusses the current infrastructure around the application site. It includes a description of the existing access of the application site, the local road network and non-vehicular access options.

Study Area

7.38 Operational HGV traffic associated with the movement of material, either importation or exportation, would utilise the principal road network, remaining on the 'A' classified roads and motorways where possible.

7.39 The application site is located conveniently within close proximity of the A1(M) at a distance of under 2km, which can be accessed directly via the A1057, an A classified road. The A1(M) then provides links to the wider strategic road network.

7.40 It is noted that there is a route to the A414 via Station Road and Smallford Lane. However, there is a restriction on vehicles of 7.5t and above which would prevent this route being used. Access to the A414 would therefore be via the A1057 east and then south on the A1001.

7.41 There may be the occasional export load which travels to a local site in St. Albans, bearing west out of the site access. However, it is expected that the vast majority would travel towards the A1(M), to the east.

7.42 The study area has therefore been determined as the A1057 to the east of the proposed access to the connection with the A1 by means of Comet Way in both a north and south direction.

Local Highway Network

A1057 Hatfield Road

7.43 The A1057 routes along the southern boundary of the application site. It runs in an east-to-west direction between St. Albans and Hatfield.

7.44 To the west the A1057 links with the A1(M), via Comet Way, at a location approximately 2.0km east of the application site.

7.45 In the proximity of the application site the A1057 is a single carriageway road classified as a principal rural road by the Department for Transport. The road is subject to 40mph speed limit and is street lit. There is a footway flanking the southern side of the road past the frontage of the application site. A photograph of the A1057 close to the application site is shown at Figure 7-1.

Figure 7-1
A1057 View Westbound



7.46 To the west of the application site is the Notcutts Garden Centre. This is a large garden centre with a wide, formal, simple priority junction access. Footway on the northern side of the carriageway terminates at this junction. A photograph of the garden centre access is shown at Figure 7-2.

Figure 7-2
A1057 Notcutts Garden Centre Access



7.47 On the opposite side of the carriageway to the garden centre there is a public house/restaurant, petrol filling station, and the residential area known as Smallford. A photograph of the A1057 to the west of the garden centre showing the petrol filling station and footways on both sides of the carriageway is shown at Figure 7-3.

Figure 7-3
View West to Petrol Filling Station



7.48 To the west of the application site, approximately 150 metres west of the garden centre access junction, the A1057 forms a roundabout junction with Oaklands Lane and Station Road; the junction is shown within Figure 7-4.

Figure 7-4
A1057/Oaklands Lane/Station Road Roundabout



7.49 The roundabout has an approximate Inscribed Circle Diameter (ICD) of 28 metres and is therefore capable of accommodating larger vehicles.

7.50 To the south of the roundabout junction Station Road links with the A414 to the north of Colney Heath. This link is subject to a 7.5t weight restriction.

7.51 To the north Oaklands Lane loops round to the west and provides an alternative route into St. Albans.

7.52 On the opposite side of the road, broadly in line with the centre of the application site's southern boundary, Wilkin's Green Lane, a narrow single width road, joins the A1057 from the south by means of a simple priority junction. This lane provides access to a few residential properties and connects to Ellenbrook Way to the west of Hatfield.

7.53 The A1057 is a relatively straight road. Whilst this provides good forward visibility it can result in higher vehicle speeds. This is also apparent due to the positing of a speed camera on the southern boundary of the application site, near to the Wilkin's Green Lane junction, as shown within Figure 7-5.

Figure 7-5
A1057 Speed Camera



7.54 Approximately 600 metres east of the Wilkin's Green Lane junction Poplar Avenue meets the A1057 from the south by means of a simple priority junction. Poplar Road provides access to the Bramble Road residential development.

7.55 A further 200 metres east of the Poplar Avenue junction the A1057 forms a junction with Albatross Way and Ellenbrook Way.

Albatross Way/Ellenbrook Lane Roundabout

7.56 Albatross Way forms the northern arm of the Albatross Way/Ellenbrook Lane roundabout junction with the A1057.

7.57 It provides a route around the western and northern boundary of the University of Hertfordshire campus, routeing past the Hertfordshire Sports Village. It also provides a link to the existing access to the application site.

7.58 Ellenbrook Lane, the southern arm of the roundabout junction, provides access to residential development. It links with Wilkins Green Lane and Selwyn Drive which both loop back and junction with the A1057. A photo of the junction is provided at Figure 7-6.

Figure 7-6
Albatross Way/Ellenbrook Way Roundabout



Mosquito Way/Comet Way

7.59 To the east, adjacent with the University of Hertfordshire, the A1057 forms a roundabout junction with Mosquito Way and then Comet Way. Both roundabouts are large, signalised junctions connected via a short section of dual carriageway.

7.60 The Mosquito Way roundabout junction comprises three arms. Mosquito Way comprises the northern arm, and links with Albatross Way on the northern side of the University, thereafter continuing northbound towards Hatfield Garden Village.

7.61 The Comet Way roundabout junction comprises four arms, and is adjacent to the A1(M) and 'The Galleria' shopping centre. Comet Way forms the northern and southern arms of the junction, and runs parallel to the A1. Approximately 1.0km south of this roundabout, Comet Way provides access both to the northbound and southbound carriageway of the A1 motorway via a signalised, grade separated roundabout junction.

A1(M)

7.62 In this location the A1(M) forms a six lane motorway which runs in a north-to-south direction. The A1(M) links with the M25 London Orbital approximately 8km to the south, which provides access to the wider strategic road network.

7.63 To the north the A1(M) provides access to Stevenage and Peterborough, continuing northbound with links to the wider network.

A414

7.64 The A414 is a major route running through the south-east of England. Commencing in Hertfordshire at a junction of the A41, west of Hemel Hempstead, the A414 routes through Hemel Hempstead towards Junction 8 of the M1 at Buncefield.

7.65 From Buncefield, the A414 continues running parallel to the M1 until the vicinity of Junction 7. At this point it bears south of St Albans and continues east through Hatfield and Hertford, crossing the A10 into Essex via Harlow, Chipping Ongar, and Chelmsford. The A414 terminates at Maldon, approximately 107km from its origin.

A414 Corridor Strategy

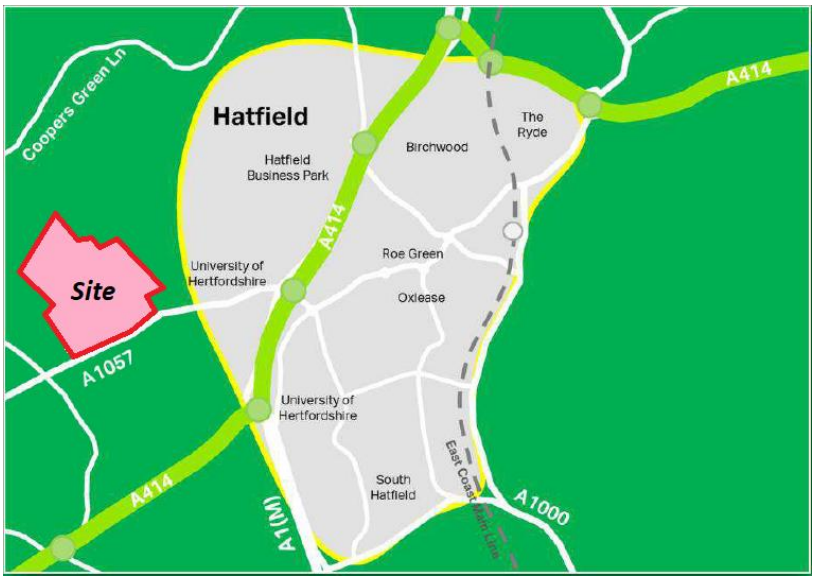
7.66 The following text is reproduced from the Hertfordshire County Council website (www.hertfordshire.gov.uk) and summarises the A414 Corridor Strategy:

'*The A414 corridor strategy covers the strategic east-west transport corridor which runs from Harlow to St Albans, where it divides with one leg running to Hemel Hempstead as the A414 and the other running through to Watford as the A405.*

The strategy identifies key challenges along the corridor and develops a series of objectives which were used to identify transport schemes, including the development of an East-West Mass Rapid Transit system'.

7.67 A Technical Report was produced by the Council in 2019; Figure 7-7 below comprises an annotated image taken from the report and serves to illustrate, broadly, the location of the application site in relation to the A414 Corridor.

Figure 7-7
A414 Corridor in context of Application Site



7.68 The following text is reproduced from the Technical Report:

'*There are very few opportunities for continuous travel by public transport which increases reliance on the car to make even fairly short journeys along the corridor…*

There are over 100,000 new homes planned for Hertfordshire and fifty per cent of these will be along the A414 route, with further development expected beyond 2031. The impacts on the route are likely to be significant…

The Local Transport Plan… has been used to develop the A414 Corridor Strategy. The emphasis will be providing alternatives to the car along the corridor through the development of a Mass Rapid Transit system.

The Mass Rapid Transit is considered to be a critical piece of infrastructure as it will encourage people to travel more sustainably, connect people with jobs, schools, shops and key services, and could lead to a reduction in traffic growth.'

Existing Non-Car Accessibility

7.69 Although the vast majority of vehicular movement from the application site is anticipated to be comprised of HGVs transporting material to and from the proposed quarry, access to the site by other modes (specifically pedestrian, cycle, and public transport) must also be considered. These modes may potentially be utilised by staff working on site, and the current infrastructure relevant to each mode needs to be investigated and assessed to determine its suitability.

Pedestrian Access

7.70 Pedestrian footway runs the entire length of the A1057, providing an option for pedestrians to access the application site from the southern side of the carriageway.

7.71 The footway runs continuously through the residential areas of Smallford and Hatfield, and within these areas footway typically flanks both sides of the road. There is also a zebra crossing to the west of the application site within Smallford and crossing facilities at the signalised roundabouts to the east of the site, near Hatfield.

7.72 There are also bus stops located along this footpath which could be used when combining sustainable transport options. These are discussed in the 'Public Transport' section below.

7.73 Whilst the site access by its nature would be unsuitable for pedestrian access, a system could be arranged for pedestrians to be given lifts by colleagues from the site access junction to the site facilities.

Cycle Access

7.74 Approximately 50 metres to the south of the A1057, Route 61 'Alban Way' of the National Cycle Network links St Albans and Hatfield with a traffic free route. Route 61 continues to both Welwyn Garden City and Maidenhead in each direction. As the A1057 is subject to a 40mph speed limit this would also be a suitable route for cyclists to utilise.

7.75 Route 61 meets up with other routes such as Route 6 in St Albans, which runs between Milton Keynes and Luton to the west of the site, and Route 12 to the east of the site, which provides links to Stevenage and St Neots.

7.76 Within the built up area of Hatfield, to the east of the application site the footway or footpath that runs alongside the carriageway provides an off road facility for cyclists to utilise. This would help connect the application site to cycle routes from Hatfield.

Public Transport

7.77 To the west of the site access, within the residential area of Smallford, bus stop facilities can be found at the Three Horses Public House. Both stops comprise covered bus shelters and are situated within laybys, avoiding the need for busses to stop on the carriageway and thereby ensuring the free-flow of traffic.

7.78 Table 7-1 below summarises the services available, and the relative frequencies thereof, from the above mentioned stops.

7.79

Table 7-1
Bus Service Summary

Service Number	Route	Nearest Stop	Frequency
302	Hemel Hempstead to Welwyn Garden City	Oaklands/Three Horses Public House (200m from site access)	Mondays-Fridays Up to 4 services an hour from 06:18 to 19:00 Saturdays Up to 4 services an hour from 06:15 to 17:51 Sundays Up to 1 service an hour from 09:16 to 17:16
601	Borehamwood - Hatfield - Welwyn Garden City	Oaklands/Three Horses Public House (200m from site access)	Mondays-Fridays Up to 4 services an hour from 06:23 to 19:30 Saturdays Up to 1 service an hour from 07:24 to 16:18 Sundays No services

Existing Traffic Flows

7.80 Recent traffic levels are impacted by the restrictions and changes in behaviour influenced by the COVID-19 pandemic, therefore new traffic counts would not be considered representative.

7.81 As a result, this ES Chapter is based on the Department for Transport (DfT) data obtained online and previous traffic count data commissioned as part of the 2016 ES.

Department for Transport Data

7.82 The DfT Road Traffic Statistics website was interrogated to acquire data recorded by the following Count Points, 1-4:

1) Count Point 7074, *A1057 West of Ellenbrook Lane*

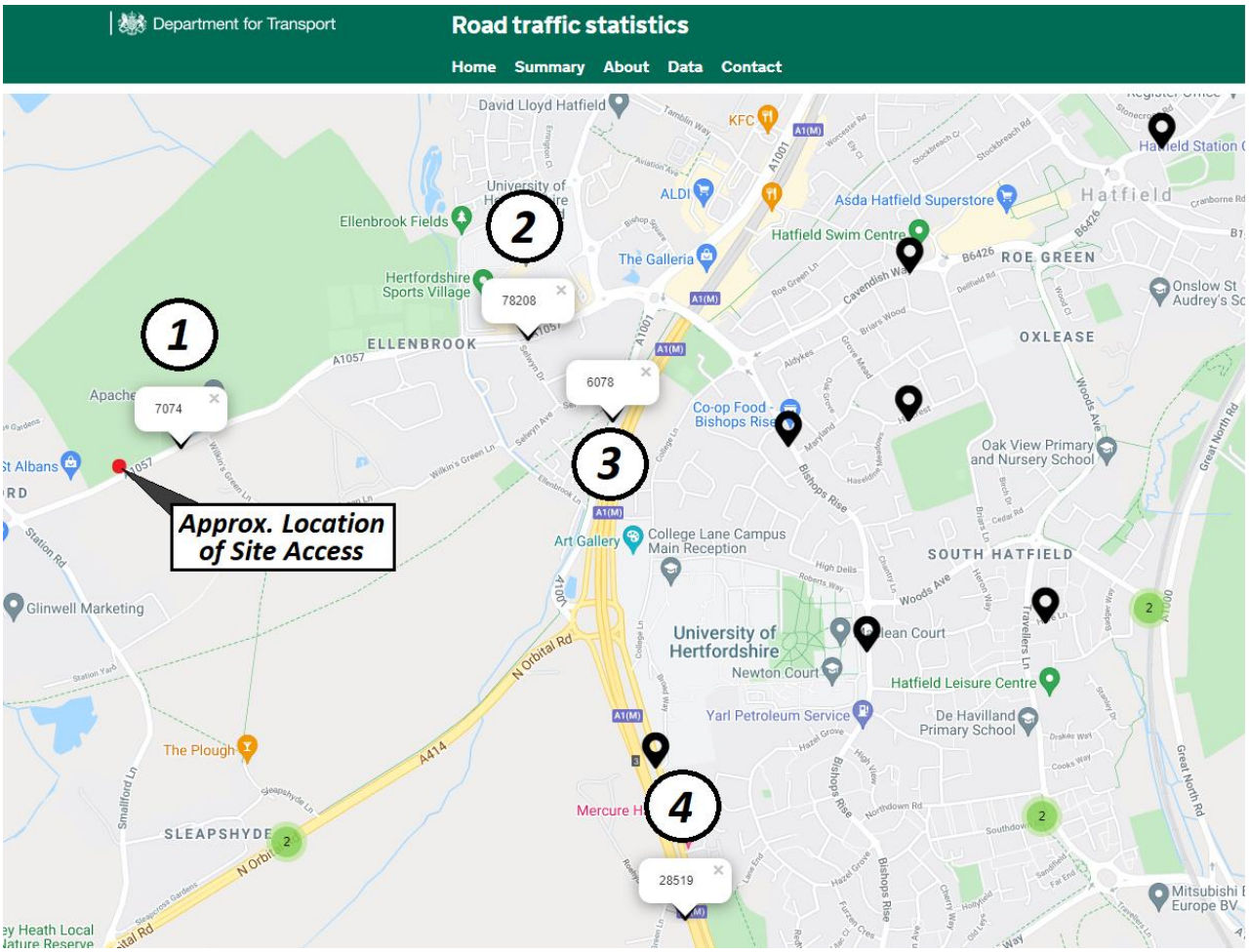
2) Count Point 78208, *A1057 East of Ellenbrook Lane*

3) Count Point 6078, *Comet Way*

4) Count Point 28519, *A1(M)*

7.83 Figure 7-8 comprises an annotated image taken from the DfT website and shows the location of the relevant Count Points, 1-4, and the approximate location of the Site Access.

Figure 7-8
Annotated Screenshot from DfT Website



7.84 The following extracts have been reproduced from the DfT website and explain the methodology and technology used to capture the data.

"The Department for Transport's road traffic statistics team have approximately 300 automatic traffic counters at locations on Great Britain's road network. The locations are a stratified panel sample, and provide sufficient observations so that in-year traffic variations can be estimated by road type and vehicle type.

The automatic traffic counters are permanent installations embedded in the road surface, which combine Inductive Loops with Piezoelectric Sensors in a 'Loop – Piezo Sensors – Loop' array, and record information about vehicles passing over them, including vehicle length and wheelbase, to classify vehicles.

The Department for Transport's road traffic statistics also make use of automatic traffic counter data that is collected and maintained by other organisations. These are:

- *Highways England: operate over 10,000 automatic traffic counters on some of the motorways and 'A' roads in England.*
- *Transport Scotland: operate over 900 automatic traffic counters on some of the motorways and 'A' roads in Scotland.*
- *Transport for London: operate over 300 automatic traffic counters on roads in London"*

Data Summary

7.85 Data for a given Count Point can be downloaded from the DfT website in a spreadsheet format and provides AADF data on the total number of vehicles passing through the Count Point, and also provides figures by vehicle category e.g. HGV's, cars, motorcycles etc.

7.86 A summary of the average weekday traffic data recorded by each of the 4 count points during 2018 is provided within Table 7-2.

Table 7-2
DfT Traffic Data 2018

Count Point	Link name	Total Vehicles	HGV's
1	A1057 West of Ellenbrook Lane	13,604	584
2	A1057 East of Ellenbrook Lane	15,101	648
3	Comet Way	18,822	1,592
4	A1(M)	60,601	4,060

ATC Data

7.87 For the purposes of the previous planning application traffic survey specialists 'Axiom Traffic Limited' were commissioned to undertake an Automatic Traffic Count (ATC) on the A1057 Hatfield Road in order to determine existing traffic conditions.

7.88 The ATC was undertaken by means of pneumatic tubes positioned in the carriageway on the A1057 Hatfield Road, located approximately 75 metres east of the entrance to the garden centre, as shown within Figure 7-9. The pneumatic tubes measure directional traffic flow/vehicle speed and also classify vehicles into various groups.

Figure 7-9
ATC Location on the A1057



7.89 Data was recorded between 25th April 2015 and 1st May 2015 and therefore reflects typical weekday traffic flow conditions on the local highway network (i.e. non-school holiday periods, typical weather conditions etc.). The ATC data 'as received' is provided in **Appendix 7/1**.

7.90 While the data would normally be considered as time-expired, the effects of the Covid 19 Pandemic cannot be underestimated in terms of disruption to 'normal' traffic volumes, and as such it is considered that growthing the previously acquired data would serve better in context of any assessment work.

7.91 The data confirms that across the surveyed weekdays, the AM peak occurs between 08:00 – 09:00hrs. The weekday PM peak was observed between 17:00 – 18:00hrs. The data also confirms that the Saturday and Sunday highway network peak periods occur between 12:00 – 13:00hrs, and 14:00-15:00hrs respectively.

7.92 A summary of the average weekday traffic data recorded on the A1057 is provided within Table 7-3

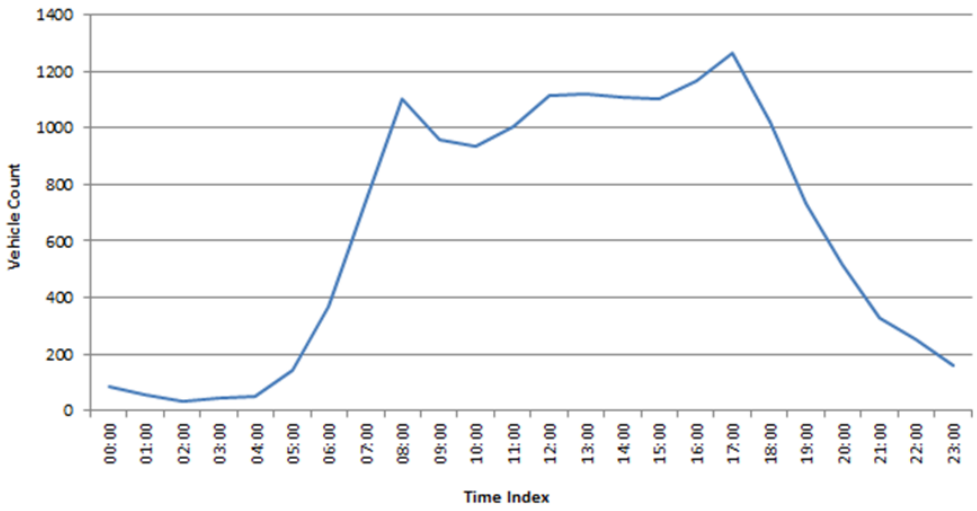
Table 7-3
2015 Baseline traffic Flows

	Eastbound		Westbound		Two-way	
Weekday	**Tot**	**HGV**	**Tot**	**HGV**	**Tot**	**HGV**
AM Peak (08:00-09:00hrs)	479	22	620	33	1,099	55
PM Peak (17:00-18:00hrs)	572	15	693	22	1,266	37
24 Hour (00:00-24:00hrs)	7,150	390	8,269	354	15,420	744
Saturday	**Tot**	**HGV**	**Tot**	**HGV**	**Tot**	**HGV**
Peak (12:00-13:00hrs)	549	18	725	13	1,274	31
24 Hour (00:00-24:00hrs)	6,979	205	8,058	221	15,037	426
Sunday	**Tot**	**HGV**	**Tot**	**HGV**	**Tot**	**HGV**
Peak (14:00-15:00hrs)	593	8	593	8	1186	16
24 Hour (00:00-24:00hrs)	5,336	107	6,037	150	11,373	257

7.93 The above summary table shows that the highest 24 hour vehicular traffic flow occurs during weekdays. It also determines that the average weekday PM peak and Saturday afternoon peak are the busiest periods on the A1057 Hatfield Road, with almost 1,300 two-way movements.

7.94 The average weekday two-way traffic profile is shown in graph form at Figure 7-10.

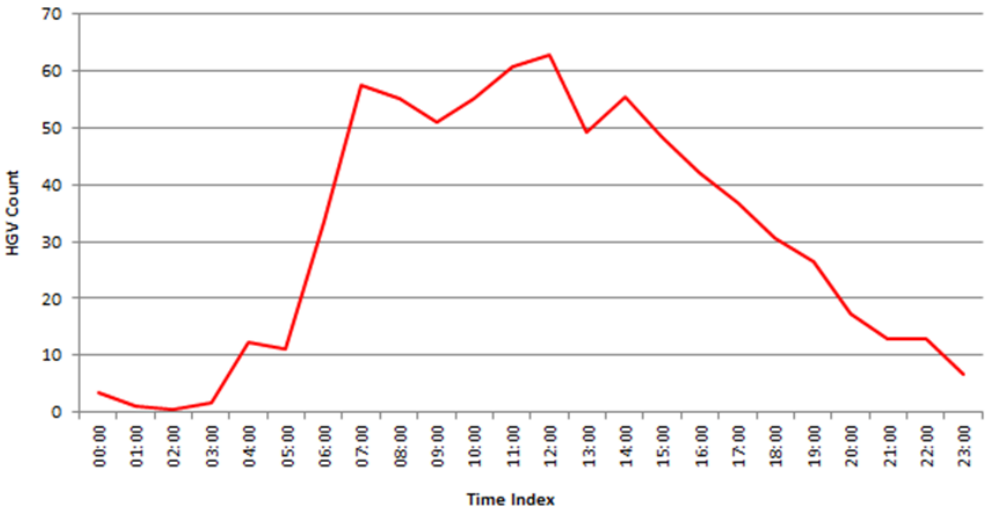
Figure 7-10
Average Weekday Two-way Traffic Profile



7.95 The average weekday traffic profile shows two defined peak periods occurring at 08:00 and 17:00, with a slight inter-peak at 13:00, consistent with standard rush-hour trends. After the 08:00 peak volumes of two-way movements drop by approximately 50 movements until 10:00hrs, and then increase steadily until the evening peak at 17:00hrs. Post 17:00hrs, volumes decline steadily until 02:00hrs.

7.96 The average weekday two-way HGV traffic profile is shown in graph form at Figure 7-11.

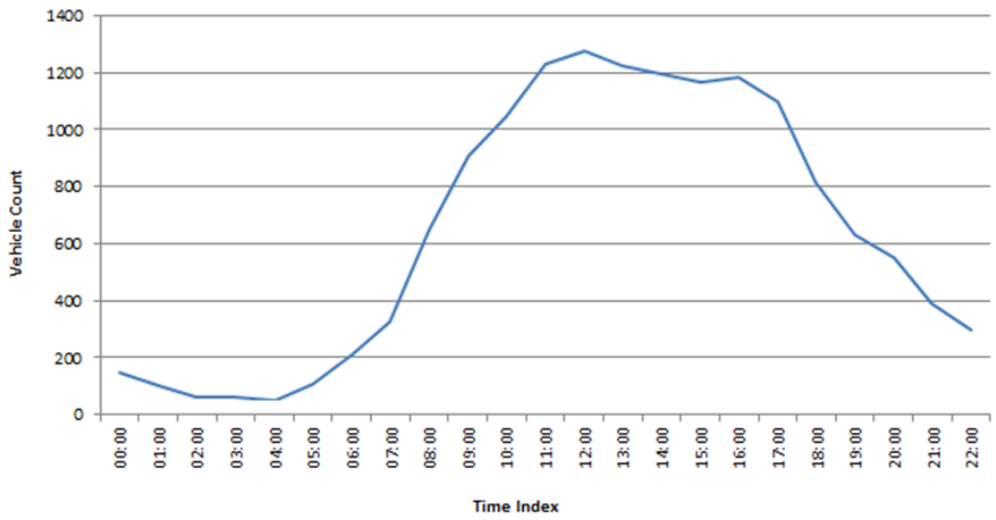
Figure 7-11
Average Weekday Two-way HGV Traffic Profile



7.97 The average weekday HGV profile shows three recognisable peaks at 07:00, 12:00, and 14:00hrs. Between 06:00 – 14:00hrs movements remain fairly constant at approximately 49 or more movements per hour, with the variation range at approximately 13-14 movements per hour. Post 14:00hrs, HGV movements decline at a steady rate until 02:00hrs. On an average weekday, HGV movements account for 4% of movements at peak times, and 5% of total movements in a 24hr period.

7.98 The Saturday traffic profile is shown in graph form at Figure 7-12.

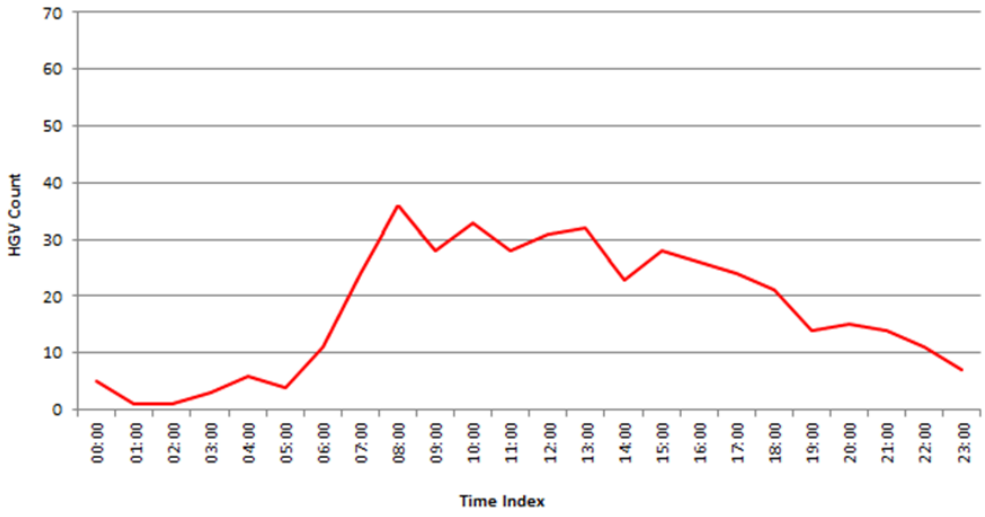
Figure 7-12
Saturday Two-way Traffic Profile



7.99 The Saturday traffic profile shows a gradual increase of traffic throughout the morning resulting in a single peak between 12:00-13:00hrs. Traffic flows then gradually decrease throughout the afternoon and early evening staying between 1,000 and 1,300 movements until 17:30hrs, after which traffic flows decline steadily until 02:00hrs.

7.100 The Saturday two-way HGV traffic profile is shown in graph form at Figure 7-13.

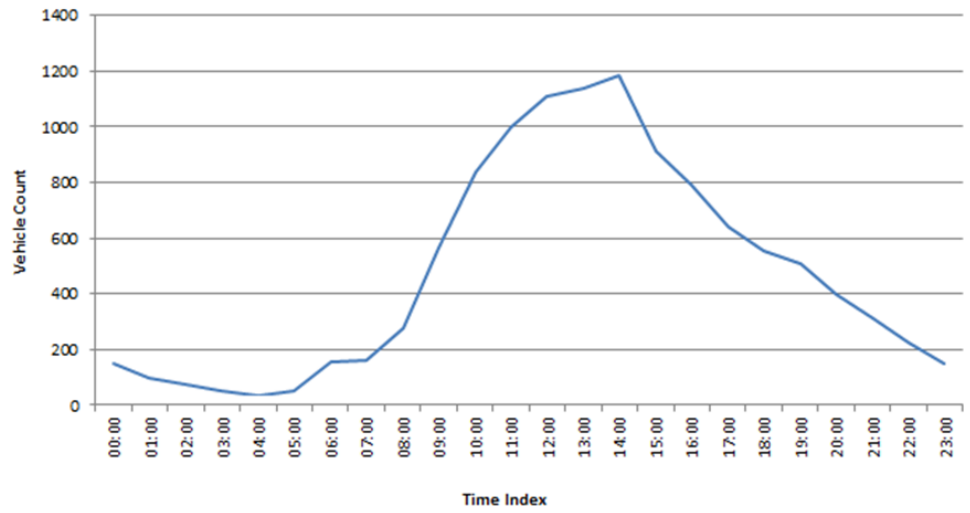
Figure 7-13
Saturday Two-way HGV Traffic Profile



7.101 The Saturday two-way HGV traffic profile shows the volumes are significantly smaller in comparison with weekday volumes, equating to around 57% of the weekday average. There is only one relative defined peak occurring at 08:00hrs after which volumes decline steadily, with a maximum variance of 5 movements per hour, until 01:00hrs. Saturday HGV movements account for 2.5% of total movements at peak times, and 3% of total movements in a 24hr period.

7.102 The Sunday total traffic profile is shown in graph form at Figure 7-14.

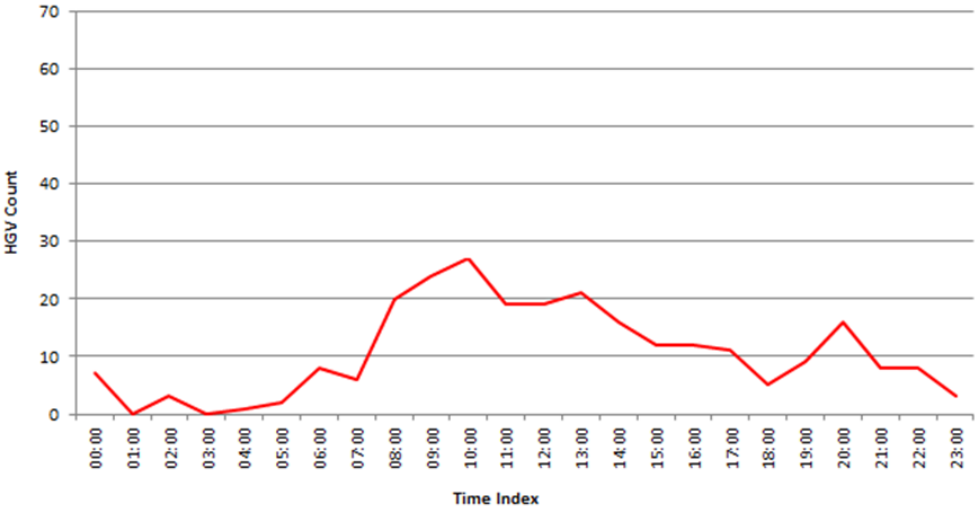
Figure 7-14
Sunday Two-way Traffic Profile



7.103 The Sunday traffic profile shows a gradual increase of traffic throughout the morning resulting in a single peak between 13:00-14:00hrs. From 14:00hrs onwards, traffic flows fall at a steady rate of decline until 04:00hrs.

7.104 The Sunday two-way HGV traffic profile is shown in graph form at Figure 7-15.

Figure 7-15
Sunday Two-way HGV Traffic Profile



7.105 The Sunday two-way HGV traffic profile shows the volumes are significantly smaller in comparison with weekday volumes, equating to around 35% of the weekday average. HGV movements on Sunday, peak at 27 movements per hour at approximately 10:00hrs and decline relatively steadily thereafter, until 20:00 where a second lesser peak of 16 movements per hour can be observed. Sunday HGV movements account for 1.3% of total movements at peak times, and 2.25% of total movements in a 24hr period.

Vehicle Speeds

7.106 The A1057 Hatfield Road in proximity of the southern boundary of the application site is subject to a 40mph speed restriction.

7.107 The ATC also provided speed data across the study period. A summary of the recorded vehicle speeds is provided at Table 7-4.

Table 7-4
Vehicle Speed Summary

Direction	85th %ile Speed	Mean Speed
Eastbound	40.0	35.2
Westbound	39.3	33.4

7.108 The above summary confirms that the 85th percentile vehicle speeds in both directions adhere to the posted speed limit.

Accident Records

7.109 Hertfordshire County Council has provided details of recorded road traffic incidents over the most recent five-year period available up to the end of 2020 within an identified study area.

7.110 The study area includes 1.4km of the A1057 Hatfield Road/St Albans Road West, between and including the roundabouts at Hatfield Rd/Station Rd and St Albans Road West/Ellenbrook Lane.

7.111 The data was forwarded by email on 14th June 2021 in a report format, which featured an incident location plan and details of each incident in the form of raw data.

7.112 The report did not include any plain text summaries of the listed accidents, and as such the summaries within in the summary table below (under the column 'Likely Cause') are interpretations of the raw data supplied, based on SLRs previous experience in processing similar datasets.

7.113 The raw data provided a description of each incident and vehicle group, broken down into individual categories and collisions and resulting casualty severities; fatal, serious and slight, as defined below:

- **Fatal** (a crash resulting in a death);
- **Serious** (detention in hospital; includes paralysis, fractures and severe lacerations); or
- **Slight** (includes whiplash, sprains and minor lacerations).

7.114 The raw incident data as received is included at **Appendix 7/2**. A summary of the data is shown within Table 7-5 below.

Table 7-5
Summary of Accident Data

Incident Ref	Severity	Location	Likely Cause	Likely Highway Deficiency
2019-410828884 01/03/2019 19:05hrs	Slight	A1057 Hatfield Road/Station Road RBT	Data suggests Vehicle 1 failed to give way at the roundabout junction, resulting in collision	No
2016-410070241 01/05/2016 12:00hrs	Slight	A1057 Hatfield Road/Station Road RBT	Data suggests Vehicle 2 failed to give way at the roundabout junction, resulting in collision	No
2016-410066193 12/05/2016 20:46hrs	Slight	A1057 Hatfield Road/Station Road RBT	Data suggests Vehicle 1 failed to give way at the roundabout junction, resulting in collision	No
2017-410248241 16/11/2017 13:36hrs	Serious	A1057 Hatfield Road Approx. 170m northeast of Station Road RBT	Data suggests the incident comprised a rear end shunt between two Goods Vehicles, the driver of the following vehicle sustained injury	No
2019-410818811 23/01/2019 15:20hrs	Serious	Approx. 800m east from Notcutts Garden Centre access	Data suggests the incident comprised a rear end shunt between two cars and a Goods Vehicle, a passenger in the 2nd vehicle sustained serious injury.	No
2018-410806883 20/12/2018 08:24hrs	Slight	Approx. 90m west from A1057 St Albans / Ellenbrook Lane RBT	Data suggests the incident comprised a rear end shunt between three cars, a passenger in the 2nd vehicle sustained slight injury.	No
2019-410917460 08/11/2019 14:20hrs	Slight	A1057 St Albans / Ellenbrook Lane RBT	Data suggests Vehicle 1 failed to give way at the roundabout junction, resulting in collision	No
2019-410874714 08/08/2019 15:50hrs	Slight	A1057 St Albans / Ellenbrook Lane RBT	Data suggests Vehicle 1 failed to give way at the roundabout junction, resulting in collision	No
2018-410804057 07/12/2018 07:40hrs	Slight	A1057 St Albans / Ellenbrook Lane RBT	Data suggests Vehicle 2 failed to give way at the roundabout junction, resulting in collision	No
2019-410843620 25/04/2019 18:55hrs	Slight	A1057 St Albans / Ellenbrook Lane RBT	Data suggests Vehicle 1 failed to give way at the roundabout junction, resulting in collision	No

7.115 Eight (8) of the 10 incidents were categorised as 'Slight', with 2 incidents categorised as 'Serious'; none of the incidents resulted in a fatality.

7.116 While the received dataset did not include any narrative descriptions of the incidents, the data available is considered sufficient to extrapolate the likely course of events in all cases.

7.117 Those incidents which have been determined to comprise rear end shunts occurred on straight sections of highway, away from junctions, and the available information is considered to support the determination.

7.118 Likewise, those incidents which occurred at roundabout junctions have been analysed in terms of the direction of each vehicle and the point of impact; it is reasonable to conclude that a vehicle entering the roundabout junction from the south, impacted on the offside by a vehicle originating from the east has not given way and driven into the path of the other vehicle. This is a common cause of collisions at roundabout junctions, and is considered to be reasonably attributable to several incidents within the data set.

7.119 Detailed analysis of the data set has not revealed any information which may be considered suggestive of a highways deficiency at any of the locations of the incident and it is considered reasonable to conclude that all incidents occurred as a result of driver/rider error.

7.120 It is recognised that a fatal incident occurred within relative proximity of the site on the A1057 Hatfield Road at a location approximately 263 metres northeast of its roundabout junction with Station Road. The incident occurred during October of 2010, which is more than 10 years prior to the writing of this report. The incident was concluded to have occurred as a result of a pedestrian stepping into traffic without looking; while tragic, it is considered that this incident was the fault of the pedestrian concerned and is not indicative of a highways deficiency at the location.

7.121 No patterns have been identified among the incidents occurring along the defined main HGV route, and it is considered that there are no highway safety concerns to be exacerbated by the proposed application.

Other Development Considerations

Hatfield Quarry (CEMEX)

7.122 CEMEX UK Operations Ltd have operated the Hatfield Quarry, located off Oaklands Lane (AL4 0HS) for several decades. Hertfordshire County Council approved planning permission (6/0439-03) for the extraction of sand and gravel and subsequent restoration of the land to agriculture (Symondshyde). The permission stipulated that development should be completed within 15 years of commencement, allowing works to continue up to 1st October 2020.

7.123 Production subsequently experienced delays, falling behind schedule, and as such a planning application pursuant to Section 73 of the Town and Country Planning Act 1990 (ref. PL/0165/20) was made to vary Condition 2 of the planning permission, extending the operational life of the quarry until 1st October 2022.

7.124 Applications have also been submitted in 2016 (PL\0820\16) and 2018 (PL\0963\18) for extensions to Hatfield Quarry. The former released around 0.45Mt and was approved in October 2018 and has an end date of 31 December 2023. The latter application would release around 3.5Mt and so extend the duration of operations by around ten years; planning permission has yet to be formally issued despite a resolution to approve (made in October 2020).

7.125 None of the recent applications seek to amend the output of the operations or alter HGV movements. The CEMEX proposals would not therefore see any additional traffic added to the

network, and as such these proposals do not raise a cause for concern in the context of the Hatfield Aerodrome scheme.

Land to the West of Hatfield (Arlington Business Parks GP Ltd)

7.126 Arlington Business Parks GP Limited submitted an Outline Planning Application (6/2018/2768/OUTLINE) to Welwyn Hatfield Borough Council for a "*…large-scale mixed use development including 1,100 new homes and supporting infrastructure including a primary school, local centre and open space with all matters reserved*".

7.127 At the time of writing Hertfordshire County Councils' planning portal records the status of the application as 'Under Consideration'.

7.128 Documentation supporting the application, including a Planning Statement authored by Maddox Planning Consultants (2018), and an Environmental Statement authored by Vectos (2018), is available through the Welwyn Hatfield Borough Council planning portal.

7.129 The assessment work by Vectos concluded that the significance of the effects of the completed development on the relevant factors - i.e. Severance, Pedestrian Delay, Pedestrian Amenity, Driver Delay, Accidents & Safety, and Public Transport – would be 'Negligible' in all cases save for Severance and Pedestrian Amenity, both of which were expected to suffer only 'Minor Adverse' effects.

PROPOSED OPERATION

Development Trip Generation

7.130 This section describes the determination of the various aspects of vehicular movements associated with the proposed development. This includes the quantity and composition of vehicle trips generated, arrival and departure profiles and route assignment from both sites due to the new development.

Trip Generation

7.131 Traffic associated with the proposal site will consist of operational HGV traffic associated with the import/export of material and light vehicle movements generated by staff and visitors.

Heavy Vehicle Trip Generation

7.132 Table 7-6 provides a forecast of the total daily traffic that could be generated by the proposed development based on a 275 day working year[1].

[1] Based on a 5.5 day week, 50 weeks per year.

Table 7-6
Daily HGV Traffic Forecast

	Volume	Unit	Average Load	HGV Trips
Exported Material				
Aggregates	250,000	tonnes	17t	54
Imported Material				
Restoration Infill	155,000	tonnes	20t	28
Totals				
HGV Trips				**82**
HGV Movements				**164**

7.133 The above calculation indicates that the proposed site would generate a total of 82 HGV trips, which equates to 164 HGV movements, across a typical 10-hour working day; therefore an average of 16 HGV's per hour.

Light Vehicle Trip Generation

7.134 For the purposes of a robust assessment, light vehicle traffic has been based on the number of staff employed, assuming they all drive individually. In reality some employees would lift share and some would use sustainable transport modes.

7.135 Therefore 10 light vehicle trips would be generated each day, arriving and leaving in line with the site's planned operational hours.

Total Vehicle Trip Generation

7.136 Table 7-7 provides a forecast of the total traffic that could be generated by the proposed development across a typical 10-hour working day.

Table 7-7
Total Traffic Forecast

	Total Vehicles	HGV
Operational Traffic	82	82
Staff Vehicles	10	0
Total Trips	92	82
Total Movements	184	164

7.137 The above summary shows that a total of 92 trips would be generated each day of which 82 would be classified as HGV. This equates to 184 vehicle movements, of which 164 will be classified as HGV.

Trip Distribution/Assignment

7.138 Operational HGV traffic associated with the movement of aggregates or restoration materials would utilise the principal road network remaining on the 'A' classified roads and motorways where possible.

7.139 As set out earlier, the application site is located conveniently within close proximity of the A1(M) at a distance of under 2km, which can be accessed directly via the A1057. The A1(M) then provides links to the wider strategic road network. There may be the occasional export load which travels to a local site in St. Albans, bearing west out of the site access, but it is expected that the vast majority will travel to the east.

7.140 No HGVs would s use Station Road and Smallford Lane to access the A414.

7.141 In order to be robust it has been assumed that 100% of all traffic would be routed to/from the east.

Traffic Profiles

7.142 HGV traffic would operate throughout the working day, scheduled evenly to ensure the site operates efficiently.

7.143 It is proposed that the operational hours of the development would be from 07:00 - 18:00 Monday to Friday, and 07:00 – 13:00 Saturday.

7.144 For robustness, on the basis of a ten hour day, 16 HGV movements (i.e. 8 in and 8 out) would be generated per hour, or one every 3.75 minutes.

7.145 Light vehicle movement patterns would be commensurate with staff shifts, arriving at the start of the working day and leaving as the site shuts.

Construction Traffic

7.146 The level of traffic that the construction phase is anticipated to generate would be well within the level of traffic assessed for the proposal site. Therefore any assessment of the site operation would be more robust than any construction scenario.

Site Access

7.147 A 1.16km internal road would run along the western boundary of the application site and junction with the A1057 forming the Site Access.

Principle of Access Served off an A Class Road

7.148 During the junction design process reference was made to the Hertfordshire County Council Local Transport Plan 3 (LTP3) which sets out the county's main transport policies.

7.149 Paragraph 3.20 provides guidance on Road Hierarchy and Network Development. It states that:

'The county council will maintain and develop a road hierarchy so that traffic is concentrated onto roads appropriate to its journey purpose'.

7.150 The LTP3 would classify the A1057 as a Rural Main Distributor Roads. It defines these roads as:

'…connect the main towns with the Primary Route Network and link neighbouring towns within the PRN grid. Single carriageways will usually be adequate. Main distributor roads consist of those county 'A' roads which do not form part of the Primary Route Network and are identified by the white backed signs'.

7.151 The LTP3 states that the County Council will develop and maintain strategies for roads within the urban and inter urban network that:

'B. In Rural Main Distributor Roads:

- *Discourage through traffic from using rural main distributor roads.*
- *Not allow new access except where special circumstances can be demonstrated'.*

'H. Consider the 'place and movement' function of a road in conjunction with the hierarchy when assessing a highway proposal, whether county council or development promoted'.

7.152 There appears to be no direct equivalent to this policy within the LTP4. There are references to a Network Management Strategy document which is marked as being available from early 2021, but this is currently not available within the public domain. The principle of access off an A class road has therefore been considered on the basis of the LTP3 requirements.

7.153 Whilst the A1057 has 'A' road status, in the proximity of the application site access it is a single carriageway road with pedestrian footways, streetlights, and mean average speeds of 33.4mph westbound and 35.2mph eastbound; many of the characteristics of an area which could be defined as 'place'.

7.154 The proposed operation and its surrounding environment would benefit from direct and dedicated access served off an A Class road.

7.155 Following an initial assessment it was considered that a ghost right turn lane was not required to meet any general design guidelines or address any issues relating to junction capacity or safety. However, a ghost right turn lane facility is now proposed as a precautionary measure in acknowledgement that the access location would be an exception from the County Policy advice.

7.156 The access junction design, as detailed within Section 4 of the Transport Chapter Addendum, was designed with a Ghost Island (ghost right turn lane) facility.

7.157 It was also noted that the application site only has frontage onto the A1057 and the applicant does not control any further land to allow for an alternative access option onto another road.

7.158 As such it was determined that an exceptional case exists.

Proposed Access Design

7.159 Technical guidance provided within DMRB CD123 states that the use of 'simple' priority junctions, in new build situations, is appropriate up to a level of 300 vehicles Annual Average Daily Traffic (AADT) 2-way flow on the minor arm.

7.160 An AADT 2-way flow of 500 vehicles is quoted as being the desirable maximum level of use for an existing junction without upgrading being considered, or where vehicles waiting on the major road to turn right inhibit the through flow and create a hazard.

7.161 On the basis of the above, the arrangement proposed as part of the 2016 submission comprised a simple priority junction.

7.162 However, following discussions with HCC it was advised that a central ghost island arrangement may be preferable to allow for the free flow of traffic, although it was accepted that the volume of traffic may demonstrate that the current arrangement would be acceptable. Notwithstanding, it was advised that having a ghost island would help in demonstrating the exceptional case.

7.163 A Stage 1 Road Safety Audit was undertaken to assist the access design; following the audit, the access design was amended to reflect the recommendations. The Road Safety Audit is included at **Appendix 7/3**.

7.164 Additionally, the design was assessed in terms of operational capacity. The analysis included a sensitivity test which multiplied the proposed site traffic by a multiple of ten. The sensitivity test showed that the junction would still work well within acceptable parameters even when subjected to significantly higher traffic scenarios.

7.165 The proposed site access is included at **Drawing HQ 7/1**. The junction features a ghost right-turn lane with the standard required deceleration taper and turning lengths.

7.166 Junction visibility splays of 4.5m x 120m can be achieved. The envelope of visibility would be cleared and maintained in order to meet the necessary requirements. In addition, new hedgerow planting would be undertaken along the boundary of the quarry on the northern side of the visibility splay to compensate for any loss of hedgerow needed to accommodate the highway works.

7.167 An island has been included which facilitates pedestrian crossing and also prevents overtaking to protect the right turn lane.

7.168 In order to promote sustainable modes of travel, a pick up point layby is proposed at the site access junction. The layby is served by footway and will operate as a hail a ride service whereby colleagues would undertake pick-ups as they pass. Alternatively management could arrange a lift. This would also discourage any pedestrians from walking up the access road conflicting with HGVs.

7.169 A wheel wash facility is also proposed to address any concerns of dust and debris on the highway network.

7.170 The junction will be subject to the Section 278 design procedures. This will include consideration of adequate and appropriate lighting levels at the junction.

7.171 A swept-path analysis has been undertaken which considers the turning requirements of a maximum sized articulated vehicle. The site access design demonstrates that two HGVs can pass without any issues. The swept-path analysis is included at **Drawing HQ 7/2**.

IMPACT OF THE PROPOSALS

7.172 The following section combines the determined existing highway conditions and proposed traffic forecast to assess the likely level of impact that the proposed development would bear on the local highway network.

Safety and Capacity

Suitability of Operational Traffic Route

7.173 The A1057 Hatfield Road is a classified 'A' road which currently accommodates an Annual Average Weekday Traffic (AAWT) flow of over 15,000 vehicles (of all sizes). It has a consistent standard carriageway width suitable for HGV movement and all of the junctions between the site access and the A1(M) are of sufficient size to accommodate large vehicles without any concerns.

7.174 The accident data has been considered in detail and it has been determined that there are no accident patterns that could be attributed to poor highway design. The incidents recorded are as a result of adverse weather conditions or human error, typically poor driver judgement.

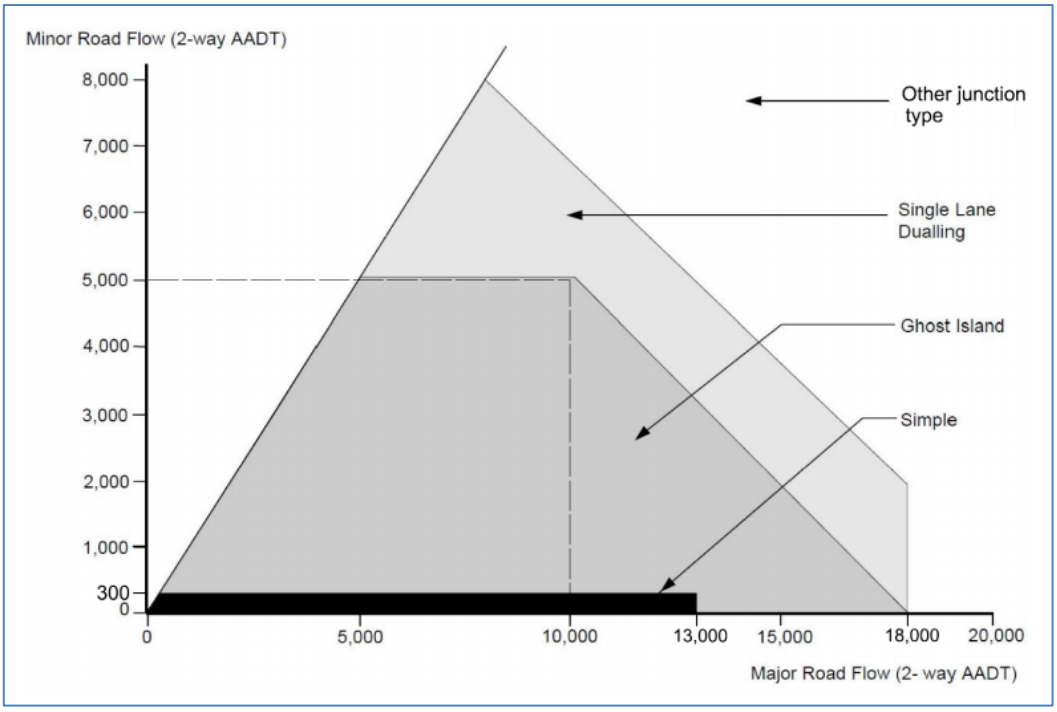
7.175 It is considered that the proposed operational traffic route is suitable for the development proposals would provide access to the county's principal roads, whilst limiting impact to residential areas.

Junction Capacity

7.176 Technical guidance provided within DMRB CD 123 (formerly TD42/95, withdrawn August 2020) provides guidance on the provision of Ghost Island junctions (ghost right-turn lanes) on single carriageway roads based on 2 Way AADT flows.

7.177 Figure 7-16 comprises a reproduction of Figure 2.3.1 'Approximate priority junction provision on single carriageway roads based on flows only', from DMRB CD 123.

Figure 7-16
Figure 2.3.1 from DMRB CD 123



7.178 The diagram above is intended to '*…determine the approximate level of junction provision prior to more detailed traffic modelling to check capacity*'.

7.179 The approximate AADT of the A1057, as recorded by the SLR commissioned ATC equates to 15,420.

7.180 Where the Major Road Flow (in this case, the A1057) experiences an AADT of 15,500, the upper limit on the AADT of the Minor Road Flow (in this case, the Site Access), for a Ghost Island junction to remain appropriate, is approximately 1,600.

7.181 The proposed application is forecast to generate a total of 168 daily vehicle movements, of which 164 would be classified as HGV.

7.182 This level of vehicular traffic across the day would comfortably be accommodated within the proposed access junction arrangements without any capacity concerns.

7.183 Additionally, as part of the access junction design a capacity analysis was undertaken which demonstrated that the junction would still work well within acceptable parameters. This included a sensitivity test which multiplied the proposed site traffic by a multiple of ten.

7.184 The A1057/Oaklands Lane/Station Road roundabout junction has been observed during the weekday peak periods and no congestion occurred. The proposals would not be routeing very much operational traffic to/from a westerly direction and the level of light vehicle traffic would be minimal. Therefore it is deemed that the proposals would not impact the existing operation of this junction.

Environmental Impact

Methodology

7.185 This section assesses the environmental impact associated with the movement of vehicles associated with the development. The assessment refers to guidance provided by the Institute of Environmental Management and Assessment (IEMA) in 'Guidelines for the Environmental Assessment of Road Traffic' (the 'IEMA guidelines').

7.186 The IEMA guidelines provide two broad rules which can be used to determine the need for a full environmental assessment. The rules form a threshold, below which the predicted environmental impact is considered to be insignificant:

- highway links where traffic flows would increase by more than 30% (or where the number of HGVs would increase by more than 30%); or
- in sensitive areas where traffic flows increase by more than 10%.

7.187 Given the determined existing conditions of the local highway network, road classification, lack of sensitive receptors and its lack of accident history, for the purposes of this assessment the links studied are not considered to be sensitive. Based on this, the 30% threshold as defined in the IEMA Guidelines is deemed to apply for assessment purposes.

7.188 If the above thresholds are exceeded then a full environmental impact assessment must be undertaken to determine the level of transport related impact borne of the proposed development. The IEMA guidelines advise that traffic flow variations within +/-10% of baseline levels are indiscernible from the day-to-day fluctuations in traffic flow, creating no material environmental impact. Therefore, increases in traffic of less than 10% are considered to have a negligible impact. Based on the guidance, the following criteria are used to determine the environmental impact of the proposed development:

- noise and vibration – a doubling of traffic flow leads to a 3dB(A) increase in noise level, below which is deemed imperceptible to change receptors;
- dust and dirt – the potential effects arising from dirt and detritus being brought onto the highway, assessment is required where the increase in traffic is above 10%;
- driver severance and delay – capacity assessments are required where traffic levels change by 10% or more, or where the links/junctions experience congestion in the baseline situation;
- community severance and delay – the existing level of community severance is determined and the relative impact of additional traffic assessed based on a sliding scale; and
- vulnerable road users and road safety – assessment is required where the increase in traffic is above 10%.

7.189 Based on the above, the assessment would determine the sensitivity and magnitude of transport related impacts according to the criteria established in Table 7-8 below.

Table 7-8
Transport Impact Criteria

Impact	Sensitivity			Magnitude			
	Low	Medium	High	Negligible	Minor	Moderate	Major
Noise & Vibration	No sensitive receptors	Presence of sensitive receptors	Presence of sensitive receptors adjacent to the road	<99% increase in traffic i.e. a doubling of traffic flow	Quantitative assessment based on predicted increase in traffic against measured baseline		
Dust & Dirt	Limited presence of sensitive receptors	Low to medium presence of sensitive receptors	High presence of sensitive receptors	No off-road vehicle movements /no loose material transport	Qualitative assessment based on type of traffic generated, materials transported and traffic speeds through sensitive areas		
Driver Severance & Delay	Road network not affected	Road network not experiencing congestion at peak times	Road network experiencing congestion at peak times	<10% increase in traffic	Quantitative assessment of road capacity based on existing traffic flows and predicted future traffic levels		
Community Severance & Delay	Moderate to high baseline traffic flows / presence of existing severance	Moderate baseline traffic flows / presence of existing severance	Low baseline traffic flows / no presence of existing severance	<10% increase in traffic	<30% increase in traffic	<60% increase in traffic	>60% increase in traffic
Vulnerable Road Users	N/A	Limited presence of vulnerable road users	Presence of vulnerable road users	<10% increase in traffic	Qualitative assessment of existing provision and future traffic levels		
Road Safety	N/A	No existing safety risk	Existing safety risk	<10% increase in traffic	Quantitative assessment of existing accident records and predicted increases in traffic		

7.190 The sensitivity and magnitude of each impact are combined to determine the significance, from which the need for mitigation can be identified. The significance definitions are detailed in Table 7-9 below. In terms of the EIA Regulations, an 'Moderate/substantial' and 'Substantial' effect are taken as being a 'significant' effect.

Table 7-9
Determination of Impact Significance

Magnitude	Sensitivity		
	Low	Medium	High
Negligible	Negligible	Slight	Slight/Moderate
Minor	Slight	Slight/Moderate	Moderate
Moderate	Slight/Moderate	Moderate	Moderate/Substantial
Major	Moderate	Moderate/Substantial	Substantial

Link Impact

7.191 The A1057 Hatfield Road has been considered in terms of the link impact that would occur as a result of the traffic forecasted for the proposed application.

7.192 All traffic forecasted to be generated by the site has been routed via the A1057 to/from the A1(M).

7.193 Furthermore, despite staff shifts starting before the AM peak period and finishing after the PM peak period all light vehicle trips have been applied to peak periods to ensure a robust link impact assessment.

7.194 Table 7-10 identifies the maximum total and HGV traffic increases on each of the key links over the course of a typical weekday. This is based on the DfT data growthed to a 2023 opening year (localised Tempro growth factor 2018-2023 of 1.034) to reflect the cumulative increase of traffic generated by new and forthcoming development.

Table 7-10
Link Impact

Link	All Vehicles			HGVs		
	2023	Proposed Traffic	% Change	2023	Proposed Traffic	% Change
1	14,061	184	1.3	604	164	27.2
2	15,608		1.2	670		24.5
3	19,454		0.9	1,645		10.0
4	62,637		0.3	4,196		3.9

7.195 The link impact assessment shows that the proposed traffic forecasted would result in a maximum increase of 1.3% on the total existing traffic flow, and a maximum increase of 27.2% on the existing HGV traffic flow.

7.196 This level of increase is within the advisory thresholds classified as 'slight' in terms of significance on the basis that it is a minor increase in an area deemed to have low level of highway sensitivity.

Noise and Vibration

7.197 As stated in the IEMA Guidelines, variation of +/-3dB(A) represents the minimum perceptible change in noise to nearby receptors, which is typically produced by a doubling or halving of traffic flow. As demonstrated within the link impact assessment the proposals would not result in a doubling of background traffic levels.

7.198 As development traffic would not travel outside of the typical operational hours, the assessment of traffic noise during the night-time is not required.

7.199 The above assessment confirms that the proposed development traffic would lead to no perceptible change in noise or vibration along any link within the study area road network during hours of operation. The magnitude of the proposed development impact on noise and vibration would therefore be negligible.

7.200 It should be noted that transport related noise is also addressed in Chapter 10 of this Volume.

Dust and Dirt

7.201 The sensitivity to the impact of dust and dirt is based upon the proximity of sensitive receptors to the roadside. The IEMA Guidelines state that "*…problems with dust and dirt are unlikely to occur at distances greater than 50m from the road*". The site access is not located within 50 metres of any sensitive receptors.

7.202 The IEMA guidelines explain that the impact of dust and dirt will depend, to a large extent, upon the management practices undertaken on site. This includes the washing down of wheels and sheeting of material during transport on the public highway. This assessment determines the level of impact generated by the proposed development under the assumption that no management practices are undertaken.

7.203 The transportation of materials in uncovered containers could lead to dust and dirt impacting the proposed access route network.

7.204 It is expected that, without sufficient mitigation measures, the magnitude of the impact of dust and dirt throughout the study area road network would be high. Appropriate mitigation measures are proposed in order to minimise any impact that is caused in terms of dust and dirt. Such mitigation measures follow best practice guidelines and are routinely used at quarry operations throughout the UK. The effectiveness of the mitigation measures is therefore well understood.

7.205 As noted in the next section, the residual impact in terms of dust and dirt would therefore be slight.

Driver Severance and Delay

7.206 The A1057 Hatfield Road is a classified 'A' road which currently accommodates an Annual Average Weekday Traffic (AAWT) flow of approximately 15,000 comprising mixed size vehicles.

7.207 The link capacity assessment undertaken has demonstrated that the A1057 currently operates within its theoretical capacity and it would continue to do so comfortably with the addition of the proposal traffic.

7.208 The link impact assessment has demonstrated that the maximum likely increase would be 1.3% in terms of total vehicles, which is well within the daily fluctuations in traffic levels experienced and is therefore unlikely to be perceptible away from the site access junction.

7.209 The impact to driver severance and delay would therefore be negligible.

Community Severance and Delay

7.210 The sensitivity of this impact is based upon the presence of communities around the local road network and the existing level of severance due to traffic flow.

7.211 The A1057 Hatfield Road is a classified 'A' road which currently accommodates an Annual Average Weekday Traffic (AAWT) flow of approximately 15,000 comprising mixed size vehicles.

7.212 The link capacity assessment undertaken has demonstrated that the A1057 currently operates within its theoretical capacity and it will continue to do so comfortably with the addition of the proposal traffic.

7.213 The link impact assessment has demonstrated that the likely increase would be 1.3% in terms of total vehicles, which is well within the daily fluctuations in traffic levels experienced.

7.214 Furthermore, adequate pedestrian crossing facilities are provided at the A1057 Hatfield Road. Weight restrictions are also in place along Station Road and Smallford Lane which prevent any detrimental impact caused by HGVs routing through Smallford and Sleapshyde.

7.215 The magnitude of the impact on community severance would therefore be negligible.

Road Safety

7.216 The accident data obtained has been considered in detail and it has been determined that there are no accident patterns that could be attributed to poor highway design. The incidents recorded are as a result of adverse weather conditions or human error, typically poor judgement.

7.217 It is therefore considered that the type and quantity of additional traffic generated by the proposed development would have a negligible impact on the safety of the local road network.

Vulnerable Road Users

7.218 The review of local accident data has also demonstrated that there is currently no safety issue relating to vulnerable road users.

7.219 The link capacity assessment undertaken has demonstrated that the road operates within its theoretical capacity. The link impact assessment has demonstrated that the likely increase would be 1.3% in terms of total vehicles, which is well within the daily fluctuations in traffic levels experienced and is therefore unlikely to be perceptible away from the site access junction.

7.220 The impact to driver vulnerable road users will therefore be negligible.

MITIGATION

7.221 Mitigation measures are proposed to facilitate safe access to the site, whilst also offsetting the potential impact caused by additional HGV traffic on the surrounding road network.

Access Junction Design

7.222 The proposed access junction includes a Ghost Island (ghost right turn lane) to maintain the safe free-flow of through traffic on the A1057. The site operator will ensure that good visibility is maintained at the proposed site access junction i.e. any trees/hedges trimmed.

A Traffic Management Plan

7.223 A Traffic Management Plan (TMP) will be produced and agreed with the local authority in writing prior to the commencement of site operations. The TMP will include:

- HGV Routeing Plan; specify on exiting the site HGVs shall travel eastbound towards Comet Way (A1001);
- Clarification of vehicle booking/scheduling systems;
- Details of wheel washing facilities at the site exit, to prevent the transfer of site material onto the public road network;
- Details of measures to ensure that all loose material transported to/from the site is suitably covered and that HGVs are not overloaded, to minimise the impact of dust resulting from material transport;
- Detail HGV turning arrangements should access not be permitted;
- Details regarding the induction of drivers of all HGV traffic accessing the development, highlighting safety issues and ensuring they follow agreed access routes to and from the site; and
- Specify methods to monitoring, reporting and enforcement of non-compliance.

Site Signage

7.224 It is recognised that too many signs at an entrance have a similar impact to that of clutter, and can often prove difficult to read, therefore becoming counterproductive. Clear and concise signage would be provided at the site entrance which follows Brett's corporate style and provides the following information:

- Site details;
- Incident/issue reporting contact information;
- State when the site is open / closed; and
- Conditions of entry.

7.225 All signs would be kept clean and securely fixed in order to not detract from the overall appearance of the quarry entrance.

RESIDUAL IMPACT

7.226 The sensitivity and magnitude of impacts associated with the additional traffic generated by the proposed development are combined according to the significance definitions provided in Table 7-9 above. Table 7-11 below summarises the significance of each impact pre- and post-mitigation, providing a number of suggested mitigation measures that could be employed to achieve the impact reduction.

Table 7-11
Significance of Traffic Impacts associated with the Proposals

Impact	Pre-Mitigation Significance	Suggested Mitigation	Residual Impact
Noise and Vibration	Negligible	N/A	Negligible
Dust and Dirt	Moderate	• No overloading of HGVs • Wheel washing facilities at site exit • Covering of materials in transit • Monitoring of dust and dirt levels	Slight
Driver Severance and Delay	Negligible	N/A	Negligible
Community Severance and Delay	Negligible	N/A	Negligible
Road Safety	Slight	HGV driver induction	Negligible
Vulnerable Road Users	Negligible	HGV driver induction	Negligible

CONCLUSIONS

7.227 An assessment of the potential impacts on the local transportation network resulting from the proposed development has been undertaken.

7.228 Access would be served off the A1057 by means of a new junction with a Ghost Island (ghost right-turn lane). It is proposed that the operational hours of the development would be from 07:00 - 18:00hrs, Monday to Friday, and 07:00 – 13:00hrs on Saturdays.

7.229 The proposals are forecast to generate up to 184 vehicle movements of which 164 would be classified as HGV. These would be generated evenly throughout the day. HGV traffic would operate throughout the working day, scheduled evenly to ensure the site operates efficiently. For robustness, on the basis of a ten hour day, 16 HGV movements (i.e. 8 in and 8 out) would be generated per hour, or one every 3.75 minutes.

7.230 A detailed audit of the existing highway conditions has been undertaken which includes a review of the local accident history in the proximity of the application site.

7.231 The A1057 provides good links with the A1(M). The A1057 Hatfield Road is a classified 'A' road which currently accommodates an Annual Average Weekday Traffic (AAWT) flow of over 15,000 mixed size vehicles. A review of the most recent 5 years of accident records have not highlighted any incident patterns or concerns.

7.232 The link impact assessment has demonstrated that the likely increase in total traffic levels on the A1057 would be approximately 1.3% in terms of total vehicles, which is well within the daily fluctuations in traffic levels experienced and is therefore unlikely to be perceptible away from the site access junction. The increase in terms of HGV traffic on this link would be under 30%.

7.233 The assessment has also demonstrated that on the wider highway network the impacts of the proposed traffic would be minimal and would not materially impact the operation of the highway network.

7.234 Appropriate mitigation measures are proposed to minimise any impacts of the proposed development relating to road safety and dust and dirt.

7.235 In view of the above, the residual impacts of the operation of the application proposals would be negligible and would not result in an unacceptable impact on road or junction capacity, driver delay, road safety or amenity; by virtue of this, the application proposal is deemed acceptable in traffic and highways terms.

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INTRODUCTION

8.1 This chapter is based on the LVIA undertaken as part of a previous assessment (reported in the 2016 ES; see Chapter 1) and includes additional information to form a suitable assessment of the landscape and visual effects now anticipated due to the revisions to the proposed development. It also considers changes to the baseline within the surrounding landscape since 2016 and potential changes due to other additional developments within the local area.

8.2 There has been no change to the guidance and methodology for undertaking Landscape and Visual impact assessments since the 2016 ES was published. There has been some change to the area within and around the application site that introduces some new visual receptors.

8.3 It is recognised that a new housing estate has been developed on the site of a former nursery, to the west of the application site, views from here would be similar to another small housing development further to the north (Pasture View) and are screened by dense planting.

8.4 In addition, a major housing development, Hatfield OPA (aka Hatfield Garden Village), has been submitted for land to the north east comprising a large mixed scale development of 1,100 new homes and supporting infrastructure (primary School, local centre, and open space). The proposals for this area include a 175m open space buffer between the housing elements and the north eastern boundary of the proposed mineral development site. The components of the mineral development include a minimal width of c. 160m of soil storage/screen bunds and ground water recharge lagoons between the open space of the housing development and actual mineral extraction. The cumulative analysis undertaken for the housing development to the north (ES Land to the West of Hatfield October 2018 – Section 15 Cumulative Effects) states significant cumulative effects would be limited to socio-economic issues only (and thus not landscape or visual).

8.5 The existing CEMEX quarry site to the north-west may be retained, including a plant site and conveyor link for a longer period (eight years), if a further extension is permitted. These potential extensions are located on the northern edge of Hatfield and sufficiently distant not to generate landscape and visual effects in themselves, although the retention of the CEMEX plant site may have a cumulative interaction with the proposed development.

8.6 It is noted that one of the reasons cited for refusal relates to Green Belt. The National Planning Policy Framework (NPPF) sets out policy relating to Green Belt in Section 13. The protection of the Green Belt is a component of the purpose of the planning system to contribute to the achievement of sustainable development.

8.7 Paragraph 137 indicates that the Government attaches great importance to Green Belts. The fundamental aim of Green Belt policy is to prevent urban sprawl by keeping land permanently open; the essential characteristics of Green Belts are their openness and their permanence.

8.8 Inappropriate development is, by definition, harmful to the Green Belt and should not be approved except in very special circumstances. However, at paragraph 146, the NPPF identifies certain operations that are not inappropriate in the Green Belt provided they preserve its openness and do not conflict with the purposes of including land within it. These include mineral extraction and engineering operations, which obviously must include ancillary operations that are

essential to the working of mineral deposits such as weighbridges, water management, access roads and processing plant. It does not provide any guidance on the temporal aspects/duration of mineral extraction.

8.9 Green Belt is not a landscape designation *per se* (in the same was as a National Park or Area of Outstanding Natural Beauty) but does have links to landscape and visual impact assessment by virtue of the need to consider openness. Ultimately though, this is a planning consideration as opposed to being part of the EIA process. However, notwithstanding this, consideration has been given to the purposes of the Green Belt and maintenance of its openness in this chapter.

8.10 For the new EIA it is considered that it will be proportionate to update the previous assessment, having regard to landscape planning policy and any published landscape character assessments to ensure that up to date references are included. Existing fieldwork photography has been used and qualitatively referring to any changes that have occurred (having regard to Google Earth, the imagery for which is dated 2019) for example the new housing development has occurred on the site of the former nursery off Oaklands Lane to the west of the site.

8.11 This chapter assesses the potential landscape and visual effects arising from the proposed development (refer to Chapter 3 above). The chapter is divided into the following sections:

- Scope and definitions;
- Methodology;
- Landscape planning context;
- Summary of the development proposal, as relevant to this topic;
- Landscape effects;
- Visual effects; and
- Conclusion.

SCOPE AND DEFINITIONS

8.12 Paragraph 1.1 of the Guidelines for Landscape and Visual Impact Assessment (3rd Edition), published by Landscape Institute and Institute of Environmental Management and Assessment (hereafter referred to as "*GLVIA 3*") states that *"Landscape and Visual Impact Assessment (LVIA) is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and on people's views and visual amenity".*

8.13 Paragraph 5.1 of GLVIA3 describes how landscape effects are concerned with *"how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character".*

8.14 Allied to this, paragraph 6.1 of GLVIA3 describes how visual effects are concerned with *"assessing how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the change or loss of existing elements of the landscape and/or introduction of new elements".*

8.15 Thus, this assessment deals separately with each of these effects, although where relevant and appropriate, cross references may be made to the same features or elements where they are relevant to both assessments.

METHODOLOGY

8.16 The main source of guidance for this chapter of the ES has been GLVIA3 (*op cit*). Table 3.1 of GLVIA3 summarises the main components of the impact assessment process, with Figure 3.1 in GLVIA3 illustrating the process. For ease of reference, the core components of LVIA identified in GLVIA3 are reproduced in Table 8-1 below. This guidance was used in the previous LVIA and remains the prime guidance available to Landscape Architects today and is therefore very much still relevant.

Table 8-1
Core Components of LVIA (taken from GLVIA3)

Component of EIA Process	Brief description of action in this part of the process
Project description / specification	Provides a description of the proposed development for the purpose of the assessment, identifying the main features of the proposals and establishing parameters such as maximum extent of the development or sizes of the elements. Normally includes description of any alternatives considered.
Baseline Studies	Establishes the existing nature of the landscape and visual environment in the study area, including any relevant changes likely to occur independently of the development proposals. Includes information on the value attached to the different environmental resources.
Identification and description of effects	Systematically identifies and describes the effects that are likely to occur, including whether they are adverse or beneficial.
Assessing the significance of effects	Systematically and transparently assess the likely significance of effects identified.
Mitigation	Makes proposals for measures designed to avoid/prevent, reduce or offset (or compensate for) any significant negative (adverse) effect.

8.17 Paragraph 3.23 of GLVIA3 describes how "*The EIA Directive and UK Regulations refer to projects likely to have significant effects on the environment. This means that identifying and describing the effects of a project is not enough in itself. They must also be assessed for their significance. This is a key part of the LVIA process and is an evidence-based process combined with professional judgement. It is important that the basis of such judgements is transparent and understandable, so that the underlying assumptions and reasoning can be understood by others*."

8.18 Figure 3.5 of GLVIA3 illustrates the step-by-step process for assessing the significance of effects based on the combination of the nature of the receptor likely to be affected (sensitivity) and the nature of effect likely to occur (magnitude).

8.19 As described in paragraph 3.26 of GLVIA3, assessment of sensitivity will incorporate judgements about the:

- *Susceptibility of the receptor to the type of change arising from the specific proposal; and*
- *The value attached to the receptor.*

8.20 As described in paragraph 3.26 of GLVIA3, assessment of magnitude will incorporate judgements about the:

- *The size and scale of the effect – for example whether there is a complete loss of a particular element of the landscape or a minor change;*
- *The geographical extent of the area that will be affected; and*
- *The duration of the effect and its reversibility.*

8.21 The criteria used for assessing sensitivity and magnitude of landscape and visual effects in this assessment (including cumulative aspects and the nature of effect) are set out in Appendix 8/1 to this chapter.

8.22 Paragraph 3.28 of GLVIA3, then describes how the separate judgements on the individual criteria of sensitivity and magnitude should be combined to provide an overall judgement of significance.

8.23 In addition to the detailed and narrative text describing how the overall judgements of significance have been determined, this assessment also uses the matrix shown in Table 8-2 below.

8.24 Both Major effects and Moderate/Major effects are regarded as "*significant*" in the context of the EIA Regulations (refer to Chapter 1 above). This process is not a quantitative process; there is not an absolute scoring system. Instead, the correlation of the two factors, although reflecting recognised features and methods of working outlined in this section, is in the end a matter of professional judgement of the qualified landscape architect.

Table 8-2
Summary of Combinations for Judging Significance of Landscape and Visual Effects

Sensitivity / Magnitude	Negligible	Low	Medium	High
Negligible	Negligible Effect	Negligible / Slight Effect	Slight Effect	Slight / Moderate Effect
Low	Negligible / Slight Effect	Slight Effect	Slight / Moderate Effect	Moderate Effect
Medium	Slight Effect	Slight / Moderate Effect	Moderate Effect	**Moderate / Major Effect**
High	Slight / Moderate Effect	Moderate Effect	**Moderate / Major Effect**	**Major Effect**

Note: **Bold** denotes a significant effect in EIA terms

8.25 The nature of the change resulting from the proposed development may also be described as beneficial (i.e. providing enhancement or improvement to the landscape), adverse (i.e. resulting in losses of characteristic elements or degradation/fragmentation of the landscape resource), or neutral (i.e. effects are neither adverse nor beneficial, or impacts may be balanced between adverse and beneficial).

8.26 Initially a desktop study was undertaken to review the relevant publications, maps and plans relating to the proposed development. This was followed by fieldwork to various parts of the application site and the surrounding study area in November 2015.

8.27 During the site visits, the weather conditions were variable, but visibility was generally moderate (between 4-10km) and considered suitable for assessing all views for this assessment.

8.28 Use has been made of 3D computer models to generate zones of theoretical visibility ('ZTVs'), identify potential viewpoints and create perspective views, which in turn have been used to inform the assessment of magnitude of change for individual viewpoints.

8.29 Photographs provide an aid to assessing landscape and visual effects. The photographs illustrate views under the particular conditions prevailing at the time of carrying out the viewpoint photography. Effects vary depending on light and weather conditions and also the time of day and time of year. Accordingly, this assessment endeavours to assess "worst case" conditions within the written assessment.

8.30 No technical difficulties were encountered in assessing the landscape and visual impacts of the proposed development, although the weather conditions during the site visit were variable as noted above.

Consultation

8.31 As part of a formal 'scoping' process (refer to Chapter 1 and Appendix 1-1), SLR originally submitted a scoping request in June 2015 to the local planning authority, which identified visual impact and landscape character as topics, potentially with environmental effects that would be considered as part of a subsequent ES.

8.32 The Landscape Report for "Hatfield Aerodrome, Scoping Opinion" from Hertfordshire County Council's Landscape Officer, Natural Historic and Built Environment Advisory Team, dated 11th August 2015, supported the proposed inclusion of an LVIA and requested *inter alia*:

- landscape baseline and the relevant local landscape character areas;
- visual baseline and production of a Zone of Theoretical Visibility (ZTV) and fieldwork to identify the area from which the development would be visible;
- a "landscape strategy" to demonstrate the mitigation of the effects of the development throughout the project lifecycle, including advance planting; and
- the cumulative effects of the site restoration should be considered alongside neighbouring schemes (e.g. Hatfield Quarry to the north).

8.33 The applicant has carried out a further formal scoping exercise, commencing with an internal scoping appraisal undertaken by SLR to establish the likely significant environmental effects, having regard to the findings of the 2016 ES. This was set out in the 'Scoping Report' submitted to the MPA on 10 May 2021, which described the proposed scope of the EIA, and was accompanied by a request for a 'Scoping Opinion'. The MPA issued their Scoping Opinion on 14 July 2021, attached as Appendix 1/2 to this ES.

LANDSCAPE PLANNING CONTEXT

8.34 Full details of the relevant planning policy context of the application site are described in Chapter 4 of this ES.

8.35 Since the previous LVIA national policy has been updated and is currently reflected in the National Planning Policy Framework (July 2021) with relevant extracts identified in the section below.

8.36 In terms of local planning the policies identified in the previous LVIA remain valid and are included below.

National Policy: The National Planning Policy Framework (NPPF)

8.37 Paragraph 11 sets out the fundamental principle of this document: that there is a presumption in favour of sustainable development. All development that is in accordance with the development plan should be approved "*without delay*" and that "*where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date*" permission should be granted for development "*unless any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in the Framework taken as a whole*."

8.38 In relation to landscape, the NPPF defines sustainability as including the protection and enhancement of the "*natural, built and historic environment*" (paragraph 8).

8.39 Paragraph 38 states that 'local planning authorities should approach decisions on proposed development in a positive and creative way. They should use the full range of planning tools available'. They should also 'work proactively with applicants to secure developments that will improve the economic, social and environmental conditions of the area'.

8.40 Paragraph 100 relates to rights of way and access, stating that these should be "*protected and enhanced*". It is noted that better facilities should be provided for users of rights of way, for example by "*adding links to existing rights of way*".

8.41 Paragraphs 126, 132 and 134 relate to the need for good design in new developments. Paragraph 126 states that "*good design is a key aspect of sustainable development, creates better places in which to live and work and helps make development acceptable to communities*". Paragraph 132 states that applicants should work closely "*with those directly affected by their proposals to evolve designs which take account of the views of the community*". Paragraph 132 states that "*Development that is not well designed should be refused, especially where it fails to reflect local design policies and government guidance on design*".

8.42 Paragraph 174 of the NPPF states that the planning system, "*should contribute to and enhance the natural and local environment by [inter alia] …protecting and enhancing valued landscapes*" and by "*recognising the intrinsic character and beauty of the countryside*". Paragraph 175 states that the planning system should "*distinguish between the hierarchy of international, national and locally designated sites*".

8.43 In paragraph 176 it is stated that "*great weight should be given to conserving and enhancing landscape and scenic beauty in National Parks, the Broads and Areas of Outstanding Natural Beauty, which have the highest status of protection in relation to landscape and scenic beauty*".

8.44 The National Planning Policy Framework (NPPF) states that the essential characteristics of Green Belts are their openness and their permanence (paragraph 137). The purposes of the Green Belt are as follows (paragraph 138):

- To check the unrestricted sprawl of large built-up areas;
- To prevent neighbouring towns from merging one into another;

- To assist in safeguarding the countryside from encroachment;
- To preserve the setting and special character of historic towns; and
- To assist in urban regeneration.

8.45 The NPPF states that "*The Government attaches great importance to Green Belts. The fundamental aim of Green Belt policy is to prevent urban sprawl by keeping land permanently open; the essential characteristics of Green Belts are their openness and their permanence*." (paragraph 137). It goes on to say that "*once established, Green Belt boundaries should only be altered where exceptional circumstances are fully evidenced and justified*" (paragraph 140). Green Belt boundaries must take account of the need for sustainable development, including provision of safeguarded land between the urban area and the Green Belt. Green Belt boundaries should follow "*physical features that are readily recognisable and likely to be permanent*" (paragraph 143).

8.46 In addition, NPPF states in paragraph 142 that;

"*Where it has been concluded that it is necessary to release Green Belt land for development, plans should give first consideration to land which has been previously-developed and/or is well-served by public transport. They should also set out ways in which the impact of removing land from the Green Belt can be offset through compensatory improvements to the environmental quality and accessibility of remaining Green Belt land*."

8.47 NPPF states in paragraph 145 that;

"*Once Green Belts have been defined, local planning authorities should plan positively to enhance their beneficial use, such as looking for opportunities to provide access; to provide opportunities for outdoor sport and recreation; to retain and enhance landscapes, visual amenity and biodiversity; or to improve damaged and derelict land*."

8.48 NPPF states in paragraph 150 that;

"Certain other forms of development are also not inappropriate in the Green Belt provided they preserve its openness and do not conflict with the purposes of including land within it. These are:

a) mineral extraction;…."

Planning Practice Guidance: Minerals (2014)

8.49 Planning Practice Guidance: Minerals (PPGM) states that with regard to the restoration and aftercare of minerals sites;

"*The level of detail required on restoration and aftercare will depend on the circumstances of each specific site including the expected duration of operations on the site. It must be sufficient to clearly demonstrate that the overall objectives of the scheme are practically achievable, and it would normally include:*

- *an overall restoration strategy, identifying the proposed after use of the site;*

- *information about soil resources and hydrology, and how the topsoil/subsoil/overburden/soil making materials are to be handled whilst extraction is taking place;*
- *where the land is agricultural land, an assessment of the agricultural land classification grade; and*
- *landscape strategy."*

8.50 With regards the landscape strategy PPGM states;

"A site-specific landscape strategy to accompany applications for either a new site or any significant extension to an existing working site should include:

- *defining the key landscape opportunities and constraints;*
- *considering potential directions of working, significant waste material locations, degrees of visual exposure etc;*
- *identifying the need for additional screening during operations;*
- *identifying proposed after uses and options for the character for the restored landscape."*

Local Planning Policy

8.51 A summary of relevant local landscape policies from the Hertfordshire Minerals Local Plan Review 2002-2016 (adopted 2007), Waste Core Strategy and Development Management Policies Document (adopted November 2012), City and District of St Albans District Local Plan Review (adopted 1994) and Welwyn Hatfield District Plan (adopted 2005) are set out in Appendix 8/2.

8.52 In summary, the local landscape planning policy context requires consideration of good design as a key aspect of sustainable development, both into its siting and landscaping treatments and ensure that any development is not detrimental to the character and appearance of the site and its surrounding environment. There is also particular emphasis placed on the protection of Green Belts.

8.53 The application site is located within a Green Belt and these, along with any other designations which are of relevance to this assessment, are examined below, under the consideration of 'landscape value' and within the subsequent section on the functionality of the Green Belt.

8.54 The application site covers the south-western part of the allocated site referred to as Preferred Area No.1 (Land at BAe) on Inset Map No 6 in Hertfordshire Minerals Local Plan Review 2002-2016. This map also shows Hatfield Quarry covering land immediately to the north of the application site and Suttons Farm extending for a further 2km.

8.55 Preferred Areas are defined as "*parcels of land likely to be required to make up the balance of the County's contribution to the regional apportionment for the plan period (to 2016) and the landbank period beyond."*

8.56 Hatfield Quarry is an active sand and gravel site immediately to the north of the application site. This other site is currently due to close in 2020 when the planning permission expires.

THE DEVELOPMENT PROPOSAL

8.57 Full details of the proposed development are described in Chapter 3 of this ES and the following items have been examined in detail due to their specific landscape and visual implications:

- winning and working, together with processing for sale, of some 8Mt of sand and gravel over a period of around 32 years over seven phases (c. 4 years. per phase);
- a new access onto the A1057, west of Popefield Farm; and
- the importation of low permeability inert material to infill the mineral workings to facilitate the restoration of the site to a beneficial after use, combining recreation and nature consideration.

Timescales and Permanency of Development

8.58 GLVIA3 refers to effects that last for 10 to 25 years as being long term. In view of this the proposed development as a whole is considered to be long term. This includes any advance planting undertaken at the outset around the site boundaries, but also the access road, plant site area and any other ancillary elements that would be required over the project lifecycle.

8.59 However, the progressive nature of the development means that certain effects may be shorter in duration, such as vehicle movements on the upper soils and overburden layers; formation of the perimeter screening bunds; or the working within individual phases themselves and subsequent restoration. For example, vegetation clearance in advance of and the stripping, working and infilling of the later phases (such as E and F) would remain in their existing condition until the second half of the development.

8.60 GLVIA3 refers to effects that last for 0 to 5 years as being short term (i.e. soil stripping and construction work) and 5 to 10 years as medium term (i.e. overall working operations and restoration in any given phase).

8.61 The proposed final restoration scheme would then be a permanent feature, progressively completed through the operational period.

Design Development and Built-in Mitigation

8.62 The proposed development incorporates design evolution and built-in mitigation devised as part of project team discussions and impact assessment, as well as other consultations.

8.63 The landscape strategy for the proposed development has the following elements:

- hedgerow management, to allow existing hedgerows around the perimeter of the site to grow out / in height (cutting sides only);
- infill planting of hedgerows around site using locally native species to increase landscape structure, enclosure / screening and habitat connectivity;
- a landscape buffer would be retained around the site perimeter, including a corridor to the north and east to accommodate the diverted Nast and offset to Home Covert, a corridor to the south along the road and Popefield Farm, to include a screening bund and to the west

to include the diverted footpath and access road. Permissive paths would also be incorporated into these corridors to provide access from Ellenbrook Fields and elsewhere;
- use of temporary soil storage to provide screening mounds. These would be grass seeded immediately following construction to ensure visual assimilation, as afar as possible;
- positioning of the plant site to the north of the application site away from the main Hatfield Road and local residential properties and use of muted and recessive colour scheme for the plant to minimise visual intrusion and potential adverse effects on local views;
- inclusion of landscaping treatments to the new access, fence and signs (grass seeding of verge and re-planting to compensate for any removal);
- progressive working, backfilling and restoration to minimise overall disturbance at any single point in time. This includes phased removal of hedgerows (such as along western end of the site) and stripping of grassland and soils and reinstatement of areas as soon as is practical (such as in the south-eastern part of the site in Phase A); and
- final restoration of the site, utilising backfill material to reinstate levels similar to existing. The access road and a small parking area would be retained for recreational purposes.

Potential Sources of Landscape and Visual Effect

8.64 The main landscape and visual elements of the proposed development include the following:

- clearance of existing vegetation and landcover and diversion of rights of way and areas of permissive access;
- erection of new access, plant and buildings within the application site;
- mineral stockpiles, including surge piles to allow working on a campaign basis;
- new screen mounds, tree and shrub and planting, buffer corridors and diverted footpaths around the periphery of the application site;
- movement of plant, machinery and vehicles within, to and from the application site;
- progressive working of the mineral extraction areas, engineering and backfilling of the voids; and
- progressive and final restoration.

8.65 There are potential direct effects upon landscape character, elements and features within the application site itself and then potential effects upon landscape character and visual amenity of offsite receptors in the immediate surrounding area. The spatial extent of landscape and visual effects are principally local.

Potential Indirect Effects

8.66 Typically, the main potential indirect impact associated with minerals and waste management projects relates to traffic generated from the development, as this would have a potential visual impact for other users of the local communication network, and a general impact on the scenic quality of local views.

8.67 The A1057 is a busy road, near to the edge of Hatfield and the Transport chapter within this ES identified that it currently accommodates an Annual Average Weekday Traffic (AAWT) flow of over 15,000 mixed size vehicles.

8.68 A total of 184 vehicle movements would be generated by the proposed development of which 164 would be classified as HGV. The link impact assessment has demonstrated that the likely increase would be 1.3% in terms of total vehicles, which is well within the daily fluctuations in traffic levels experienced and is therefore unlikely to be perceptible away from the site access junction; therefore, the proposals do not represent an additional significant indirect visual impact in this respect. Viewpoints 4 and 5 have been included to represent views along this road corridor.

Lighting

8.69 The operations would require some artificial lighting for health, safety and security requirements. However, lighting of roadways and footpaths would be localised and temporary and designed to ensure that there was no 'glare' or light trespass. In this respect, regard would be given to guidance provided by the Institution of Lighting Engineers (Guidance Notes for the Reduction of Obtrusive Light (GN01), 2005) and the former Good Planning Guide (GPG) 10 "*Lighting in the Countryside*". The proposals are not anticipated to represent an additional significant visual impact in this respect.

LANDSCAPE EFFECTS

8.70 A study area of up to 5km surrounding the application site has been adopted for this assessment, based on interpretation of the Zone of Theoretical Visibility (ZTV) maps and experience of similar projects.

Landscape Baseline

8.71 Baseline conditions for the application site and surrounding study area have been assessed and described below.

Character of the landscape

8.72 **Appendix 8/3** of this chapter presents a summary of the relevant published assessments at national and local authority scales:

- the application site lies within National Character Area NCA 111 – Northern Thames Basin; and
- The Welwyn Hatfield Landscape Character Assessment (Hertfordshire Landscape Strategy) published by Welwyn Hatfield Council and Hertfordshire Council in April 2005 describes the site as located within "Area 31 De Havilland Plain".

8.73 A review of the landscape attributes at the application site and surrounding area are reported in detail in **Appendix 8/3**.

8.74 The analysis of existing landscape attributes has concluded that the study area is generally consistent with the published key characteristics for "Area 31 De Havilland Plain" as described in The Welwyn Hatfield Landscape Character Assessment (*op cit*).

8.75 At a local level, the application site can be classified as "medium to large-scale greenspace plain/former aerodrome".

Trends and change

8.76 The study area has been subject to various past land use influences, such as the original establishment of Hatfield Aerodrome and its subsequent abandonment.

8.77 In the absence of this development it is assumed that the application site would continue in its current state, being used as informal recreational greenspace and promoted to local residents. However the promotional literature specifically references potential mineral extraction and the site is allocated in the MLP for such uses.

8.78 The application site forms part of Ellenbrook Fields which has been "*opened up to the public for your enjoyment*" by the landowners; it is consequently well used by local walkers and cyclists for informal recreation. The interpretation boards around the site describe how *"In the future the land is expected to contribute to the further development of Hertfordshire, through the extraction of some of the land's valuable mineral resources. This will be in response to the County Mineral Local Plan which has identified the site for the extraction of much needed sand and gravel. The current management of the land will continue and is intended to provide a public benefit throughout the process."*

8.79 To the north west of the proposed development the existing Hatfield Quarry has been largely worked out and undergoing restoration and analysis of relatively recent aerial photography has identified that much of the mineral extraction areas have been replaced by restored areas over the past 10 years. However, the plant site at Hatfield Quarry and conveyor link to the north would be retained, if proposals to develop a distant satellite extraction area are permitted. Both these features are screened by mature vegetation and generally adsorbed into the current landscape. They tend to be more apparent for limited areas in proximity such as where PRoW cross the line of the conveyor.

8.80 To the north east a major housing development is proposed which retains a Green Link of open space between its 'Lower Village' and the eastern boundary of the proposed development. As previously mentioned, this western edge of the proposed development includes various mounds and open ground for recharge lagoons as shown on the Drawings in Chapter 3 above. These lagoons will be restored to permanent water bodies retaining the current open space and unbuilt nature of the area. In combination this would provide a minimum buffer of 335m between the proposed housing and the nearest extraction phase. Although this buffer would include mounds and lagoons these features would be relatively undisturbed component of the mineral development, in comparison with the activities of the phased extraction works and/or processing plant. The nearest two phases of the mineral extraction would also be the first to be restored to the final landscape illustrated on Drawing HQ 3/15. Drawings HQ 3/6 and HQ 3/7 show the advance landscaping work which includes hedgerow planting along the proposed mineral boundary, which would screen the artificial forms of the mounds and lagoons from view. The relatively undisturbed nature of this area would be likely to attract wildlife and be relatively tranquil in nature, particularly after the first few phases of extraction which are adjacent to it.

8.81 NCA 111 – Northern Thames Basin describes *inter alia* the following key drivers of change:

- *"The increased pressure for infrastructure development around London is going to continue to grow and create difficulties in preserving the London green belt. Care must be taken so that important habitats, geological, archaeological features and recreational greenspace is not destroyed in the process and the character of the area adversely affected;* and
- *There are many existing mineral sites in the area and the demand for building material is large so this creates industrial opportunities. However, priority habitats need to be preserved to maintain the geodiverse and biodiverse nature of the area. There are also opportunities to return abandoned mineral sites back to the habitats that were previously found there and expand the biodiversity of the area…"*

8.81 The proposed development retains vegetation within the extraction area as long as feasible, establishes good boundary landscape treatment at an early stage and includes a phased restoration approach. These features all help to address the changes identified in the Northern Thames Basin NCA.

Landscape Value

8.82 Table 8-3 provides summary analysis of the criteria and factors that influence landscape value (taken from GLVIA3, Box 5.1 *op cit*), as they apply to application site and the wider study area. The approach to value in LVIA has been recently updated with the release of TGN 02-21 (26th May 2021), this does not invalidate the approach taken in the previous LVIA which remains valid and was updated prior to the release of the recent technical note. The key issue is in the assessment of the site condition in the De Havilland Plain LCA which identifies a poor condition to the landscape with "*much of the area there is a sense of semi-dereliction or poor management. There has been extensive land-use change and little of the original pattern remains*."

8.83 Overall the landscape value of the application site and immediate surrounding mixed land cover (of grassland, woodland, farmland, mineral workings and built development) is considered to be of local value. Although within the Green Belt, the former aerodrome site is also allocated in the Minerals Local Plan as one of three Preferred Areas for future mineral extraction. The existing landscape and scenic quality at the application site derives from its open urban fringe character (rather than mature landscape elements) and how this provides a contrast to the more built up nature of Hatfield and the wider Northern Thames Basin on the edge of London. The site is well used as a local recreational greenspace and is also located within the Watling Chase Community Forest, which *inter alia* aims to assist in the protection and enhancement of countryside and greenspace around urban areas.

Table 8-3
Analysis of Factors Influencing Landscape Value (from GLVIA3)

Landscape Element	Description
Landscape Quality	The study area has a variable landscape quality. The former aerodrome is in a relatively poor condition (with grassland, regenerating scrub, concrete trackways, footpaths and bunds and a general absence of mature trees, ditches or other natural features, other than remnant hedgerows, becoming more intact around the edges and the River Nast which passes through the site, but culverted in places). The landscape quality in "Area 31 De Havilland Plain", is in a similar condition, with a diverse mix of uses, such as sand and gravel extraction (active and restored) amongst farmland,

Landscape Element	Description
	crossed by a modest number of sinuous secondary roads and dispersed settlement pattern (between built areas of Hatfield and St Albans), few hedgerows, trees and woodland (although Home Covert is one of several areas of woodland to the north of the application site)
Scenic Quality	"Area 31 De Havilland Plain" as a whole is described as being "..*as empty as it is flat*", often resulting in long open views. Such views are generally more scenic where there is an absence of built or industrial development/detractors or where mature trees feature in views; the disused Hatfield aerodrome and new business park are described as having visually dominant structures. The new housing on the edge of Smallford and Ellenbrook were visible to varying degrees from footpaths in the area and result in urban fringe character.
Rarity	The former aerodrome is unusual, with unique history, restoration and management under the auspices of Ellenbrook Fields. However the landscape (and associated views and vistas) is not especially valued for their rarity. "Area 31 De Havilland Plain" character area itself, whilst distinctive, is also not described as a rare landscape character type.
Representativeness	The former aerodrome is considered to be a representative feature, in so far as it is mentioned in the published character assessment; its flatness and original suitability for an airfield is also representative of the "*extensive level plain*".
Conservation Interests	There are no ecological or cultural heritage designations within the application site, although there are listed buildings to the south at Popefield Farm and southwest corner of the site near Three Horseshoes Public House. There are seven more listed buildings are located along Wilkins Green Lane. There are several protected species that have been surveyed within the site and the Ellenbrook Fields (of which the application site forms part) is being actively managed by the landowner to enhance conservation interest.
Recreational Value	The application site is used as an informal public open space, (with both a public right of way and permissive footpaths) and partly for grazing. This is promoted on the landowners website and leaflets/interpretation boards as "Ellenbrook Fields". Parking is available alongside Ellenbrook Fields at Notcutts Garden Centre to the south-west of the application site on Hatfield Road.
Perceptual Aspects	A degree of tranquillity is present within the site, albeit with urban fringe character; overall provides a contrast to the more built up nature of A1057, Hatfield and northern Thames basin on the edge of London.
Associations	No evidence of artistic or literary associations with the landscape of the application site or study area has been noted as part of this assessment, other than aviation history of the former aerodrome and more recent use by film companies.

Prediction of Landscape Effects

8.84 As described in paragraph 5.34 of GLVIA3, landscape receptors that may be affected by the scheme include overall character and key characteristics, individual elements or features and specific aesthetic or perceptual aspects.

8.85 The effects resulting from the proposed development relate potentially to the following:

- physical disturbance of landscape elements and features and reinstatement of landcover;
- alteration to aesthetic and perceptual aspects such as scale, simplicity, openness and sense of tranquillity and wildness; and
- alteration to overall landscape character and key characteristics.

Assessment of Significance of Residual Landscape Effects

8.86 The assessment of significance of residual landscape effects is carried out for each landscape effect thought likely to occur and for the relevant landscape receptor that may be altered by the scheme (such as individual elements or features, specific aesthetic and perceptual aspects and overall character and key characteristics).

Criteria

8.87 The criteria for assessing the significance of residual landscape effects (i.e. after the built-in mitigation) are described in GLVIA3 and set out in Appendix 8/1 to this chapter. They are based on the combination of sensitivity (susceptibility of the receptor to the change proposed and the value attached to the receptor) and magnitude of change (size and scale, geographical extent, duration and reversibility).

8.88 As described in paragraph 5.56 of GLVIA3, at opposite ends of the spectrum, the following may apply to landscape effects:

- *Major loss or irreversible negative effects, over an extensive area, on elements and/or aesthetic and perceptual aspects that are key to the character of nationally valued landscapes are likely to be of the greatest significance;*
- *Reversible negative effects of short duration, over a restricted area, on elements and/or aesthetic and perceptual aspects that contribute to but are not key characteristics of the character of landscapes of community value are likely to be of the least significance and may, depending on the circumstances, be judged as not significant.*

Physical Disturbance of Individual Elements and Features

8.89 Physical disturbance of individual elements and features occurs at the site level only (within the application site itself).

8.90 The application site covers an area of around 87.1ha and comprises the western part of the former aerodrome and area known as Ellenbrook Fields.

8.91 The sensitivity of the application site to the type of change proposed is low, this is due to the following:

- low susceptibility of the large scale, flat/gently sloping and generally simple landform, which has been subject to previous disturbance, generally lacking in mature trees, ditches, or other natural features and which overall are able to accommodate disturbance from the proposed development. Mineral excavation of the application site is supported by local planning policy; and
- local value of the site, as there are no landscape designations in place and the physical state is currently relatively poor condition and reduced scenic quality (with visibility of man-made features), with limited conservation interest. Recreational activity is largely based on informal permissive access. Tranquillity is present within the application site and its open urban fringe character provides a contrast to the more built up areas. No particularly rare elements or features present and is not a rare landscape type.

8.92 The magnitude of change upon individual elements and features during operational phases would vary over the project lifecycle from low during initial site establishment, rising to medium during the middle phases (maximum extent of disturbance), then becoming low towards the later phases, due to the following:

- progressive clearance of vegetation and soils in advance of operations, starting with initial site clearance around perimeters, northern and eastern areas, then gradually working westwards;
- diversion of 0.6km of public right of way and other permissive footpaths and access within the application site around the perimeters;
- advance planting of approximately 2km of native trees and shrubs around the perimeter and a small c1ha block adjacent to the plant site at the outset and then retained on a permanent basis;
- retention of two great crested newt ponds around the boundary / corridor, with new ponds created;
- new internal access roads, including over 0.8km from A1057 site entrance to the plant site area, installed at outset and retained on a permanent basis;
- formation of soil/overburden storage mounds, typically 3 to 5m above existing ground levels, mainly around the site perimeters with steep gradients as dictated by operational and geotechnical constraints and other shorter-term locations as necessary;
- formation of the around 11ha plant site area at the outset, including new structures (processing plant with up to 13m highest point) and temporary formation of mineral stockpiles up to 10m above existing ground levels and steep sides;
- formation of voids on a progressive basis, typically by between 12 and 17m below existing ground levels, to the base of proposed mineral deposit, with a restriction to working the lower mineral horizon, and across the c53ha mineral extraction area and all with steep gradients as dictated by operational and geotechnical constraints;
- subsequent engineering, backfilling and restoration of majority of voids on a progressive basis, using imported inert materials and site derived materials; and
- the operational phases at the site (as a whole) are long term overall, but medium term individually.

8.93 The magnitude of change to the individual elements and features after final restoration would be low, due to the following:

- final restored landform would be flat to gently sloping and very similar to that currently existing, with the exception of 2.5ha waterbody in the north-eastern end for wildlife and amenity interest;
- c1km hedgerows would be planted as part of the reinstated historic field pattern, in conjunction with the advance planting undertaken at the outset of the development;
- inclusion of 6ha new shallow wetlands across the site linked to the field pattern of open ditches and swales and wildlife ponds;
- 72.4ha of restored conservation grassland based on a variety of plant communities established using variable substrates and micro topography, with approximately 20ha in the north of the site as a tranquil area, with ridge and furrow and limited access for conservation benefits;

- approximately 3ha of scattered scrub would be established in the south-eastern corner of the site;
- reinstatement of 0.6km of public right of way along its original route and permissive access paths along similar routes to existing;
- retention of the 1ha access road and a small car parking area / site offices for recreational purposes; and
- the final restoration scheme would result in permanent enhancements to the landscape.

8.94 The potential effect relating to the physical differences between the landscape elements and features at the application site is therefore considered to be slight, rising to moderate and adverse during working becoming slight and beneficial after restoration. Overall these are not considered significant effects.

Alterations to Aesthetic and Perceptual Aspects

8.95 Changes to aesthetic and perceptual aspects occur principally within the application site and its immediate landscape setting, with effects on the wider landscape setting being influenced by the size and scale of the new elements and their limited visibility.

8.96 The sensitivity of the application site and its immediate setting to the type of change proposed is considered to be low due to the following:

- low susceptibility of the "incoherent pattern" (combination of the partly removed former aerodrome, flat and straight trackways and paths, remnant hedgerows and naturally regenerating scrub amongst the overall green grassland), which is quite simple, with a degree of tranquillity, but albeit urban fringe character (due to the existing presence of the Hatfield Quarry to the north and A1507 road to the south, close to visible signs of human activity and development associated with Smallford, Ellenbrook and Hatfield), which overall are considered to be able to accommodate disturbance from the proposed development; and
- local value of the site, as previously described above, in relation to landscape elements and features.

8.97 The magnitude of change to the aesthetic and perceptual aspects during operational phases would be moderate, due to the following:

- overall scale would remain medium to large;
- the pattern would become more organised in places (new roads, linear bunds, heaps of processed materials and stocks), but remain incoherent in other areas (wherever the void and disturbance cuts through existing roads and tracks and hedges as the development progresses);
- the progressive alterations to form would be more apparent (deepening of voids and raising of mounds), but line would be less so, as the temporary straight edges of the phasing boundaries, engineered slopes and mounds would move around the site as it is worked;
- the alterations to colours would be apparent from the green grass, hedgerow and scrub cover, changing to brown, sandy yellow and grey exposed minerals (soil, sand and gravel and clay), as well as imported inert waste materials;

- the diversity and movement within the application site would increase associated with the combination of active workings (extraction and infill), plant and machinery, stocking areas, affecting tranquillity, although this would be localised/concentrated at certain locations (plant site and active phases);
- the ZTVs included in Drawings HQ 8/2 – 4 indicate that the main element influencing the surrounding landscape would be the proposed processing plant, with the working phases limited to areas all limited to areas very close to the development boundary. In reality, the processing plant would be screened by woodland, hedgerows and adjacent vegetation, and seen within the context of the existing CEMEX plant at Hatfield Quarry and other built and urban components of the surrounding landscape; and
- the operations at the site are long term, but the final restoration scheme would reinstate the landscape on a permanent basis.

8.98 The magnitude of change to the aesthetic and perceptual aspects after final restoration would be low, due to the following:

- overall scale would remain medium to large;
- the use of imported inert fill to reinstate the flat to gently sloping form would be complimented by the regular and straight field pattern (hedgerows and ditches), resulting in a more organised pattern;
- the green grass and hedgerows would be returned, with a reflective waterbody in the north-east corner and smaller field ponds and wetlands elsewhere;
- the diversity within the application site would increase associated with the combination of micro-topographical and substrate variation and resulting plant communities that would be encouraged, but movement would return to existing recreational activity and maintenance operations; and
- the final restoration scheme would result in permanent enhancements to the landscape.

8.99 The potential effects relating to the aesthetic and perceptual aspects are therefore considered to be moderate and adverse during working becoming slight and beneficial after restoration. Overall these are not significant effects.

Alterations to Overall Character and Key Characteristics

8.100 The alterations to overall landscape character and key characteristics result from a combination of changes to physical elements and features and the changes to the aesthetic and perceptual aspects of views/inter-visibility. Such effects occur both within the application site and its immediate landscape setting (and these are considered together).

8.101 The susceptibility to change resulting from the proposed development for the "Area 31 De Havilland Plain" as a whole, is considered to be negligible to low due to the following characteristics:

- scale, where large scale indicates lower sensitivity, and landform, where absence of strong topographical variety, featureless, convex or flat indicates a lower sensitivity ("*extensive level plain"*);
- pattern and complexity, where simple, regular or uniform indicates a lower sensitivity ("..*as empty as it is flat*", but with a diverse mix of land-uses);

- settlements, man-made influence and skylines, where presence of existing man-made features indicate lower sensitivity (former aerodrome, as well as the operational Hatfield Quarry to the north and built development forming the edge of the urban fringe); and
- inter-visibility with adjacent sensitive landscapes, where little inter-visibility indicates lower sensitivity (flat site enclosed by perimeter vegetation).

8.102 The overall value of the aforementioned "Area 31 De Havilland Plain", is of a local level, due to the following:

- lack of landscape designations, although it is within a Green Belt and part of Watling Chase Community Forest;
- mix of land-uses, including sand and gravel extraction (active and restored);
- scenic quality varies, but influenced by Hatfield Aerodrome and business park; and
- features of local recreational value, such as the public rights of way and permissive access to Ellenbrook Fields.

8.103 The overall sensitivity of the aforementioned "Area 31 De Havilland Plain" to the proposed development is considered to be low.

8.104 The magnitude of change relating to the alteration of overall landscape character within the aforementioned "Area 31 De Havilland Plain", as a whole is considered to be low due to the following:

- the published character area is relatively large in area in comparison to the application site, covering over 1,224ha in a 2km (and greater) wide band extending for over 2km north-east and south-west of the application site. Consequently, the size or scale of change to the area as a whole (both in terms of physical disturbance and changes to views) would be limited (with the overall application site area being around 81ha, or around 7% of the character area);
- the "Area 31 De Havilland Plain" would continue as an extensive plain with a diverse mix of land-uses including quarrying activities and mineral extraction plant; and
- the duration of the development would be long-term but the final restoration permanent.

8.105 Thus, the overall landscape effects upon the application site and the "Area 31 De Havilland Plain" as a whole are considered to be slight and not significant. The effects are adverse in nature during working becoming beneficial after final restoration; there would be no new key characteristics introduced, but the addition of a new area of active quarrying and infilling, with processing plant is nevertheless a detracting element.

8.106 At a local level, the application site would be classified as "medium to large-scale greenspace with mineral workings" and after restoration would be returned to "medium to large-scale greenspace plain/former aerodrome".

Cumulative landscape effects

8.107 This part of the assessment focuses on the cumulative landscape effects of the proposed development in conjunction with the operational Hatfield Quarry to the north and proposed major Hatfield Garden Village housing development to the north east; all three of these sites lie within "Area 31 De Havilland Plain".

8.108 Application reference 5/1240-14 describes how "*Hatfield Quarry (the Quarry) has been an active sand and gravel and waste site since the 1940/50's based on planning records held by the mineral planning authority, the Quarry having been used as a disposal point for household waste at various times and locations…The current sand and gravel workings take place approximately one to two kilometres north west of Cut Field with aggregates processing, storage and distribution taking place approximately one kilometre to the south west*".

8.109 An application has been submitted (October 2018) for the working a new extension to Hatfield Quarry. The application area is 117ha of predominately agricultural land adjoining Coopers Green Lane, on the periphery of the Hatfield Garden Village development on the north west of Hatfield Town Centre. The site would be linked to the existing CEMEX Hatfield Quarry by a conveyor link approximately 4km in length, utilising part of the existing conveyor link that passes to the north of the proposed development.

8.110 The proposed housing development (67.5 ha) is an extensive site along the western edge of Hatfield and effectively links the proposed CEMEX extraction area with the proposed development area resulting in major change along a large proportion of the western edge of Hatfield. These three developments together therefore have the potential to greatly affect the perception of the western edge of Hatfield and nature of the town's boundary.

8.111 The cumulative effect on "Area 31 De Havilland Plain" also has the potential to be great. However, the De Havilland Plain is identified as being in poor condition, with a moderate strength of character and a management objective of 'improve and restore'. There is thus a degree of acceptance to change as opposed to trying to conserve, strengthen or reinforce existing character.

8.112 Because of the conveyor link the two proposed mineral extractions would be perceived as separate areas and not together, although each may be perceived in conjunction with the housing development. Mitigation of the potential level of change is present in the form of the extensive amount of open space included with the housing development (53% of the housing development area). This would create a more permeable landscape with green links from the existing urban edge out to the green belt further west. In a similar way the phased working and restoration of the two mineral developments would reduce the level of disturbance present at any one stage. Ultimately both mineral developments would be fully restored and creating an extended area of habitat and recreational benefits to the north and south of the housing development and enhancing the remaining green belt.

8.113 The presence of "*existing and restored mineral workings*" is already one of the key characteristics of "Area 31 De Havilland Plain". Therefore, the addition of the proposed development, to the ongoing operations at Hatfield Quarry would not give rise to changes in landscape character of such an extent as to have major effects on its key characteristics or transform it into a different character type; it is not considered that the development "*tips the balance*" through its additional effects.

Summary Statement of the significant landscape effects

8.114 Overall this assessment has not identified any significant (major or moderate/ major) landscape effects as a result of the proposed development.

VISUAL EFFECTS

8.115 A study area of up to 5km surrounding the application site has been adopted for this assessment, based on the interpretation of the ZTV maps and experience of similar projects.

Visual Baseline

8.116 Baseline conditions for the application site and surrounding study area have been assessed and are described below.

Visual receptors

8.117 Paragraph 6.13 of GLVIA3 defines visual receptors as people living in the area; people who work there; people passing through on road, rail or other forms of transport; people visiting promoted landscapes or attractions; and people engaged in recreation of different types.

8.118 Initially, it is necessary to define the extent of visibility both within and outside the application site and how it relates to potential receptors. Comparative ZTV were calculated for the following aspects of the proposed development using 3D digital terrain model in using LSS software (McCarthy Taylor) in accordance with the method statement in Appendix 8/4:

- Plant Site (based indicative worst case 15m high pinnacle and with perimeter bunds formed during site establishment as screening features) – Drawing HQ 8/3;
- Phase A extraction area (with perimeter bunds formed during site establishment as screening features) – Drawing HQ 8/3; and
- Maximum extraction void (with perimeter bunds formed during site establishment as screening features) – Drawing HQ 8/4.

8.119 The ZTV assessment is limited to subtended vertical angles above 0.25˚. Areas with less than this theoretical angle were considered unlikely to generate significant effects.

8.120 Furthermore, the ZTV's are based on a bare terrain; that is, the computer model does not include any vegetation, structures or other buildings. As a result, the extent of visibility, which is illustrated on the drawings, is very much a worst case scenario and would be greatly reduced if other potentially screening features were included in the model, for example Home Covert or the peripheral hedgerows.

8.121 The general theoretical visibility of the plant is limited to the following areas:

- the area of visible vertical angle above 3 degrees extends for around 0.3km and covers part of the Ellenbrook Fields and the existing public right of way, which would be diverted to the north-western corner of the field, into a corridor screened by the proposed bund;
- the area of visible vertical angle between 1 and 3 degrees extends for a further 0.5km over more of the public right of way and Ellenbrook Fields, Ninefields Nursery and edge of Smallford;
- the areas of visible vertical angle of between 0.25 and 1 degree extend approximately 2km further in all directions including Coopers Green Lane to the north and Hatfield Road to the south and parts of Smallford, Ellenbrook and Wilkin's Green and several isolated properties

(such as Popefield Farm and Beech Farm), as well as additional parts of Ellenbrook Fields and the A1(M) and edges of Hatfield, Colney Heath and St Albans; and

- there is some visibility predicted over part of Hatfield to the east, Oaklands College or St Albans to the west or Sandridge to the north a small part of Ellenbrook Fields to the east. Although in reality buildings present within the urban areas are likely to provide screening and visibility is predicted to be restricted to the outer edges of those urban areas. Intervening vegetation would also provide screening.

8.122 The general theoretical visibility of the Phase A extraction area is much less due to it being the extraction of mineral down below ground level:

- the area of visible vertical angle above 3 degrees covers the working area only / Ellenbrook Fields;
- the area of visible vertical angle between 1 and 3 degrees extends further west slightly, by around 0.1km and affecting the former aerodrome site/ Ellenbrook Fields only;
- the areas of visible vertical angle of between 0.25 and 1 degree extends further west slightly again, by approximately 0.3km and affecting the former aerodrome site/Ellenbrook Fields only and a very small section of the public right of way, which would be diverted; and
- there is no visibility predicted over Coopers Green Lane to the north or Hatfield Road to the south, Smallford, Ellenbrook or any of the nearby properties due to the containment offered by the perimeter screening bunds. Much of the Ellenbrook Fields to the north, east and west would have no visibility.

8.123 The general theoretical visibility of the maximum extraction void is also limited and very much a worst case scenario, as the initial working phases are anticipated to be restored as the later phases are brought into operation meaning that the whole void would not be opened at any single point in time:

- the area of visible vertical angle above 3 degrees covers the former aerodrome site/ Ellenbrook Fields only;
- the area of visible vertical angle between 1 and 3 degrees extends further west slightly, by around 0.1km and affecting the former aerodrome site/ Ellenbrook Fields, with a small part of the Ninefield Nursery to the west, as well as small part of Hatfield Road to the south, associated with the new access point (where there is no bunding);
- the areas of visible vertical angle of between 0.25 and 1 degree extends further west, north and east slightly again, by approximately 0.3km and affecting former aerodrome site/ Ellenbrook Fields and public right of way, which would be diverted, as well as the bridleway that runs parallel to Oaklands Lane and a number of residential properties, the right of way adjacent to the east of Smallford and part of Hatfield to the south-east; and
- there is no visibility predicted over Coopers Green Lane to the north or Ellenbrook due to the containment offered by the perimeter screening bunds. Much of the Ellenbrook Fields to the north and east would have no visibility.

8.124 Following the initial desk based modelling of theoretical visibility, fieldwork was carried out to review the degree of additional screening provided by vegetation and/or built up areas and buildings. The level of screening is reflected in the viewpoint photography shown in **Drawings HQ 8/5 to 8/12.**

8.125 Screening from trees and hedgerows is relatively high, in particular along roadsides and within settlements, with occasional glimpses where hedgerows have been clipped short or removed, or from gateways and road junctions. The former aerodrome site has some enclosure from naturally regenerating scrub as well as remnant hedgerows, although medium to long views over the flat, open space is characteristic.

8.126 As a result of the fieldwork, much of the more distant areas of theoretical visibility identified for the highest part of the plant site (shown on **Drawing HQ 8/2**), have been discounted such as the A1(M) and edges of Hatfield, Colney Heath and St Albans.

8.127 Potential visual receptors in the area covered by the ZTVs and assessed in more detail include the following:

- inhabitants of settlements and residential properties, such as Ellenbrook to the east, Popefield Farm to the south, Smallford and properties along Oaklands Lane to the south-west and west and Beech Farm to the north;
- users of public highways such as A1057 Hatfield Road to the south and Coopers Green Lane to the north or southern part of Oaklands Lane to the south-west;
- users of rights of way or other informal recreational access to Ellenbrook Fields or elsewhere in the local area; and
- users of National Cycle Route 61 and St Albans Way / Watling Chase Trail.

Viewpoints - representative, specific, illustrative

8.128 As stated in paragraph 6.19 of GLVIA3 (*op cit*), viewpoints selected for inclusion in the assessment and for illustration of the visual effects fall broadly into three groups: representative; specific; and illustrative.

8.129 In accordance with paragraph 6.20 of GLVIA3, the selection of the final viewpoints used for the assessment has taken account of the following range of factors:

- accessibility to the public;
- the potential number and sensitivity of viewers who may be affected;
- the viewing direction, distance (i.e. short, medium, and long-distance views) and elevation;
- the nature of the viewing experience (for example static views, views from settlements and views from sequential points along routes);
- the view type (for example panoramas, vistas and glimpses); and
- the potential for cumulative views of the proposed development in conjunction with other developments.

8.130 Photography and fieldwork analysis of the views of the application site were then carried out from the surrounding landscape. The object was to determine which locations offer the clearest views of the application site and/or are most accessible to the public and to identify representative viewpoints for detailed viewpoint analysis. The existing views from each of these points are briefly described with the aid of photographs.

8.131 The locations of the selected viewpoints are shown on **Drawings HQ 8/2 to 8/4** and existing photography drawing sheets are listed in Table 8-4 below.

8.132 Photographs illustrating views from a selected series of viewpoints were taken using a Nikon D70 digital camera. The camera was set to a focal length which is the equivalent of a 50mm lens for a 35mm format camera. The nature of the views was of relatively wide panoramas and it was therefore considered beneficial to present the photographs in this way. The panoramic views consist of three or four photographic frames and were digitally merged together using industry standard software and followed Landscape Institute Advice Note 01/11. Each photographic sheet includes the viewpoint location co-ordinates.

8.133 In addition to the existing photography drawing sheets, the detailed descriptions of the existing views are included in the individual viewpoint analysis in **Appendix 8/5** to this chapter.

Table 8-4
List of Viewpoints

VP	Location/Description	Drawing
1	View south from public right of way to the north near conveyor crossing point. This viewpoint represents the recreational users of this route.	HQ 8/5
2	View south public right of way as it joins the application site to the north. This viewpoint represents recreational users of this route and visitors to Ellenbrook Fields.	HQ 8/6
3	View west from edge of Ellenbrook. This viewpoint represents the views of recreational visitors to the Ellenbrook Fields greenspace and local residents.	HQ 8/7
4	View from Hatfield Road at entrance to Popefield Farm. This viewpoint represents the views of users of the local road network and local residents.	HQ 8/8
5	View from Hatfield Road at junction with public right of way, near proposed site entrance. This viewpoint represents the views of users of the local road network and local residents, as well as users of the right of way and visitors to Ellenbrook Fields and/or parking at Notcutts Garden Centre.	HQ 8/9
6	View from public right of way to the west edge of the application site. This viewpoint represents the recreational users of this route and part of Ellenbrook Fields.	HQ 8/10
7	View from residential properties, near to Oaklands Lane and public right of way. This viewpoint represents local residents and users of the nearby public right of way.	HQ 8/11
8	View south from public right of way to the west, parallel to Oaklands Lane. This viewpoint represents the recreational users of this route.	HQ 8/12

Sequential views

8.134 The viewpoints selected above include the following key routes and transport corridors to enable sequential views to be considered:

- two locations along the A1057 Hatfield Road;

- four locations along the right of way which passes through the application site and Ellenbrook Fields greenspace; and
- two locations on the public right of way which runs parallel to the western boundary of the application site.

Prediction of Visual Effects

8.135 As described in paragraph 6.26 of GLVIA3, changes in views and visual amenity may arise from built or engineered forms and/or soft landscape elements of the development.

Changes in views from viewpoints

8.136 For all viewpoints the potential changes have been reviewed by using 3D models to analyse spatial data (distances, elevations and slopes) and generate perspective views, although these have not been included in this chapter.

8.137 **Appendix 8/5** provides a detailed analysis of potential change for each individual representative viewpoint, which identified that:

- the clearance of existing vegetation and landcover, the formation, working and subsequent backfilling of the mineral extraction void would have very limited visibility due to the existing and proposed perimeter screening measures, but also the generally flat topography which restricts any potential views down into or over the application site;
- the diversion of the rights of way and areas of permissive access around the site perimeters would move visitors to this part of Ellenbrook Fields along landscaped corridors that are of similar character to existing routes and/or across the new internal access roads and over undisturbed areas. These routes would then be reinstated as part of final restoration;
- the mineral processing plant would have some visibility from limited locations at gaps in hedgerows, etc to the north and west of the application site, but this is generally backgrounded and/or seen as part of a mainly wooded horizon, with other development such as Ellenbrook, Hatfield or Smallford; and
- the formation of the site entrance and movement of vehicles to and from the site would be visible from a small part of the existing busy Hatfield Road (A1057).

Settlements and Residential Properties

8.138 The ZTVs indicated some theoretical visibility around residential areas, such as Ellenbrook to the east, Popefield Farm and Wilkin's Green to the south, Smallford and properties along Oaklands Lane to the south-west and west and Beech Farm to the north. However, the actual visibility of the application site is limited by the topography and intervening or adjacent buildings and vegetation. Views are more open towards the edges of the settlements and/or from slightly elevated positions, rather than within the centre of settlements or from lower lying positions; although the generally flat plain limits this:

- Viewpoint 3 was positioned on the edge of Ellenbrook, where although views opened out over the broad extensive plain, these where shortened in the direction of the application site by intervening vegetation;
- representative Viewpoint 5 was positioned on the edge of Smallford, where the existing tree belt along the Hatfield Road screened all potential views into the application site; and

- Viewpoint 7 was positioned at the northern edge of Smallford, where a recent housing development, served by a private road, screened all views towards the application site from the public highway/right of way.

8.139 For smaller groups or isolated properties, which will have a higher potential for views out to the application site, the presence of vegetation around the dwellings will still influence the degree of change to views, as well as the elevations relative to and distances from the property to the application site. The orientation of the dwellings themselves will also affect the degree of visibility for residential receptors, for example whether the views would be direct or indirect (or oblique). It is considered that direct views are where the difference between the direction of view from the main front or rear façade of each building and the direction to the proposed development is less than 45°. Correspondingly indirect views are where there is difference of over 45° between the two bearings:

- representative Viewpoint 4 was positioned adjacent to Popefield Farm where the existing tree belt along the Hatfield Road and around the farm boundary screened all potential views into the application site; and
- Viewpoint 1 was positioned approximately 200m south of Beech Farm, to reflect more open views as opposed to the significantly enclosed and screening views of the application site at the property.

8.140 Nevertheless, there is a small degree of change to the baseline condition predicted for residential properties on the edge of Smallford, especially upstairs windows, wherever facing towards the application site; change would be discernible but underlying landscape character or view composition would be similar to the baseline.

Roads

8.141 The visibility from road and recreational routes will inevitably be influenced by the direction of travel and position of the proposed development relative to the viewer (for example whether along or in line with the route/road corridor and in the field of view of the traveller, or perpendicular to the route and difficult to see without the traveller turning away from the direction of travel). Furthermore, the presence of other existing focal points within the route corridor as well as adjacent buildings and roadside vegetation and other boundary features will influence impacts on composition or character.

8.142 For most of the road users the application site is offset and perpendicular to the main direction of travel:

- Coopers Green Lane is orientated north-east to south-west and offset by approximately 0.8km. However intervening vegetation such as Balls Covert and south of Beech Farm or along the Hatfield Quarry conveyor line, screen views of the application site; and
- Oaklands Lane is orientated north to south and offset by approximately 0.5km. However the built up edge of Smallford obscures all views eastwards towards the application site.

8.143 As noted above, representative Viewpoints 4 and 5 were positioned along the Hatfield Road where the existing tree belt screened all potential views into the application site, other than the short section adjacent to the proposed site access.

Recreational Routes and Public Rights of Way

8.144 There are several public rights of way in the local area, including:

- a connection between the northern edge of Smallford and Oak Farm to the north, via the existing Hatfield Quarry plant site area. This is offset to the application site by 0.3km, where views would be perpendicular to the direction of travel; and
- a connection from Beech Farm southwards into the application site and connecting to Smallford/Hatfield Road. Viewpoint 1 illustrates the northern limit of visibility and Viewpoint 5 illustrates the southern limit of visibility, in total around 1.5km, with 0.6km to be diverted. Much of this route would experience changes although the mitigation proposed aims to provide a landscaped corridor for visitors to this route with additional tree planting.

8.145 The ZTVs for the plant covered approximately two-thirds of the Ellenbrook Fields, whilst the maximum extraction void was nearer half. Visitors to the Ellenbrook Fields would experience diversions to the existing permissive routes in the western part, along landscaped corridors around the site perimeter. However, as illustrated by Viewpoint 3, typically visitors to the northern and eastern parts of Ellenbrook Fields would not experience any change due to intervening vegetation and the generally flat topography.

8.146 The ZTV for the plant covered less than 0.2km of the National Cycle Route 61 and St Albans Way / Watling Chase Trail, which overall is very limited. Nevertheless, users of this route would be offset from the application site by around 0.5km at their nearest point and where it would be perpendicular to the direction of travel, with intervening vegetation (along Hatfield Road) and buildings (around Smallford) and the generally flat landform also removing any potential visibility.

Assessment of Significance of Residual Visual Effects

Criteria

8.147 The criteria for assessing the significance of residual visual effects (i.e. after the built-in mitigation) is described above and in GLVIA3 and based on the combination of the nature of the receptor likely to the affected (sensitivity) and the nature of effect likely to occur (magnitude).

8.148 As described in paragraph 6.44 of GLVIA3, at opposite ends of the spectrum, the following may apply to visual effects:

- *Effects on people who are particularly sensitive to changes in views and visual amenity are more likely to be significant;*
- *Effects on people at recognised and important viewpoints or from recognised scenic routes are more likely to be significant;*
- *Large-scale changes which introduce new, non-characteristic or discordant or intrusive elements into the view are more likely to be significant than small changes or changes involving features already present in the view.*

Summary assessment

8.149 Overall there are no significant visual effects predicted on any of the individual representative viewpoints (i.e. major or major/moderate). Although there are several sensitive receptors in the study area (mainly residential and recreational), most would experience a small degree of change to the baseline condition; change is discernible but underlying landscape character or view composition would be similar to the baseline. The landscape strategy / mitigation proposals would be effective.

8.150 Using the detailed descriptions provided in Appendix 8/5, Tables 8-5 and 8-6 summarise the residual visual effects resulting for each of the receptors at the representative viewpoints and concludes as follows:

- inhabitants of settlements, such as Ellenbrook to the east and Smallford to the south-west, as well as the scattered farmsteads and dwellings elsewhere would have no more than moderate effect (e.g. Viewpoint 5) and mainly with no change (e.g. Viewpoints 3 and 7);
- users of public highways such as Hatfield Road would have no more than slight/moderate effect (e.g. Viewpoints 4 and 5);
- users of rights of way or other informal recreational access in the local area would have no more than moderate effect (e.g. Viewpoints 1, 7 and 8); and
- recreational visitors to the Ellenbrook Fields would vary between moderate effects (e.g., Viewpoints 2, 5 and 6) and no change (e.g. Viewpoint 3).

Table 8-5
Summary of Effect for each Viewpoint during Working Phases

VP	Location/Description	Sensitivity	Magnitude	Significance
1	View south from public right of way to the north near conveyor crossing point.	Medium to high (recreational visitors in an urban fringe context, adjacent to quarry conveyor)	Low and adverse during initial stages, becoming low and neutral as the perimeter planting matures	Moderate
2	View south public right of way as it joins the application site to the north.	Medium to high (recreational visitors in an urban fringe context)	Low and adverse during initial stages, becoming low and neutral as the perimeter planting matures	Moderate
3	View west from edge of Ellenbrook.	Medium to high (recreational visitors in an urban fringe context and local residents, where interpretation boards refer to past and future mineral extraction),	No change	None

VP	Location/Description	Sensitivity	Magnitude	Significance
4	View from Hatfield Road at entrance to Popefield Farm.	Low (road users) and medium (local residents along an existing busy road)	Negligible and adverse	Slight/ moderate
5	View from Hatfield Road at junction with public right of way, near proposed site entrance.	Low (road users) and medium (recreational visitors in an urban fringe context and local residents along an existing busy road)	Low and adverse during initial stages, becoming low and neutral as the landscaping matures	Slight/ Moderate
6	View from public right of way to the west edge of the application site.	Medium to high (recreational visitors in a largely urban fringe context)	Low to medium and adverse, during initial stages becoming low and neutral as the planting matures	Moderate
7	View from residential properties, near to Oaklands Lane and public right of way.	Medium to high (local residents and recreational visitors, in built up context)	No change	None
8	View south from public right of way to the west, parallel to Oaklands Lane.	Medium to high (recreational visitors in an urban fringe context and adjacent to an existing quarry)	Low and adverse during initial stages of the development, becoming low and neutral as the landscaping matures	Moderate

Table 8-6
Summary of Effect for each Viewpoint after Final Restoration

VP	Location/Description	Sensitivity	Magnitude	Significance
1	View south from public right of way to the north near conveyor crossing point.	Medium to high (recreational visitors in an urban fringe context, adjacent to quarry conveyor)	Low and neutral	Moderate
2	View south public right of way as it joins the application site to the north.	Medium to high (recreational visitors in an urban fringe context)	Low and neutral	Moderate
3	View west from edge of Ellenbrook.	Medium to high (recreational visitors in an urban fringe context and local residents, where interpretation boards refer to past and future mineral extraction),	No change	None

VP	Location/Description	Sensitivity	Magnitude	Significance
4	View from Hatfield Road at entrance to Popefield Farm.	Low (road users) and medium (local residents along an existing busy road)	No change	None
5	View from Hatfield Road at junction with public right of way, near proposed site entrance.	Low (road users) and medium (recreational visitors in an urban fringe context and local residents along an existing busy road)	Low and neutral	Slight/ Moderate
6	View from public right of way to the west edge of the application site.	Medium to high (recreational visitors in a largely urban fringe context)	Low and neutral	Moderate
7	View from residential properties, near to Oaklands Lane and public right of way.	Medium to high (local residents and recreational visitors, in built up context)	No change	None
8	View south from public right of way to the west, parallel to Oaklands Lane.	Medium to high (recreational visitors in an urban fringe context and adjacent to an existing quarry)	Low and neutral	Moderate

Cumulative Visual Effects

8.151 This part of the assessment focuses on the potential cumulative visual effects of the proposed development with the proposed development at Hatfield Quarry and the major housing development, Hatfield OPA (aka Hatfield Garden Village).

8.152 No occurrence of simultaneous visibility of the two mineral excavations is predicted due to their physical separation and intervening presence of the town of Hatfield. However, the retained plant site and conveyor link at Hatfield Quarry would lead to some limited simultaneous visibility with the proposed development at the following locations:

- users of the public right of way to the north of the application site, near to the Hatfield Quarry conveyor (Viewpoint 1); and
- users of public right of way to the west of the application site, parallel to Oaklands Lane, near to the Hatfield Quarry processing plant site area and perimeter soil storage bund (Viewpoint 8).

8.153 However, in each case the proposed development would be in a different direction to the elements and features of Hatfield Quarry, meaning that walkers along the route would be looking around to experience any potential coalescence.

8.154 Visual interaction with the proposed housing development would also be limited due to the screening vegetation around the edge of the proposed development site. Viewpoint 6 looks north east across the proposed development site and would see the phased extraction and restoration

process set against the urban elements of Hatfield Business Park and Hertfordshire University. The proposed housing development would infill between these two existing urban features increasing the extent of the overall urban component of the view. Similar effects would occur in views in the opposite direction from the housing development, intervening vegetation, mounds, and hedgerow planting would reduce visibility at ground level, but upstairs windows are likely to have more extensive views. Such views may include the CEMEX processing plant, thus creating a cumulative effect in conjunction with the proposed development plant site, although such effects would be limited due to the screening provided by Home Covert.

8.155 The other potential cumulative visual effects are of a sequential nature, for example users of the road network or recreational visitors moving along the rights of way. However, this is also considered to be limited and mitigated by the existing urban fringe character of area and roadside vegetation screening.

8.156 Overall, there are no significant cumulative visual effects anticipated because of the proposed development.

FUNCTIONALITY OF THE GREEN BELT

8.157 Utilising the assessment work above, a focused study of proposed development has been carried out in relation to the functions of the green belt as set out in the National Planning Policy Framework (e.g., checking sprawl, preventing towns from merging, safeguarding the countryside from encroachment, preserving the setting and special character of historic towns, and assisting in urban regeneration).

8.158 It has already been described above how there is a history of mineral working in the area to the north, associated with Hatfield Quarry and "*existing and restored mineral workings*" is already one of the key characteristics of "Area 31 De Havilland Plain". These areas are also in the green belt and in general terms therefore active and restored sites should not necessarily be incompatible with this designation, depending on the character and quality of the schemes proposed.

8.159 The proposed development would ensure high environmental standards and the long-term restoration of the application site would deliver new areas of wetland, woodland, and hedgerows, amongst a more diverse grassland mosaic. These proposals respond to NPPF paragraph 141 "*local planning authorities should plan positively to enhance their beneficial use,* such as *looking for opportunities to provide access; to provide opportunities for outdoor sport and recreation; to retain and enhance landscapes, visual amenity and biodiversity".*

Openness

8.160 The proposed development also looks to preserve the openness of the Green Belt as far as possible through the operational stage of the mineral extraction. Openness is defined in various planning precedents as free from buildings. It is accepted by practitioners that the degree of openness is affected not only by the proportion of a land parcel which is occupied by buildings, but also by the prominence of buildings both within and around that parcel. It follows that a site that is free from buildings, but which is surrounded by existing development will not be entirely open.

8.161 In terms of the proposed development, the long term proposed plant site would be located as far away from the urban edges of the Hatfield Aerodrome development area, Ellenbrook and Smallford, minimising effects on openness. The plant site would be the main source of effects on openness due to its constructed appearance, size and part urban nature. The built structures relating to the processing plant would also be relatively narrow structures and isolated built forms, rather than being a broad, solid mass of built development as would typically be associated with effects on openness. Particularly important though, this would not be a permanent feature, being removed after the mineral extraction process ends. Therefore, although some temporary effects on the openness of the Green Belt may occur the proposed development would ensure the long-term openness of the Green Belt as illustrated on proposed Restoration Plan.

8.162 The restoration plan provides an opportunity for future outdoor recreation and biodiversity through a phased restoration that begins to deliver these benefits from the early stages of Phase C and D. These early restoration phases, in conjunction with the extensive planting around Popefield Farm, support both the extension of the Welwyn Hatfield Green Corridor (Welwyn Hatfield Green Corridor Strategic Framework Plan) through these early phases, but also contributes to the Woodland Enhancement Creation Zone/Hertfordshire Woodland Arc and Watling Chase Community Forest. This illustrates that despite the long-term nature of the proposed development, it involves a short term, regular creation of restoration supporting and enhancing existing and proposed green infrastructure projects.

8.163 The effects caused by the phased working and restoration process on openness would be far more limited, with disturbance caused by machinery and movement within the active phases during working hours, and with shorter timescales due to the phased nature of the extraction and restoration proposals. The permanent retention of existing vegetation around the periphery of the development, and the various phases as long as possible, followed by phased restoration and replanting, would all help to screen urban influences from adjacent areas and within the site, thus reducing the overall effects on openness within the development site from the extraction process.

8.164 The temporary soil and overburden storage mounds would be long, relatively low and grass seeded, thus avoiding high, steeply rising, engineered pinnacles. Temporary mineral stockpiles may be visible at certain times, as the heaps are surcharged on a campaign basis and then reduced in size as processed and sold from site. They would also be removed as part of final restoration and the infilling of mineral voids would not result in land raising or additional permanent enclosure as the landform would be low and very gently sloping, in keeping with the existing character.

8.165 The plant site area is located to the north, approximately 0.3km away from the other existing development at Smallford and 0.8km away from Ellenbrook housing development. The perimeter bund at the eastern edge of the site is around 0.3km away from Ellenbrook. The proposed development would not constitute coalescence of Smallford and Hatfield with open land (either unworked or restored) always present between the two settlements. In addition, the sports pitches of the University of Hertfordshire, in combination with the permitted open green space between the proposed development and the Hatfield OPA site ensure separation of land use and openness particularly when seen within the various proposed green infrastructure plans.

8.166 To the north some effects on openness are caused by the CEMEX plant site, although this is relatively well screened behind mature vegetation and would be approximately 800m away from the main plant of the development site and to the east. Therefore, separation would be apparent with views and aesthetic links to the agricultural land to the north.

8.167 In conclusion on openness it can be stated that some urban influences are present on the development site and these would be added to be the proposed development. But the phased restoration and layout of the development helps to minimise these and provide an opportunity for the restoration to play an important part in the developing green infrastructure which will enhance the openness and recreational value of the area.

Sprawl

8.168 Sprawl is defined as the outward spread of the edge of a (usually large) built up area in a disorganised or irregular manner. A strongly performing parcel of land would be on the settlement edge but would be free from built development and there would be little perception of built development available from publicly accessible viewpoints.

8.169 The proposed development is located adjacent to Smallford in the south west and on the far side of the A1057 to Ellenbrook to the south east. The boundary with Smallford is limited to the weighbridge area and final extraction phase within the site, and the existing Notcuts Garden Centre outside. The small weighbridge building would be limited in size and of a much smaller scale compared to the large-scale garden centre buildings with a tall screen of vegetation between the two. The site entrance from the A1057 is located approximately 120m to the east from Smallford and turns sharply into the site screening views from the A1057. Hedgerow planting along the eastern side of the access road would have sufficiently established to screen the mineral extraction in Phase G by the time that phase was initiated (last phase of extraction).

8.170 A good screen of vegetation is present along the A1057 road to the south and this would screen the earliest phase (Phase A) adjacent to the farthest western extent of Ellenbrook. The majority of Ellenbrook being adjacent to the sports pitches of the University of Hertfordshire.

8.171 The proposed development would thus not appear as an extension to either settlement and built development associated with the development would be limited to the small weighbridge offices. The potential for the development to be perceived as sprawl from an adjacent settlement is considered limited.

Coalescence

8.172 Defined as the merging of two nearby settlements. A strongly performing parcel of land would be located between two settlements, it would be open and free from built development with no perception of built development available from publicly accessible viewpoints.

8.173 For the same reasons as identified above in Sprawl the perception of coalescence would be limited, largely due to the vegetation along the A1057 and the limited weighbridge building present. The perceived gap between Ellenbrook and Smallford would therefore remain largely intact, with the access junction into the site having a limited effect on coalescence.

Encroachment

8.174 Defined as the construction of built development on open countryside, with countryside defined as land of rural use and character. A strongly performing parcel of land would be an entirely open piece of agricultural land, in good condition, free from built development and there would be little perception of built development available from publicly accessible viewpoints.

8.175 There would be an element of encroachment caused by the proposed plant site due to its position in open countryside. However, the agricultural land present is not in good condition as illustrated by Viewpoints 1, 6 and 8 and noted in the landscape character study. Other built development is also perceived in the form of the Hertfordshire University, Hatfield tower blocks, housing at Oaklands Lane and the existing CEMEX mineral plan site, fencing and conveyor line. Thus the level of perceived encroachment would be limited.

Setting and Special Character of Historic Towns

8.176 The proposed development would not affect the setting or special character of any historic towns. Historic features present within the development site, or the adjacent landscape are limited to listed buildings identified in Table 8-3.

Urban Regeneration

8.177 Mineral extraction is limited to the presence of mineral deposits and is generally impossibly to site within urban areas unless historically established there. Combined with a suitably secured restoration scheme the proposed development is unlikely to have any effect on the process of urban regeneration.

CONCLUSIONS

8.178 This chapter has assessed the potential landscape and visual implications of the proposed development, as has been described in Chapter 3 above. This included a baseline study of the existing site and its surroundings, a study of the landscape and visual characteristics of the development and an assessment of the residual landscape and visual effects likely to be generated after mitigation has been considered and their significance.

8.179 Overall there are no significant landscape or visual effects predicted as a result of the proposed development, influenced in part by the proposed mitigation and landscape strategy.

8.180 The physical changes to landscape elements and features is initially considered to be slight, associated with site preparation and establishment stages, rising to moderate and adverse during working phases and when the majority of disturbance would have occurred, but reducing as part of progressive restoration and eventually becoming slight and beneficial after final restoration is achieved.

8.181 The changes to aesthetic and perceptual aspects are also considered to be no more than moderate and adverse during operation phases, but becoming slight and beneficial after restoration.

8.182 The overall landscape effects upon the application site and “Area 31 De Havilland Plain” as a whole are considered to be slight as the published character area is relatively large in comparison and the scale of change is limited; the area would continue to be described *inter alia* as a jumbled, urban fringe landscape, with existing and restored mineral workings across parts of the extensive level plain.

8.183 There would be no new key characteristics introduced, but the addition of a new area of active quarrying and infilling, with processing plant is nevertheless a detracting element.

8.184 At a local level, the application site would be classified as “medium to large-scale greenspace with mineral workings” and after restoration would be returned to “medium to large-scale greenspace plain/former aerodrome”.

8.185 In terms of cumulative landscape effects, the addition of the proposed development to the ongoing operations at Hatfield Quarry would not give rise to changes in landscape character of such an extent as to have major effects on its key characteristics or transform it into a different character type; it is not considered that the development “tips the balance” through its additional effects.

8.186 The visibility of the application site is influenced at a local level by the screening effects of vegetation in the surrounding area, in particular in conjunction with the flat, level plain which prevents any views down or over the site. The clearance of existing vegetation and landcover, the formation, working and subsequent backfilling of the mineral extraction void would have very limited visibility.

8.187 The diversion of the rights of way and areas of permissive access around the site perimeters would move visitors to this part of Ellenbrook Fields along landscaped corridors that are of similar character to existing routes and/or across the new internal access roads and over undisturbed areas. These routes would then be progressively reinstated as part of final restoration.

8.188 The mineral processing plant would have some visibility from limited locations at gaps in hedgerows, etc to the north and west of the application site, but this is generally backgrounded and/or seen as part of a mainly wooded horizon, with other development such as Ellenbrook, Hatfield or Smallford. The formation of the site entrance and movement of vehicles to and from the site would be visible from a small part of the existing busy Hatfield Road (A1057).

8.189 Although there are several sensitive receptors in the study area (mainly residential and recreational), most would experience a small degree of change to the baseline condition; change is discernible but underlying landscape character or view composition would be similar to the baseline. The landscape strategy / mitigation proposals would be effective.

8.190 In cumulative terms effects are restricted in landscape terms due to the nature of the existing landscape character and potential for screening and separation of the considered developments. In visual terms, some visual interconnection would occur, but this would be limited by screening. A wide 335m buffer of open space would be retained between the proposed development and the housing development with soil mounds and a hedgerow included in the proposed development to reduce visibility between the two developments. The detailed consideration of cumulative effects within the proposed large scale housing development confirms this assessment of cumulative effects and conclude cumulative effects would be restricted to socio-economic issues only.

8.191 In considering the previous planning application no objections were raised in relation to landscape and visual impact by technical consultees, such as the County Landscape officer. The proposed development no longer includes the concrete plant which would have represented the tallest element on the operational mineral site and an increase in the overall level of development. The tallest element is now the mineral processing plant which represents an essential element of the mineral extraction process; with the principal of mineral extraction in the

Green Belt being identified in the NPPF (as previously identified in the policy section of the chapter).

8.192 It is noted that landscape does not form one of the draft reasons put forward to refuse the planning application, but Green Belt has been cited (in relation to the duration of the development). The review of Green Belt objectives above indicates limited effects on sprawl, coalescence and encroachment may occur. However, the level of these effects is not considered sufficient to have a significant impact on the function of the Green Belt, particularly in the context of the phased restoration proposals and temporary (although long term) nature of the proposed development.

8.193 The proposed development seeks to improve the recreational and ecological aspects of the development site without removing it from Green Belt through development that is not inappropriate in the Green Belt.

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INTRODUCTION

9.1 This chapter considers the potential air quality effects associated with the operation of a proposed sand and gravel quarry (the 'proposed development') at the Hatfield Aerodrome (also known as the 'application site') upon the receiving environment.

9.2 This chapter should be read in conjunction with the supporting Appendices:

- **Appendix 9/1: Dispersion Modelling Methodology; and**
- **Appendix 9/2: Dispersion Modelling Results.**

Development Description

9.3 As set out in Chapter 3 above, the proposed development comprises the extraction and processing of 8Mt material over a period of around 30 years (based upon an annual output of around 250,000tpa). Excavated material would be processed at the quarry using a combination of screening and washing plant to produce a range of graded aggregates and sands.

9.4 Processed aggregates would be dispatched from the site in heavy good vehicles (HGV) via a new access constructed onto the A1057 Hatfield Road, on the southern side of the quarry. From the site entrance, an internal paved road would be constructed to a similar specification up until the plant area to facilitate loading and minimise vehicles travelling on internal unpaved surfaces.

9.5 A wheel washing facility will be in operation within the plant site to minimise suspension of dust/particulate matter (PM) on internal and external paved surfaces, following access to unpaved surfaces at the plant area.

Scope of Assessment

9.6 The objective of the assessment is to consider the potential air quality impacts arising from the operation of the proposed development on the surrounding environment. These impacts relate to emissions generated by road vehicles accessing the site, as well as on-site operational activities.

9.7 The scope of the assessment comprises:

- a review of baseline conditions at the application site;
- operational phase assessment, comprising:
  - assessment of emissions generated from road traffic accessing the site; and
  - assessment of fugitive dust/PM_{10} emissions generated from on-site activities.
- identification of appropriate mitigation measures, as required.

LEGISLATIVE CONTEXT, POLICY AND GUIDANCE

National Air Quality Legislation

Air Quality Standards Regulations

9.8 The Air Quality Standards Regulations 2010[1] include Limit Values, Target Values, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment. Limit values are legally binding and are considered to apply everywhere with the exception of the carriageway and central reservation of roads and any location where the public do not have access (e.g. industrial sites).

Air Quality Strategy

9.9 The UK Air Quality Strategy (AQS) 2007 for England, Scotland, Wales and Northern Ireland[2] provides the over-arching strategic framework for air quality management in the UK and contains national air quality standards and objectives established by the UK Government and Devolved Administrations for the protection of public health and the environment.

9.10 The AQS objectives are only applicable at locations:

- which are situated outside of buildings or other natural or man-made structures above or below ground; and
- where members of the public are regularly present.

9.11 As such, compliance with the objectives should focus on areas where members of the general public are present over the entire duration of the concentration averaging period specific to the relevant objective, herein referred to as 'relevant exposure'.

Local Air Quality Management

9.12 Part IV of the Environment Act 1995 induces a statutory duty for local authorities to undergo a process of Local Air Quality Management (LAQM). This requires local authorities to Review and Assess air quality within their boundaries to determine the likeliness of compliance, regularly and systematically.

9.13 Where any of the prescribed AQS objectives are not likely to be achieved, the authority must designate an Air Quality Management Area (AQMA). For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the objective. AQMAs can give rise to potential constraints to development, or at least a higher degree of scrutiny to air quality assessment work. Local authorities therefore have formal powers to control air quality through a combination of LAQM and through application of wider planning policies.

1 The Air Quality Standards Regulations (England) 2010, Statutory Instrument No 1001, The Stationary Office Limited.
2 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra. July 2007.

Protection of Nature Conservation Sites

9.14 Ecological habitats vary in terms of their sensitivity, perceived ecological value, geographic importance, and level of protection. Within the UK, there are three types of nature conservation designations: international, national and local designations, which are all provided environmental protection from developments, including from atmospheric emissions, with a greater level of protection afforded to the former, relative to the latter.

9.15 The Conservation of Habitats and Species Regulations 2017 ('Habitats Regulations') introduces the precautionary principle for protected European sites, i.e. that projects can only be permitted to proceed; having ascertained that there will be no adverse effect on the integrity of the designated site. It requires an assessment to determine if significant effects (alone or in combination) are likely, followed by an 'appropriate assessment' by the competent authority, if necessary. European sites include Special Areas of Conservation (SAC) and Special Protection Areas (SPA). The Habitats Regulations were subsequently amended in 2019 to make them operable from 1 January 2021 despite the UK's withdrawal from the EU[3].

9.16 Other sites of international significance are Ramsar sites, which are wetlands protected under the 1971 Ramsar Convention[4]. Many of these sites in the UK were initially selected on the basis of their importance to waterbirds, and are therefore also classified as SPAs.

9.17 The Countryside and Rights of Way (CRoW) Act (2000) provides protection to Sites of Special Scientific Interest (SSSI) to ensure that developments are not likely to cause damage.

9.18 Locally important sites (such as National Nature Reserves (NNR), Local Nature Reserves (LNR), Local Wildlife Sites (LWS) or Sites of Importance for Nature Conservation (SINCs) and Ancient Woodland (AW)) are also protected by legislation to ensure that developments do not cause significant pollution.

General Nuisance Legislation

9.19 Part III of the Environmental Protection Act (EPA) 1990 (as amended) contains the main legislation on Statutory Nuisance and allows local authorities and individuals to take action to prevent a statutory nuisance. Section 79 of the EPA defines, amongst other things, smoke, fumes, dust and smells emitted from industrial, trade or business premises, as to be prejudicial to health or a nuisance, as a potential Statutory Nuisance. It also defines accumulation or deposit, which is prejudicial to health, as a nuisance.

Planning Policy

9.20 The following section presents planning policies relevant to the assessment, of which have been addressed throughout this assessment.

[3] The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.

[4] Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat.

National Planning Policy

9.21 As noted from Chapter 4 above the National Planning Policy Framework (NPPF) describes the policy context in relation to pollutants, with specific reference to air quality its states:

"174. Planning policies and decisions should contribute to and enhance the natural and local environment by:

[….]

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of ... air … pollution ... Development should, wherever possible, help to improve local environmental conditions such as air … quality …"

[….]

"186. Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

9.22 The NPPF is accompanied by supporting Planning Practice Guidance (PPG) which includes guiding principles on how planning can take account of the impacts of new development on air quality. In regard to air quality, the PPG states:

"Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife)."

9.23 The PPG sets out the information that may be required within the context of a supporting air quality assessment, stating that *"assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality […] Mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact".*

9.24 Furthermore, in relation to minerals, the NPPF states:

"Planning policies should:

[….]

f) set out criteria or requirements to ensure that permitted and proposed operations do not have unacceptable adverse impacts on the natural and historic environment or human health, taking into account the cumulative effects of multiple impacts from individual sites and/or a number of sites in a locality."

9.25 The NPPF further states:

"When determining planning applications, great weight should be given to the benefits of mineral extraction, including to the economy. In considering proposals for mineral extraction, minerals planning authorities should:

[….]

b) ensure that there are no unacceptable adverse impacts on the natural and historic environment, human health or aviation safety, and take into account the cumulative effect of multiple impacts from individual sites and/or from a number of sites in a locality;

c) ensure that any unavoidable noise, dust and particle emissions and any blasting vibrations are controlled, mitigated or removed at source, and establish appropriate noise limits for extraction in proximity to noise sensitive properties."

Local Air Quality Planning Policy

9.26 WHBC's current local plan is the Welwyn Hatfield District Plan[5] adopted in 2005, comprising saved policies. The following policy is of relevance to this assessment:

Policy R18 – Air Quality:

"The Council will have regard to the potential effects of a development on local air quality when determining planning applications. Consideration will be given to both the operational characteristics of the development and to the traffic generated by it. Any development within areas designated as Air Quality Management Areas must have regard to guidelines for ensuring air quality is maintained at acceptable levels asset out in the Air Quality Strategy'.

9.27 WHBC's new local plan (Welwyn Hatfield Local Plan[6]) is currently in the process of examination which will shape the future of local development up until 2032. The following policies are of relevance to this assessment:

Policy SADM 18:

"Air Quality

Prevailing air quality and potential impacts upon air quality arising from airborne emissions, dust and odour associated with the construction and operation of a proposal (including vehicular traffic) will be considered when determining planning applications. Proposals that would result in or be subject to unacceptable risk to human health and the natural environment from air pollution, or would prejudice compliance with national air quality objectives, will be refused.

[5] Welwyn Hatfield District Council. Welwyn Hatfield District Plan 2005.
[6] Welwyn Hatfield District Council. Draft Local Plan Proposed Submission. August 2016.

An Air Quality Assessment that demonstrates how prevailing air quality and potential impacts upon air quality have been considered and how air quality will be kept to an acceptable standard through avoidance and mitigation will be required for major and minor development proposals that are:

i. Likely, due to the nature of the proposal, to give rise to significant air pollution;

ii. Within an Air Quality Management Area;

iii. Within 50 metres of a major road or heavily trafficked route;

iv. Within proximity to a source of air pollution which could present a significant risk to human health; and/or v. Particularly sensitive to air pollution due to their nature, such as schools, health care establishments or housing for older people."

9.28 SADC's current local plan is The District Local Plan Review 1994[7], comprising saved policies. No policies relate to air quality.

Local Mineral Planning Policy

9.29 HCC have adopted their Minerals Local Plan[8] in 2007. The following policies relate to air quality:

Minerals Policy 18 – Operational Criteria for the Control of Mineral Development

"All proposals for mineral extraction and related development shall, where appropriate:

[…] ix) demonstrate that no significant degradation of the air (particularly from dust and emissions) […] will occur.

[…] xi) include proposals to prevent the soiling of the public highway including the provision of suitably surfaced access roads, wheel cleaning equipment and sheeting to prevent dust or spillage and measures for dealing with the immediate cleaning of public roads should accidental soiling occur."

Assessment Guidance Documents

9.30 The air quality assessment has been undertaken in accordance with the principles outlined within the following guidance documents:

- Defra: 'LAQM Technical Guidance 16' (LAQM.TG(16)) (2021);
- Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK): 'Land-Use Planning and Development Control: Planning for Air Quality' (2017);
- IAQM: 'Guidance on the Assessment of Mineral Dust Impacts for Planning' (2016);
- United States Environmental Protection Agency: 'Air Pollutant 42' (US EPA AP-42) (2021);
- Australian Government: National Pollutant Inventory (NPI) 'Emission Estimation Technique Manual for Mining' Version 3.1 (2012); and
- EA: 'Monitoring Particulate Matter in Ambient Air around Waste Facilities' (2013).

[7] St Albans District Council. The District Local Plan Review 1994. Saved and Deleted Policies Version (July 2020).
[8] Hertfordshire Minerals Local Plan Review 2002 – 2016 (adopted March 2007).

Applied Environmental Standards

9.31 The sections below presents the environmental standards applied for the purposes of this assessment.

Ambient Concentrations

9.32 The ambient air quality standards of relevance to human receptors in this assessment (collectively termed Air Quality Assessment Levels (AQALs) throughout this report) are provided in Table 9-1.

Table 9-1
Relevant AQALs Applied

Pollutant	Standard (µg/m^3)	Measured As	Equivalent Percentile
Nitrogen Dioxide (NO_2)	40	Annual Mean	-
	200	1-hour Mean	99.79th percentile of 1-hour means (equivalent to 18 1-hour exceedences)
Particles (PM_{10})	40	Annual Mean	-
	50	24-hour mean	90.41th percentile of 24-hour means (equivalent to 35 24-hour exceedences)
Particles ($PM_{2.5}$)	25	Annual Mean	-

9.33 As per Defra's LAQM.TG(16), these AQALs should only be assessed at locations of relevant exposure i.e. where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period. These AQALs do not apply to exposure at the workplace. For further information including examples of relevant exposure for each exposure period, see LAQM.TG(16).

Dust Deposition

Human Receptors – Disamenity Dust

9.34 There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist as it is a subjective concept, and its perception is highly dependent upon the existing conditions and the change which has occurred.

9.35 The EA's dust monitoring guidance (M17) proposes limit values for protection against dust annoyance for different monitoring methods that are acknowledged as coming into use through 'custom and practice'. A limit of 200mg/m^2/day is proposed for use with dust gauges as a guide at which the onset of nuisance might be experienced, and has therefore been adopted within this assessment.

Ecological Receptors – Dust Smothering

9.36 In relation to dust deposition, the physical effects on ecological receptors can be associated with blockage and damage to stomata (for small particle size 8-12µm), shading, and abrasion. However, there is limited published evidence and guidance available.

9.37 The IAQM minerals guidance suggests that a level of dust deposition is likely to lead to a change in vegetation at a rate of 1,000mg/m^2/day, as evidenced by research[9]. This value has commonly been prescribed in various other guidance documents (M17), and has therefore been adopted as an appropriate standard for the purposes of this assessment.

9.38 Application of this threshold is believed to be conservative; it is known that moist species appear to be unaffected until dust deposition rates are at levels considerably higher than this.

9.39 Effects associated with dust smothering on ecological sites should only be considered for distances up to 250m in relation to sand and gravel quarries, as per IAQM guidance.

METHODOLOGY

9.40 Detailed dispersion modelling of both road traffic and fugitive dust emissions generated by site activities has been undertaken in consideration of potential effects onto both sensitive human and ecological receptors.

9.41 This has involved the consideration of potential effects on human health associated with increases in ambient pollutant concentrations, as well as the loss of amenity and deterioration of sensitive ecological environments arising from dust deposition.

9.42 Modelling in relation to road traffic emissions has been undertaken through use of the Cambridge Environmental Research Consultants (CERC) ADMS-Roads dispersion model (v5.0.0.1), to predict concentrations of NO_2, PM_{10} and $PM_{2.5}$ at human receptor locations, for the following scenarios:

- 2019 Baseline (2019 BC) - Without development base flows for the year (2019);
- 2023 Do Minimum (2023 DM) - Without development flows for the proposed year of opening (2023), inclusive of any relevant committed development; and
- 2023 Do Something (2023 DS) – 'Do Minimum' flows, plus all trips associated with the Proposed Development flows for the proposed year of opening.

9.43 For the above future year scenario (DM and DS), 2019 emission factors and background pollutant concentrations have been used to reflect the opening year (2023). This theoretically assumes that there is no improvement in emission factors or background concentrations for the pollutants considered within the local area, relative to the verified year. These modelled scenarios are likely to represent a conservative approach as, despite uncertainty in quantification, it is generally accepted that variables such as background concentrations and/or vehicle emission factors will improve to some degree in future years, with local monitoring trends somewhat supporting this.

[9] 4 Farmer, A M, 1993. The effects of dust on vegetation – a review. Environmental Pollution 79, 63-75.

9.44 Modelling of fugitive dust emissions generated by on-site operation activities has been undertaken through use of the US American Meteorological Society and Environmental Protection Agency Regulatory Model (AERMOD v9) dispersion model. This has focussed on concentrations of $PM_{2.5}$ and PM_{10} for human receptors as well as the predicted dust deposition rates (as total suspended particles (TSP)) for both human and ecological receptor locations.

9.45 In the absence of dust emissions factors for similar quarry operations in the UK, emission factors and associated compilation methodologies provided within the following guidance documents have been used:

- Australian Government Department of the Environment and Heritage National Pollutant Inventory (NPI) 'Emission Estimation Technique Manual for Mining'; and
- United States Environmental Protection Agency 'Air Pollutant 42' (US EPA AP-42);

9.46 Application of these emission factors within the context of UK schemes is believed to be conservative given these relate to arid regions of the USA and Australia, therefore likely to over-predict the potential impacts. The modelling assessment quantified emissions from all operational processes, as well as control measures proposed to be implemented. This will determine whether additional mitigation measures (outside of those already proposed) are required.

9.47 Consideration was given to the phased excavation of material within the dispersion model, to ensure all worst case impacts (in terms of separation distance and orientation to nearby sensitive receptors) are understood and assessed.

9.48 Five year of meteorological data was used for the purposes of modelling fugitive dust emissions, whereby the maximum concentration (across all phases considered) has been used to account for conservatism and inter-year variability.

9.49 It is acknowledged that a recent planning application[10] for an extension of a sand and gravel quarry at Hatfield Quarry off Oaklands Lane, Hertfordshire (Land Adjoining Coopers Green Lane) located 2km north east of the application site has been submitted. To facilitate a cumulative assessment, maximum modelled PM_{10} (1.26µg/m^3) and $PM_{2.5}$ (0.89µg/m^3) concentrations reported within the accompanying health impact assessment[11] for all phases and receptors considered were added to the future year modelled concentrations. This ensures the assessment and resultant modelled concentrations considers potential future localised sources of PM concentrations in line with IAQM guidance. This approach is believed to be conservative on reflection, given that the development does not represent a committed development and as assumes the maximum calculated concentration from all receptors considered is constant across the modelled area (not accounting for dispersion and dilution with distance).

9.50 Where modelled contributions from road traffic and fugitive dust emissions overlap, these have been combined to provide a cumulative assessment. This is limited to $PM_{2.5}$ and PM_{10} concentration contributions at human receptors. In relation to the 24-hour mean PM_{10} AQAL, given the known

[10] Hertfordshire County Council, Planning Application PL\0963\18.
[11] Land adjoining Coopers Green Lane Extension to Hatfield Quarry, off Oaklands Lane, Hertfordshire Health Impact Assessment. CEMEX UK Operations Ltd and Gascoyne Cecil Estates. September 2018.

limitations with modelling short-term objectives for road traffic assessments, the empirical relation provided within LAQM.TG(16) has been adopted through combination of both outputs.

9.51 Full details of the dispersion modelling methodology are provided in **Appendix 9/1**.

Receptors

Human Receptors

9.52 Human receptors considered in the assessment are detailed in **Appendix 9/1**, whilst their locations are illustrated in **Figure 9-1**. These receptor locations are considered to capture worst-case relevant exposure relative to the Site, in accordance with LAQM.TG(16) and excludes workplace locations.

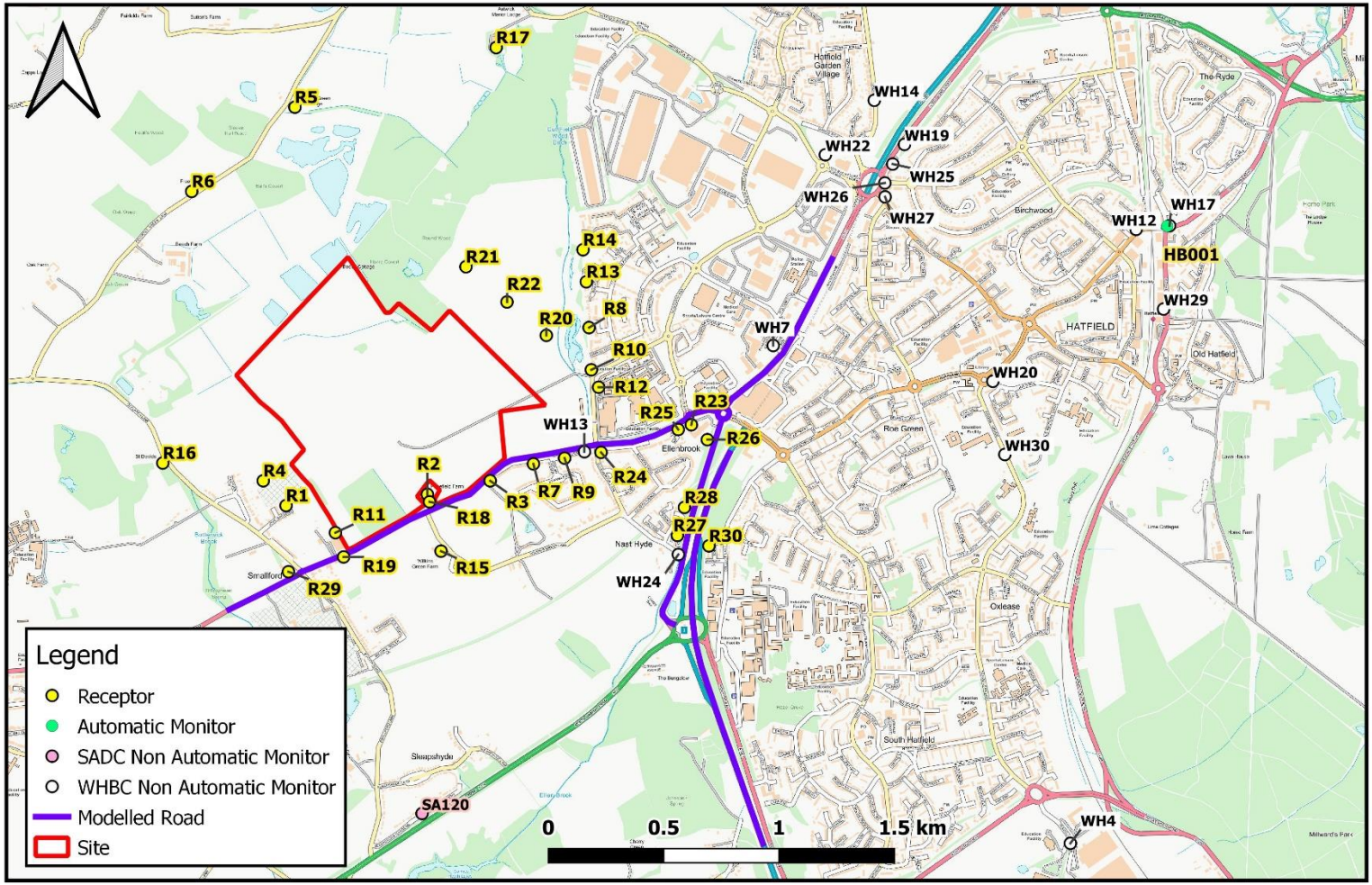
9.53 Consideration has also been given to land uses with sensitive populations for inclusion within the model (e.g. elderly care home, schools etc.).

9.54 Both sets of dust and road traffic sensitive receptor locations have been modelled in full to provide a complete assessment.

Ecological Receptors

9.55 No statutory ecological designations are located within 250m of the site boundary. Therefore, as per IAQM guidance, dust deposition impacts on ecological sites can be screened out and classed as insignificant. No further consideration is given herein.

Figure 9.1 - Modelled Road Network and Local Monitoring Locations Relative to the Site



Significance Criteria

Human Health

9.56 In relation to ambient AQALs at human receptor locations, the significance criteria provided within the EPUK/IAQM guidance document has been applied.

9.57 Whilst considering long-term AQALs, the significance criteria outlined in Table 9-2 has been used. Impacts are defined based upon the resultant total concentration at a specific receptor location, as well as the magnitude of change in relation to respective AQALs.

Table 9-2
Impact Descriptor Matrix for Long Term AQALs at Human Receptors

Long Term Resultant Concentration	Change in Concentration Relative to AQAL			
	1% [(A)]	2-5%	6-10%	>10%
75% or less of AQAL ('well-below')	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

[(A)] Changes <0.5% will be described as Negligible.

9.58 The EPUK/IAQM guidance requires a judgment on the significance of the 'effect' as 'significant' or 'not significant'. This is based upon the impact descriptors at receptors alongside other considerations that also have a bearing, including:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the worst case assumptions adopted when undertaking the prediction of impacts; and
- the extent to which the proposed development has adopted best practice to eliminate and minimise emissions.

Dust Deposition

Human Receptors

9.59 For the assessment of disamenity dust at human receptors, a deposition rate of 200mg/m^2/day has been adopted. If modelled deposition rates are below this threshold, impacts can be classed as insignificant.

BASELINE ENVIRONMENT

Ambient Air Quality

Local Air Quality Management

9.60 Both SADC and WHDC, in fulfilment of statutory requirements, have conducted an on-going exercise to review and assess air quality within their administrative area (Review and Assessment).

9.61 The latest publicly available LAQM reports (titled Annual Status Reports (ASR)) for both councils at the time of writing are as follows:

- 2020 ASR – WHBC[12]; and
- 2019 ASR – SADC[13].

9.62 WHDC do not presently have any declared AQMAs; however SADC have three at present. The nearest AQMA is located approximately 5km west of the application site in central St Albans, titled 'St Albans AQMA No. 1'. Given the separation distance relative to the proposed development, no further consideration has been given to this AQMA within this assessment.

Automatic Monitoring

9.63 Automatic monitoring is undertaken by WHBC at one location; however the location of this monitor could not be corroborated due to incorrect coordinates presented within the ASR.

9.64 The nearest monitor associated with the national Automatic and Urban Rural Network is located >10km away, and therefore has not been considered as not considered relevant to the study area.

9.65 Automatic monitoring is undertaken as part of the regional Hertfordshire and Bedfordshire Air Quality Network at two locations within WHBC, titled HB016 and HB001. Monitoring at HB016 commenced in September 2020 so therefore has not been considered. Monitoring at HB001 commenced in 2016 however limited to $PM_{2.5}$. HB001 is located approximately 2.7km east of the site within Hatfield at a roadside location.

9.66 Details and relevant 2016-2019 concentrations monitored at HB001 are presented in Table 9-3 and Table 9-4, whilst its location relative to the site is illustrated in **Figure 9-1**.

Table 9-3
Relevant Automatic Monitoring Locations: Details

Site ID	Site Type	Pollutants Monitored	X	Y	Distance to site
HB001	Urban Traffic	$PM_{2.5}$	523283	209161	2.7

Table 9-4
Relevant Automatic Monitoring Locations: $PM_{2.5}$ Annual Mean Results

[12] Welwyn Hatfield Borough Council, 2020 Air Quality Annual Status Report, 2020.
[13] St Albans District Council, 2019 Air Quality Annual Status Report, 2019.

Site ID	2019 Data Capture (%)	Annual Mean $PM_{2.5}$ Concentration (µg/m³)			
		2016	2017	2018	2019
HB001	97.3	13.2	12.7	11.0	9.8

9.67 For the period assessed (2016-2019), annual mean $PM_{2.5}$ concentrations were below the relevant AQAL.

Non-Automatic Monitoring

9.68 Passive NO_2 diffusion tube monitoring is currently undertaken by both WHBC and SADC within the development locale. The details and results of the monitoring locations of relevance to the site (i.e. within 1.5km of the site and adjacent/within the modelled domain) are presented in Table 9-5 and Table 9-6 respectively, whilst their locations are illustrated in **Figure 9-1**.

Table 9-5
Local LAQM NO_2 Passive Diffusion Tube Monitoring Sites: Details

Site ID	Site Type	X	Y	Height (m)	Distance to site (km)
WH7	Roadside	521575	208645	2.0	0.2
WH13	Urban Background	520757	208185	2.0	1.0
WH24	Urban Centre	521164	207740	2.0	0.9
SA120	Kerbside	520053	206618	2.3	1.3

Table 9-6
Local LAQM NO_2 Passive Diffusion Tube Monitoring Sites: 2015 – 2019 Results

Site ID	2019 Data Capture (%)	Annual Mean NO_2 Concentration (µg/m³)				
		2015	2016	2017	2018	2019
WH7	100	30	31	30	28	28
WH13	-	14	16	17	15	-

Site ID	2019 Data Capture (%)	Annual Mean NO_2 Concentration (µg/m³)				
		2015	2016	2017	2018	2019
WH24	100	39	44	40	38	36
SA120	-	31.5	30.3	30.3	29.3	-

9.69 Annual mean NO_2 concentrations at all locations of relevance to the site, with the exception of WH24 in 2016 and 2017 have been below the AQAL for the period assessed.

9.70 WH24 is located roadside of the A1001 Comet Way, not at a location of relevant exposure. Despite this, annual mean NO_2 concentrations have appeared to reduce year on year since 2016 to be below the AQAL, demonstrating improvements at key roadside locations, correlating somewhat to national projections.

9.71 Annual mean NO_2 concentrations recorded at the remainder of sites appear to be stable, and can largely be considered to be 'well below' the AQAL. WH13 is an urban background site located 0.2km from the site, however a 2019 concentration was not reported.

9.72 The empirical relationship given in LAQM.TG(16) states that exceedences of the 1-hour mean AQAL for NO_2 is unlikely to occur where annual mean concentrations are <60µg/m³. This indicates that an exceedence of the 1-hour mean AQAL is unlikely to have occurred at any of the monitoring sites between 2015 and 2019.

Defra Mapped Background Concentration Estimates

9.73 Defra maintains a nationwide semi-empirical model of projected background air quality concentrations at a 1km grid square resolution across the UK. The data sets include annual average concentration estimates for NO_x, NO_2, PM_{10} and $PM_{2.5}$ using a base year of 2018 (the year in which comparisons between modelled and monitoring are made)[14].

9.74 Annual mean background concentrations of NO_x, NO_2, PM_{10} and $PM_{2.5}$ have been obtained from the Defra published background maps (2018 base year), based on the 1km grid squares which cover the modelled domain.

9.75 The Defra mapped background concentrations for the base year of 2019 are presented in Table 9-7.

Table 9-7
2019 Defra Mapped Background Pollutant Concentrations

Grid Square (X, Y)	Annual Mean Concentration (µg/m³)			
	NOx	NO_2	PM_{10}	$PM_{2.5}$
519500, 207500	18.8	13.8	15.4	10.3

[14] Defra Background Maps (2018-Reference) http://uk-air.defra.gov.uk/data/laqm-background-home.

Grid Square (X, Y)	Annual Mean Concentration (µg/m³)			
	NOx	NO_2	PM_{10}	$PM_{2.5}$
520500, 208500	18.3	13.6	15.4	10.1
519500, 208500	17.3	12.9	15.8	10.0
519500, 209500	15.2	11.4	14.9	9.7
520500, 209500	16.8	12.5	14.9	9.8
520500, 207500	18.8	13.9	16.0	10.3
518500, 208500	18.3	13.5	15.3	10.0
521500, 208500	29.0	20.3	17.1	11.2
521500, 207500	27.0	19.1	17.1	11.1
AQAL	-	*40*	*40*	*25*

9.76 All of the mapped background concentrations presented are well below the respective annual mean AQALs.

Meteorology

9.77 Figure 9-2 presents a wind rose recorded at Luton Airport for the cumulative period of 2015-2019. This demonstrates south-westerlies as the predominate wind in the area.

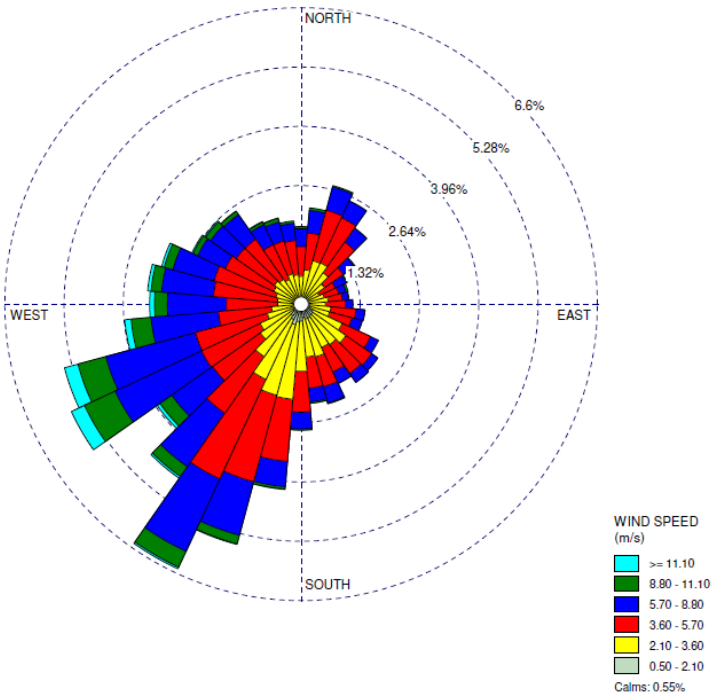


Figure 9-2
2015-2019 Meteorological Data Recorded at Luton Airport

9.78 From inspection of the meteorological data, 39.1% of the period with available data (i.e. four out of five years) precipitation >0.254mm/day, equating to circa 114 days per year where natural suppression of dust occurs irrespective of controls.

ASSESSMENT OF EFFECTS AND SIGNIFICANCE

Human Receptors - Health

9.79 A summary of modelled concentrations for worst-case human receptors is provided in turn below for each pollutant assessed, complete results are provided in **Appendix 9/1**. The worst-case receptors presented below refers to the location of maximum change and resultant predicted pollutant concentration.

NO_2 Modelling Results

9.80 Table 9-8 presents a summary of the annual mean NO_2 concentrations predicted for the 2019 BC, 2023 DM and 2023 DS scenarios.

Table 9-8
Predicted Annual Mean NO_2 Concentrations: Summary

Receptor	Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)			% Change of AQAL	% of 2023 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2023 DM	2023 DS			
R19	19.8	19.9	20.1	0.5	50.3	Negligible
R30	29.3	29.7	29.8	0.2	74.5	Negligible

9.81 In accordance with EPUK and IAQM guidance, the impact of the development on annual mean NO_2 concentrations at all assessed existing receptors is considered to be 'negligible'. Furthermore, there are no predicted exceedences of the annual mean NO_2 AQAL, and are calculated to be 'well below' the AQAL.

9.82 Effects associated with annual mean NO_2 concentrations at all assessed receptor locations are therefore considered to be 'not significant', despite the conservative nature of the applied assessment methodology.

PM_{10} Modelling Results

9.83 Table 9-9 presents a summary of the annual mean PM_{10} concentrations predicted for the 2019 BC, 2023 DM and 2023 DS scenarios.

9.84 Modelled annual mean PM_{10} concentration contributions arising from on-site fugitive dust releases have been added to the 2023 DS reported concentration to facilitate a cumulative assessment.

Table 9-9
Predicted Annual Mean PM_{10} Concentrations: Summary

Receptor	Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)			% Change of AQAL	% of 2023 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2023 DM	2023 DS			
R3	16.4	17.7	18.1	0.9	45.3	Negligible
R30	19.6	21.0	21.0	0.1	52.5	Negligible

9.85 In accordance with EPUK and IAQM guidance, the impact of the development on annual mean PM_{10} concentrations at all assessed existing receptors is considered to be 'negligible'. Furthermore, there are no predicted exceedences of the annual mean PM_{10} AQAL, and are calculated to be 'well below' the AQAL.

9.86 Cumulative effects associated with annual mean PM_{10} concentrations at all assessed receptor locations are therefore considered to be 'not significant', despite the conservative nature of the applied assessment methodology.

9.87 Based upon the maximum predicted annual mean PM_{10} concentration of 21.0µg/m^3 (predicted at Receptor R30 – 2026 DS), this equates to less than 5 days where 24-hour mean PM_{10} concentrations are predicted to be greater than 50µg/m^3. This is well below the 35 permitted exceedences, and therefore the number of maximum exceedences is in compliance with the 24-hour mean AQAL. Cumulative effects associated with likely 24-hour mean PM_{10} concentrations at all assessed receptor locations are therefore considered to be not significant.

$PM_{2.5}$ Modelling Results

9.88 Table 9-10 presents a summary of the annual mean $PM_{2.5}$ concentrations predicted for the 2019 BC, 2023 DM and 2023 DS scenarios.

9.89 Modelled annual mean $PM_{2.5}$ concentration contributions arising from on-site fugitive dust releases have been added to the 2023 DS reported concentration to facilitate a cumulative assessment.

Table 9-10
Predicted Annual Mean $PM_{2.5}$ Concentrations: Summary

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m^3)			% Change of AQAL	% of 2023 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2023 DM	2023 DS			
R3	10.7	11.6	11.7	0.4	46.8	Negligible
R30	12.6	13.5	13.5	<0.1	54.0	Negligible

9.90 In accordance with EPUK and IAQM guidance, the impact of the development on annual mean $PM_{2.5}$ concentrations at all assessed existing receptors is considered to be 'negligible'. Furthermore, there are no predicted exceedences of the annual mean $PM_{2.5}$ AQAL, and are calculated to be 'well below' the AQAL.

9.91 Cumulative effects associated with annual mean $PM_{2.5}$ concentrations at all assessed receptor locations are therefore considered to be 'not significant', despite the conservative nature of the applied assessment methodology.

Dust Deposition

Human Receptors – Dust Disamenity

9.92 From review of results presented in **Appendix 9/1**, the maximum modelled dust deposition rate at any human receptor considered was 7.5mg/m^2/day at Receptor R3. This equates to 3.7% of the applied assessment limit (200mg/m^2/day). Effects associated with dust disamenity can therefore be classed as insignificant.

CUMULATIVE EFFECTS

9.93 Cumulative consideration has been given to pollutant contributions associated with both road traffic and fugitive dust releases at human receptor locations, where relevant. Effects were found to be not significant.

9.94 Cumulative dust-led impacts from other quarries have the potential to arise where processes overlap at a receptor location. For human health (ambient PM concentrations), a 1km distance threshold is prescribed by IAQM guidance, consistent with national planning policy. Whereas for dust deposition effects (human and ecological), dust impacts from sand and gravel sites are uncommon beyond 250m from the nearest dust generating activities. As established above, no statutory ecological receptor exists within 250m of the site, therefore no cumulative impacts can arise.

9.95 It is acknowledged that a planning application for an extension of a sand and gravel quarry at Hatfield Quarry off Oaklands Lane (land adjoining Coopers Green Lane) is under consideration – located north east of the application site. A review of the health impact assessment submitted for that application was undertaken.

9.96 Dispersion modelling of proposed fugitive dust sources was undertaken in support the assessment, limited to three extraction sites (located approximately 2km north east from the application site) and supporting (new) infrastructure (e.g. conveyors). The full extent of new sources considered are located 1.3km from the application site. As such, cumulative effects associated with dust disamenity arising from the proposed extraction sites and supporting infrastructure can therefore be scoped out given the separation distances between proposed sources (>500m i.e. 250m + 250m process contribution overlap from sand and gravel sites) and limited likelihood of effects arising.

9.97 The Hatfield Quarry off Oaklands Lane sand and gravel quarry will be served by existing infrastructure (CEMEX Hatfield processing plant and supporting conveyor lines) located north and west of the application site. These sources were not considered as part of the Hatfield Quarry off Oaklands Lane dispersion modelling assessment on the assumption that throughput is to remain unchanged and are sufficiently distant from any new source for cumulative effects to arise. The processing plant is located approximately 200m from the application site. However, despite this all receptors considered are not found to be located within 250m from both sources. As such, cumulative effects associated with existing and proposed operations relative to the CEMEX Hatfield processing plant and supporting conveyor lines can be scoped out.

9.98 As discussed above, the maximum modelled PM_{10} and $PM_{2.5}$ concentrations reported within the accompanying health impact assessment (relating to proposed operations) for all receptors and phases considered has been added to the future year modelled concentrations to address potential cumulative impacts (i.e. 2023 DM and DS). This approach is believed to be conservative on reflection, as assumes the maximum modelled concentration at all receptors for those sources considered is constant across the modelled area, not accounting for dispersion and dilution with distance - contrary to established guidance (IAQM). Furthermore, this approach is considered to be suitably conservative in the absence of PM_{10} and $PM_{2.5}$ modelled contributions from existing sources (CEMEX Hatfield processing plant). Despite this, existing sources (such as the processing plant) are believed to be suitably covered through inclusion within the relevant background concentrations given that throughput is not expected to change.

9.99 In relation to road traffic emissions, traffic flows used for the air quality assessment includes vehicle movements associated with committed developments in the assessment area.

9.100 The air quality assessment, and the results presented are therefore inherently cumulative, where relevant.

9.101 Furthermore, all modelled concentrations/deposition rates are considered to be well-below the respective environmental benchmarks despite the conservative assessment methodology adopted (i.e. use of dust emission factors derived from arid conditions, 2019 road traffic emission factors and background concentrations). Therefore, the likelihood of a cumulative effect or exceedence arising outside of the operational envelope assessed is low.

MITIGATION

9.102 In relation to ambient AQALs at human receptor locations, the overall effect of the development on NO_2, PM_{10} and $PM_{2.5}$ concentrations at all assessed receptor locations is considered to be 'not significant', with concentrations considered to be 'well-below' the respective AQALs, despite the worst case assessment approach undertaken.

9.103 Furthermore, dust deposition rates modelled at all sensitive receptor locations are below the applied nuisance threshold.

9.104 As such, no further mitigation measures in relation to the operational phase of the development outside of those already proposed and encountered for within this assessment are not considered to be necessary. Those measures already proposed to be employed at the quarry, and evidenced to be effective in reducing on-site fugitive dust emissions are detailed in Table 9-11.

Table 9-11
Summary of Dust Control Measures

Site Operation	Dust Control Measures
Excavation of Sand and Gravel	Use of water as and when necessary, particularly in the event of dry and windy weather
	Vehicles not overloaded
	Reduction of drop heights
	Avoid double handling of material
Soil Stripping and Overburden Removal (including restoration)	Water sprays to be used as required
	Phased activity to minimise the duration of activity
	Avoid soils handling during adverse weather conditions
	Optimise timing regarding weather and seeding season. Seed as soon as possible
	Soil bunds & mounds profiled to minimise wind blown dust
	Temporary cessation of activities in the event of unacceptable dust emissions in the vicinity of receptor properties.
Storage and Material Handling	Water sprays to be used as required
	Avoid soils handling during adverse weather conditions
	Optimise timing regarding weather and seeding season. Seed as soon as possible
	Soil bunds & mounds profiled to minimise wind blown dust
	Where material contains less than 3mm in size the material should be conditioned with water before the point of discharge into the pile.
	Areas around the base of the storage piles would be clearly designated to ensure passing vehicles do not disturb dusty material and the area should be kept clean and in good repair
Processing	Processing operations will take place to the north of the quarry, away from the closest receptors
	Enclosure of transfer points with chutes
	Cleaning belts with scrapers and dust catch plates
	Materials are deposited carefully into screens by reducing drop heights and the correct matching of machine
	Ensure base of stockpiles clearly marked and shielded from wind and keep moist in dry weather
	Operations ceased during adverse weather conditions

Site Operation	Dust Control Measures
Transport: Internal Movements	Controlled use of haul routes
	Haul routes to be regularly maintained by grading to minimise dust generation
	Speed controls of 10mph to be implemented on all haul routes
	Water bowsers to be used as required
	Mobile plant exhausts will discharge above the horizontal
Transport – access road	Controlled use of fixed haul routes
	All vehicles exiting the site carrying material are sheeted or totally enclosed as soon as possible after loading and before leaving site
	Speed controls to be implemented and enforced on all haul routes
	Operation of a wheel washing facility

CONCLUSIONS

9.105 An air quality assessment has been undertaken focusing on the air quality impacts arising from operation of a new sand and gravel quarry at Hatfield, in accordance with relevant guidance.

9.106 Detailed dispersion modelling of both road traffic and fugitive dust emissions generated by site activities has been undertaken in consideration of potential effects onto both sensitive human and ecological receptors. This has involved the consideration of potential effects on human health associated with increases in ambient pollutant concentrations, as well as the loss of amenity and deterioration of sensitive ecological environments arising from dust deposition.

9.107 In conclusion, all impacts assessed associated with the operational phase of the quarry were found to be not significant.

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INTRODUCTION

10.1 This chapter of the ES considers the potential for the proposed development to impact upon the noise environment in the vicinity of the application site. The chapter describes the scope, relevant legislation, assessment methodology and the baseline conditions that exist around the application site. The chapter then assesses the potential environmental effects the proposals, which have been described in Chapter 3 of this Volume, would have on the baseline noise environment. It then considers the mitigation measures required to prevent, reduce or offset any significant adverse effects (should they be identified) and the likely residual effects after these measures have been employed.

10.2 Technical terms or references are occasionally used in this Chapter. To assist the reader, a Glossary of Terminology, including a table of example noise levels that may be found in general life, are included in **Appendix 10/1**.

METHODOLOGY

10.3 This assessment considers the potential impact of operational noise resultant from the quarry development upon nearby existing Noise Sensitive Receptors (NSRs),and also the cumulative impact of operational noise from the Hatfield and Astwick quarries combined. It has been completed in accordance with the legislation and guidance detailed in the following sections of this chapter.

Legislation and Planning Policy Guidance

Hertfordshire County Council Scoping Opinion

10.4 Within the Scoping Opinion document provided by Hertfordshire County Council in connection with the 2016 ES it was requested that the EIA includes a noise assessment for all phases of extraction and restoration and that the noise assessment is completed with reference to:

- BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound.
- BS8233:2014 Guidance on sound insulation and noise reduction in buildings.
- World Health Organisation thresholds for disturbance from noise.
- Noise Policy Statement for England.
- National Planning Policy Guidance

10.5 It is considered that BS4142:2014 *Methods for rating and assessing industrial and commercial sound* is not relevant guidance for assessing noise from mineral extraction sites particularly as the Government issues specific guidance separately with the web-based Planning Practice Guidance which has been adopted for this assessment.

10.6 BS8233:2014 *Guidance on sound insulation and noise reduction for buildings* is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, and is therefore not applicable for the assessment of noise from minerals extraction sites.

10.7 The assessment does not comment on the World Health Organisations thresholds for disturbance from noise as it is considered that the Planning Practice Guidance itself is based around the 'Guideline values for community noise in specific environments' guidance contained within the document Guidelines for Community Noise, which have since been superceded by the 'Environmental Noise Guidelines for the European Region' (2018).

10.8 It is assumed that "National Planning Policy Guidance" refers to the web-based Planning Practice Guidance which has been adopted for this assessment.

Planning Practice Guidance

10.9 The web-based Planning Practice Guidance (PPG) sets out the Government's planning policies for England and has a specific category for mineral developments.

10.10 With respect to noise, it requires those making mineral development proposals to carry out a noise impact assessment which should identify all sources of noise and, for each source, take into account the emission level, its characteristics, proposed operating location, on-time and its potential impact at the nearby noise-sensitive receptors.

10.11 The guidance also sets out the basis of the parameters to be considered for the control or mitigation of any potential impacts including:

- consider the main characteristics of the production process and its environs, including the location of noise-sensitive receptors;
- assess the existing acoustic environment around the site of the proposed operations, including the gathering of background noise levels at nearby noise-sensitive receptors;
- estimate the likely future noise from the development and its impact;
- identify proposals to minimise, mitigate and remove noise emissions at the source; and
- monitor the resulting noise to check compliance with any proposed or imposed conditions.

10.12 Paragraph 020 of the guidance describes how mineral planning authorities should determine the impact of noise from minerals sites, stating:

"Mineral planning authorities should take account of the prevailing acoustic environment and in doing so consider whether or not noise from the proposed operations would:

- *give rise to a significant adverse impact;*
- *give rise to an adverse impact; and*
- *enable a good standard of amenity to be achieved.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure would be above or below the significant observed adverse effect level and the lowest observed effect level for the given situation."

10.13 Paragraph 021 of the guidance sets out appropriate noise standards for mineral extraction sites for normal operations, i.e. those that would be undertaken over a period greater than eight weeks in any working year. The guidance states:

"Mineral planning authorities should aim to establish a noise limit, through a planning condition, at the noise-sensitive property that does not exceed the background noise level (LA90,1h) by more than 10dB(A) during normal working hours (0700 to 1900). Where it will be difficult not to exceed the background level by more than 10dB(A) without imposing unreasonable burdens on the mineral operator, the limit set should be as near that level as practicable. In any event, the total noise from the operations should not exceed 55dB(A) LAeq,1h (free field). For any operations during the period 22.00 – 07.00 noise limits should be set to reduce to a minimum any adverse impacts, without imposing unreasonable burdens on the mineral operator. In any event the noise limit should not exceed 42dB(A) LAeq,1h (free field) at a noise sensitive property."

10.14 Paragraph 022 of the guidance sets limits for operations which may give rise to particularly noisy short-term activities. The guidance states:

"Mineral planning authorities should aim to establish a noise limit, through a planning condition, at the noise-sensitive property that does not exceed the background noise level (LA90,1h) by more than 10dB(A) during normal working hours (0700 to 1900). Where it will be difficult not to exceed the background level by more than 10dB(A) without imposing unreasonable burdens on the mineral operator, the limit set should be as near that level as practicable. In any event, the total noise from the operations should not exceed 55dB(A) LAeq,1h (free field). For any operations during the period 22.00 – 07.00 noise limits should be set to reduce to a minimum any adverse impacts, without imposing unreasonable burdens on the mineral operator. In any event the noise limit should not exceed 42dB(A) LAeq,1h (free field) at a noise sensitive property."

Activities such as soil-stripping, the construction and removal of baffle mounds, soil storage mounds and spoil heaps, construction of new permanent landforms and aspects of site road construction and maintenance.

Increased temporary daytime noise limits of up to 70dB(A) LAeq 1h (free field) for periods of up to eight weeks in a year at specified noise-sensitive properties should be considered to facilitate essential site preparation and restoration work and construction of baffle mounds where it is clear that this will bring longer-term environmental benefits to the site or its environs.

Where work is likely to take longer than eight weeks, a lower limit over a longer period should be considered. In some wholly exceptional cases, where there is no viable alternative, a higher limit for a very limited period may be appropriate in order to attain the environmental benefits. Within this framework, the 70 dB(A) LAeq 1h (free field) limit referred to above should be regarded as the normal maximum."

British Standard 5228-1:2009+A1:2014

10.15 Operational noise levels have been calculated in accordance with BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise. This standard sets out a methodology for predicting noise levels arising from a wide variety of open site activities and contains tables of sound power levels generated by a wide variety of mobile and fixed plant and machinery, including those typically found within mineral sites.

10.16 Noise levels generated by open site operations and experienced at local receptors will depend upon a number of variables, the most significant of which are likely to be:

- the periods of operation of the plant at the development site, known as the "on-time";
- the distance between the noise source and the receptor, known as the "stand-off";
- the attenuation due to ground absorption or barrier screening effects; and
- reflections of noise due to the presence of hard vertical faces such as walls.

10.17 Noise levels generated by construction or related operations and experienced at local receptors will depend on a number of variables, the most significant of which are:

- the sound power emissions of processes and/or plant;
- the periods of operation of processes and/or plant;
- the distance between the sources and the receptors;
- the presence of screening mounds, buildings or barriers;
- the potential reflection of sound; and
- soft ground attenuation.

10.18 Predicted noise levels in this chapter have been determined using proprietary noise modelling software, CadnaA, and the calculation methodologies contained in BS5228-1:2009+A1:2014. The sound power levels used as input data for the noise model are those contained in the standard, specified in the plant manufacturers' data sheets, from sound emission badges on plant or from field measurements of similar plant.

10.19 Due to the location of the proposed development relative to the nearby properties, the predictions have been based on 100% soft ground between the sources and receptor locations under weather conditions considered favourable for noise propagation leading to a conservative result.

10.20 The Standard also describes examples of acceptable limits for noise generated by construction operations at nearby sensitive receptor locations. The most simplistic being based upon the breach of fixed noise limits. The Standard states in paragraph E.2:

> "*Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut.*"

10.21 The paragraph goes on to state:

> "*Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:*
>
> - *70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise;*
> - *75 decibels (dBA) in urban areas near main roads in heavy industrial areas.*
>
> *These limits are for daytime working outside living rooms and offices.*"

Assessment Methodology

10.22 The assessment considers the likely noise impacts generated by operations associated with the proposed development, with reference to measured background noise levels at locations representative of the nearest noise-sensitive properties.

10.23 Environmental advantages and disadvantages have been identified and, where appropriate, mitigation measures and/or scheme changes to offset potentially adverse impacts have been suggested.

10.24 Operational noise levels generated by the various items of plant/machinery have been predicted to the façade to the nearby noise-sensitive receptors facing the site. The results have been assessed against criteria derived in accordance with the Planning Practice Guidance.

Significance Criteria

10.25 *The Guidelines for Environmental Noise Impact Assessment ('the Guidelines')* address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. In accordance with the guidelines the following must be determined:

- the noise impact;
- the noise effect; and
- the significance of the effect.

Operational Impact

10.26 The impact of operational noise upon residential receptors is determined with reference to PPG.

10.27 In accordance with PPG:

"Mineral planning authorities should aim to establish:

- *a noise limit at the noise-sensitive property that does not exceed the background noise level (LA90,1h) by more than 10dB(A) during normal working hours (0700 to 1900).*
- *Where this is not possible without imposing unreasonable burdens on the mineral operator, the limit set should be as near that level as practicable. In any event, the total noise from the operations should not exceed 55dB(A) LAeq,1h (free field).*
- *For any operations during the period 22.00 – 07.00 noise limits should be set to reduce to a minimum any adverse impacts, without imposing unreasonable burdens on the mineral operator. In any event the noise limit should not exceed 42dB(A) LAeq,1h (free field) at a noise sensitive property."*

10.28 Based on the above, the impact of operational noise upon residential receptors is as detailed in Table 10-1. The impact will first be identified for Hatfield Aerodrome operating in isolation. In the cumulative assessment, operational noise from Astwick Quarry (CEMEX) will also be considered.

Table 10-1
Operational Noise Residential Receptors – Impact Magnitude

Magnitude	Description
Major	Limit value exceeded by more than 5dB
Moderate	Limit value exceeded between 3.0 and 4.9dB
Minor	Limit value exceeded between 1.0 and 2.9dB
Negligible	Limit value exceeded between 0.1 and 0.9dB

Magnitude	Description
None	Limit value not exceeded

Effect

10.29 Generic noise effects are detailed in the Guidelines. Where an adverse impact is identified the guidelines present the following generic relationship between noise impact and noise effect:

- Negligible Impact Noise Effect: "Noise impacts can be heard, but do not cause any change in behaviour or attitude, e.g. turning up volume on television; speaking more loudly; closing windows. Can slightly affect the character of the area but not such that there is perceived change in the quality of life";
- Minor Impact Noise Effect: "Noise impact can be heard and causes small changes in behaviour and/ or attitude, e.g. turning up volume of television; speaking more loudly; closing windows. Potential for non-awakening sleep disturbance. Affects the character of the area such that there is a perceived change in the quality of life";
- Moderate Impact Noise Effect: "Causes a material change in behaviour and/or attitude, e.g. voiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in character of the area"; and
- Major Impact Noise Effect: "Significant changes in behaviour and/or inability to mitigate effect of noise leading to psychological stress or physiological effects e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory".

The Significance of the Effect

10.30 The significance of the noise effect will depend on the receptor type and its sensitivity to the noise impact. The sensitivity of the receiving environment is shown in Table 10-2.

Table 10-2
Sensitivity Criteria for Acoustic Receptors

Sensitivity	Definition
Very High	Residential properties (night-time), Schools and healthcare building (daytime)
High	Residential properties (daytime), Special Areas of Conservation, Special Protection Areas, Sites of Special Scientific Interest (or similar areas of special interest)
Medium	Offices and other non-noise producing employment areas
Low	Industrial areas

10.31 The sensitivity of the receiving environment together with the magnitude of impact defines the level of effect as shown in Table 10-3.

Table 10-3
Level of Effect – Magnitude / Sensitivity

Magnitude	Sensitivity			
	Very High	High	Medium	Low
Major	**Major**	**Major**	**Major**	**Moderate**
Moderate	**Major**	Moderate	Moderate	Minor
Minor	Moderate	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible
None	None	None	None	None

10.32 In the context of the EIA Regulations (refer to Chapter 1), where the purpose of the assessment is to identify 'significant effects', a 'Major' effect in Table 10-3 is considered to be significant.

BASELINE CONDITIONS

Baseline Conditions

10.33 For the previous assessment (as reported in the 2016 ES), environmental baseline noise surveys were undertaken on 23rd September 2015 to capture the prevailing noise climate at the nearby noise-sensitive receptor locations agreed with the local authority.

10.34 Updated baseline noise surveys have been undertaken on 27th May 2021 and 28th June 2021 to ascertain whether there have been any shifts in noise climate the measurement locations.

10.35 Access to Popefield Farm and The Lodge could not be gained during the 2016 assessment, therefore alternative, nearby, representative locations were chosen. For consistency, the same locations were used during the 2021 baseline survey.

10.36 Since the previous baseline monitoring was completed in 2015, a new residential development located on land adjacent to the garden centre/nursery to the west of the application site, called Jove Gardens, has been built. Therefore, as part of the updated baseline monitoring for 2021, a noise meter was installed at this location.

10.37 The noise monitoring locations were chosen as being representative of the nearest noise-sensitive receptors identified and are shown on **Figure HQ 10/1**, namely:

1) Popefield Farm, Hatfield Road, to the south;
2) The Lodge and No.403 St Albans Road West, to the south;
3) No.616 Hatfield Road, to the southwest;
4) Pasture View, to the west;
5) Walker Grove, to the east; and
6) Jove Gardens, to the west.

10.38 At each monitoring location the following parameters were measured:

- $L_{Aeq,T}$ - The A-Weighted equivalent continuous noise level over the measurement period.

- L_{A90} - The A-weighted background noise level, i.e. the noise level exceeded for 90% of the measurement period thereby excluding short duration noise events.
- L_{A10} - The A-weighted noise level exceeded for 10% of the measurement period, usually used to describe road traffic noise.
- L_{Amax} - The maximum A-weighted noise level during the measurement period.

Figure 10-1
Noise Monitoring Locations



10.39 The noise monitoring equipment used during the surveys is detailed in Table 10-3. The sound level meter was field calibrated before and after the surveys and no significant drift in calibration was found to have occurred. The calibration chain is traceable via the United Kingdom Accreditation Service (UKAS) to National Standards held at the National Physical Laboratory (NPL). The equipment had been calibrated within the 24-months preceding the surveys.

Table 10-3
Noise Monitoring Equipment

Location	Description of Equipment	Serial Number
1. Popefield Farm	Rion NL-52 Type 1 sound level meter	976174
	Rion NC-74 Acoustic calibrator	34478298
2. The Lodge and No.403 St. Albans Road West	Cirrus CR171B Type 1 sound level meter	G301839
	Cirrus CR515 Acoustic calibrator	93674

Location	Description of Equipment	Serial Number
3. No.616 Hatfield Road	Cirrus CR171B Type 1 sound level meter	G301707
	Cirrus CR515 Acoustic calibrator	94806
4. Pasture View	Cirrus CR171B Type 1 sound level meter	G079816
	Cirrus CR515 Acoustic calibrator	81268
5. Walker Grove	Cirrus CR171C Type 1 sound level meter	G301707
	Cirrus CR515 Acoustic calibrator	94806
6. Jove Gardens	Cirrus CR171C Type 1 sound level meter	G300561
	Cirrus CR515 Acoustic calibrator	87922

10.40 Weather conditions during the surveys were within the parameters suitable for baseline monitoring, being predominantly dry with 50-80% cloud cover. The temperature was between 14-17°C and wind speeds were below 5m/s throughout the survey periods.

10.41 The results of the baseline surveys are presented in full in **Appendix 10/2** and are summarised in Table 10-4. The noise climate in the area consisted of close and distant road traffic noise dependant on the receptor location, occasional aircraft overhead and natural sounds, such as birdsong, wind in nearby trees, etc.

Table 10-4
Measured 2021 Baseline Levels

Location	$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{Amax}
1. Popefield Farm	58.6	52.3	60.4	77.3
2. No.403 St. Albans Road West & The Lodge	73.4	56.8	77.2	88.8
3. No.616 Hatfield Road	72.2	60.6	75.8	87.9
4. Pasture View & Radio Nursery	45.5	42.5	47.0	61.2
5. Walker Grove & Nimrod Drive	44.0	32.3	40.0	75.5
6. Jove Gardens	45.5	41.0	47.2	71.0

10.42 Comparing the 2021 noise monitoring data to that measured in 2015 the following is noted:

- Ambient noise levels at Popefield Farm are similar, but the background noise level has increased slightly by 1.4dB(A);
- Ambient noise levels at No 403 St Albans Road and No 616 Hatfield Road have increased by around 4.1dB(A) and 5.3dB(A) respectively. Similarly, background noise levels have increased by 3.8dB(A) and 6.1 dB(A) respectively;
- Ambient noise levels at Pasture View/Radio Nursery have decreased by 5.9 dB(A), whilst the background noise levels have decreased by around 4.4 dB(A); and
- Ambient noise levels at Walker Grove and Nimrod Drive have decreased by 12.5dB(A) with background noise levels decreasing by 8.5 dB(A).

Environmental Design Measures

10.43 The operational layout, location of the processing plant, route of internal haul roads and location of screening bunds and fences have been designed to offer maximum protection from potential impacts, and to protect the amenity at nearby residential receptors.

10.44 Operational hours have also been limited to the following periods to protect the amenity of nearby residents during the most sensitive periods:

- Monday to Friday (07:00 to 18:00 hours).
- Saturday (07:00 to 13:00 hours).

10.45 A bund with an acoustic fence on top (having a combined height of 5m) has been included in the assessment, to run along the entire western boundary of the site, to protect the amenity at the nearby residential receptors.

Potential Impacts

10.46 As set out in Chapter 3 above, the development proposals would involve the winning and working, including processing, of 8Mt of sand and gravel over a period of approximately 32 years based on an annual output of 250,000tpa.

10.47 The quarry would be worked on a phased basis allowing for the stripping, extraction (with associated processing) and progressive restoration of the application site.

10.48 The web-based Planning Practice Guidance contains the current Government advice on noise emissions from minerals extraction sites in England and is directly applicable to assessing the potential noise impacts from the operational phases of the proposed development.

10.49 The absolute limit of 70dB $L_{Aeq,1hr}$ for temporary operations and noise limits for normal operations derived from the measured background noise levels in accordance with the current guidance, i.e. background +10dB, and detailed in Table 10-5, are considered appropriate for this assessment. The noise levels have been rounded to the nearest whole number.

Table 10-5
Derived Noise Limits for Normal Operations, free-field, dB

Location	Derived Background Noise Level, L_{A90}	Derived Noise Limit, LAeq,1hr
1. Popefield Farm	52.3	55
2. No.403 St. Albans Road West & The Lodge	56.8	55
3. No.616 Hatfield Road	60.6	55
4a. Pasture View	42.5	53
4b. Radio Nursery	42.5	53
5a. Walker Grove	32.3	42
5b. Nimrod Drive	32.3	42
6. Jove Gardens	41.0	51

10.50 Operational plant and equipment details have been provided by the applicant and are set out in Table 10-6 together with the adopted sound power levels or internal reverberant noise levels for plant buildings. The sound power levels are taken from manufacturers' datasheets, machine noise emission badges where available or the tables contained in BS5228-1:2009+A1:2014.

10.51 Plant buildings, i.e. the primary screen building, secondary screen building and crusher building, would be constructed as steel portal frame buildings which would be clad in 0.7mm plastic coated sheet steel which has a Weighted Sound Reduction Index of 24dB Rw. The internal reverberant noise levels within these buildings have been calculated within the CadnaA noise modelling software and take into account the noise generating sources within the building, the surface area of the buildings and an absorption co-efficient, alpha low, of 0.2.

Table 10-6
Plant & Equipment

Operation	Plant/Equipment Item (or similar)	Sound Power Level, L_{WA}, dB each
Construction, including Site Preparation & Plant Site Establishment	Caterpillar CAT336D 40t Hydraulic Excavator	105
	Volvo A30G Articulated Dumper	108
	Komatsu D51EX-22 Bulldozer	106
	CAT16M Motor-grader	108
	Komatsu WA380-7 Wheeled Loading Shovel (x2)	106
	Crane (x2)	107
	Telehandler	99
	Various Hand Tools (total)	104
	Delivery Trucks	111*
Extraction	Caterpillar CAT325D 30t Hydraulic Excavator	104
	Volvo A30G Articulated Dumper - S&G to plant site (x6)	108
	Caterpillar CAT336D 40t Hydraulic Excavator - Inter-burden removal	105
	Volvo A30G Articulated Dumper - Inter-burden removal (x4)	108
	Komatsu D51EX-22 Bulldozer - Inter-burden placement	106
Processing	Feed Hopper	97
	Primary Screening House - internal reverberant noise level	98
	Washing & Screening House - internal reverberant noise level	94
	Crusher House - internal reverberant noise level	100
	Sand plant	95
	Stockpiler Conveyors (x8)	81
	Komatsu WA380-7 Wheeled Loading Shovel (x2)	106
Transport	HGV - 32t Rigid Bodied Tipper Wagons (Sand & Gravel)	111*
	HGV - 32t Rigid Bodied Tipper Wagons (Inert Fill)	111*
	HGV - Mixer Trucks	111*

Construction Phase Assessment

10.52 The construction phase of the proposed development is estimated to take between 12 and 18 months to complete and has been assessed in accordance with the noise limits set out in British Standard 5228-1:2009+A1:2014 using the Potential significance based on fixed noise limits methodology. For the purpose of this assessment, the lower noise limit of 70dB(A) has been adopted.

10.53 Construction operations include the establishment of the site access road, stripping of soils in the processing plant area, lagoon areas and initial working phase, erection of the processing plant and construction of the perimeter screening bunds.

10.54 The predictions are based on the worst-case scenario when all activities are being undertaken simultaneously and when screening mound construction is taking place at its closest approach to the receptor being considered. For example, the predictions at Popefield Farm have been made during the construction of the screening bund directly adjacent to the property whilst construction operations within the plant site area are also being undertaken.

10.55 The results of the assessment are shown in Table 10-7. The predicted noise levels have been rounded to the nearest whole number.

Table 10-7
Predicted Noise Levels Generated by Construction Operations, free-field, dB

Location	Predicted Noise Level, $L_{Aeq,1hr}$	Derived Noise Limit, $L_{Aeq,1hr}$	Difference
1. Popefield Farm	61	70	-9
2. No.403 St. Albans Road West & The Lodge	59		-11
3. No.616 Hatfield Road	57		-13
4a. Pasture View	53		-17
4b. Radio Nursery	56		-14
5a. Walker Grove	48		-22
5b. Nimrod Drive	50		-20
6. Jove Gardens	59		-11

10.56 Table 10-7 shows that the worst-case predicted noise levels generated by construction operations would remain below the 70dB(A) noise limit adopted for the assessment.

10.57 It should also be noted that noise levels generated by construction operations are the worst-case noise levels with all operations combined, including the bund construction at the site boundary. Therefore, the predicted noise levels would only occur for a limited duration of the construction phase.

10.58 Based on the results of the construction noise assessment, mitigation measures to reduce potential impacts at the nearby receptors are considered unnecessary. However, good site management practices would be followed at all times.

Mineral Extraction and Processing Operational Assessment

10.59 Sand and gravel would be extracted using hydraulic excavators and transported to the plant site using a fleet of articulated dump trucks where it would be processed into a range of graded aggregates and sands which would be dispatched from the site typically using HGVs. Aggregates would be loaded using wheeled loading shovels.

10.60 Site restoration would take place on a phased basis following behind the working face. Overburden and inter-burden stripped from operational phases would be placed within the base of the previously worked phase, with imported inert infill materials placed on top of the site derived wastes and shaped to create the designed landscape features. Restoration is currently intended to be a combination of nature conservation, including grassland and small waterbodies, as well as amenity after-uses.

10.61 Based on an annual output of 250,000tpa with the majority exported by 32t rigid bodied trucks having a payload of around 20t, there would be five 32t trucks per hour visiting the site, i.e. 10 movements (five in and five out). In addition, there would also be 3 trucks (6 movements) delivering inert waste for restoration purposes.

10.62 Therefore, in total there would be 16 HGV movements along the site access road in a worst-case 1-hour period. The site speed limit along the access road will be 25kph (15mph).

10.63 Noise predictions represent a worst-case scenario in terms of plant and equipment locations where mobile equipment is operating at its closest approach to the nearby receptors or in locations where attenuation provided by the screening bunds is at a minimum, i.e. plant working away from the perimeter bund. For the extraction phase, predictions include extraction of the UMH and LMH materials, inter-burden removal and progressive restoration operations.

10.64 All predictions are based on plant operating at full power and 100% on-time. No allowance has been made for breaks and/or temporary shutdowns of the plant and equipment. As such the predictions are worst case and conservative.

10.65 The results of the predictions for worst-case operational noise levels in Phases A, B, F and G, i.e. the closest phases to noise-sensitive receptor locations, are shown in Table 10-8. The predicted noise levels have been rounded to the nearest whole number. The worst-case phase prediction is shown in bold.

Table 10-8
Predicted Operational Noise Levels

Location	Prediction Worst-case Noise Levels, dB				
	Phase A	Phase B	Phase F	Phase G South	Phase G North
1. Popefield Farm	53	50	**54**	51	49
2a. No.403 St. Albans Road West	**54**	48	48	45	44
2b. The Lodge	**55**	49	48	45	45
3. No.616 Hatfield Road	47	47	49	**52**	51
4a. Pasture View	45	45	46	47	**48**
4b. Radio Nursery	46	46	47	**49**	**51**
5a. Walker Grove	**42**	**42**	**42**	40	40
5b. Nimrod Drive	**43**	**43**	42	39	40
6. Jove Gardens	47	47	48	50	**50**

10.66 Table 10-9 shows the worst-case results assessed against the derived noise limits.

Table 10-9
Predicted Operational Noise Levels Generated, free-field, dB

Location	Predicted Noise Level, $L_{Aeq,1hr}$	Derived Noise Limit, $L_{Aeq,1hr}$	Difference
1. Popefield Farm	54	55	-1
2a. No.403 St. Albans Road West	54	55	-1
2b. The Lodge	55	55	0
3. No.616 Hatfield Road	52	55	-3
4a. Pasture View	48	53	-5
4b. Radio Nursery	51	53	-2
5a. Walker Grove	42	42	0
5b. Nimrod Drive	43	42	+1
6. Jove Gardens	50	51	-1

10.67 Table 10-9 shows that at the majority of locations the worst-case predicted noise levels generated by day-to-day operations would be at or below the derived noise limit adopted for the assessment.

10.68 At Location 5b (Nimrod Drive), there is a marginal exceedance of 1dB, which would not be noticeable and is therefore not of concern. As this still meets the 55dB $L_{Aeq,1hr}$ limit, this is considered to be acceptable with respect to Paragraph 022 of PPG.

10.69 It should also be noted that these are worst-case operational noise levels when all operations are taking place simultaneously and at their most exposed elevation or closest approach. For the majority of the life of the development operations would be undertaken at greater distances and/or lower elevations within the void and therefore noise levels are likely to be lower than those shown.

10.70 Table 10-9 also shows that the predicted worst-case noise levels would be equal to or slightly above the derived noise limit at Location 5b (Nimrod Drive). This would still fall into the LOAEL level of effect, however, as it meets the 55dB limit, as per Paragraph 022 of PPG. At the remainder of the Locations, the predicted worst-case noise levels would be below the derived noise limits thus falling into the NOEL level of effect. (refer to paragraph 10.23 for definitions of these effect levels).

10.71 Based on the results of the operational noise assessment, mitigation measures to reduce potential impacts at the nearby receptors, other than those included within the design of the site, are considered unnecessary. However, good site management practices would be followed at all times.

CUMULATIVE IMPACTS

10.72 The cumulative effect of worst-case operational noise levels at the proposed Hatfield Aerodrome Quarry development and the working area at CEMEX Hatfield Quarry (Astwick) have been assessed against the defined noise limit.

10.73 Table 10-10 summarises the cumulative effect. The cumulative noise level of operations at Hatfield Aerodrome and Astwick Quarry is presented, and a comparison is made with the noise limit at each Receptor.

10.74 The Astwick Quarry and background noise levels at the receptors have been rounded to the nearest whole number. The cumulative impact is assessed against the values contained in Table 10-1.

Table 10-10
Cumulative Impacts, free-field, $L_{Aeq, 1hr}$ dB

Location	Hatfield Aerodrome Level at Receptors	Astwick Quarry Level at Receptors	Combined Level at Receptors	Background Noise Level	Limit PPG Criteria	Difference between Cumulative level and Limit	Impact
1. Popefield Farm	54	26	54	52	55	-1	None
2a. No.403 St. Albans Road West	54	26	54	57	55	-1	None
2b. The Lodge	55	26	55	57	55	0	None
3. No.616 Hatfield Road	52	26	52	61	55	-3	None
4a. Pasture View	48	28[1]	48	43	53	-5	None
4b. Radio Nursery	51	28	51	43	53	-2	None
5a. Walker	42	27	42	32	42	0	None

[1] Operation noise levels were not predicted at this receptor in the Astwick Quarry assessment, so the predicted noise level from the nearby Radio Nursery receptor has been used as a guide.

Location	Hatfield Aerodrome Level at Receptors	Astwick Quarry Level at Receptors	Combined Level at Receptors	Background Noise Level	Limit PPG Criteria	Difference between Cumulative level and Limit	Impact
Grove							
5b. Nimrod Drive	43	28	43	32	42	+1	Minor
6. Jove Gardens	50	28[1]	50	41	51	-1	None

10.75 Table 10-10 shows that the impact in accordance with PPG is 'None' for all receptors, apart from Nimrod Drive where the impact is defined as 'Minor'. As this still meets the 55dB $L_{Aeq,1hr}$ limit, this is considered to be acceptable with respect to Paragraph 022 of PPG.

10.76 Table 10-10 shows that the cumulative noise level at the receptors from the operation of both quarries are no higher than noise from the Hatfield Aerodrome in isolation. This is due to the noise level from the Astfield Quarry at receptors being significantly (i.e. typically between 15-30dB) below the noise levels from Hatfield Quarry.

10.77 It should be noted that at Location 4b (Radio Nursery) the given existing measured noise levels were measured away from the working nursery, at Pasture view, so the limit is lower than it needs to be.

10.78 The predictions are based on worst case scenarios with 100% on time and all operations occurring simultaneously at the closest position to the receptor. It is considered that noise levels would be less than that calculated.

MITIGATION MEASURES

Good Site Practice

10.79 Surface minerals extraction sites, by their nature, generate noise due to the use of heavy machinery. During the proposed development the potential risk of noise impacting on the nearby noise-sensitive receptors would vary depending on the type of activities being undertaken at the time and the effectiveness of any noise control measures that are in place. The site design incorporates several features that provide mitigation against potential noise impacts; these features include, but are not limited to:

- the construction of perimeter screening mounds/bunds between operations and noise-sensitive receptors.
- acoustic fencing.
- enclosing the processing plant with buildings.
- the use of broadband reverse warning systems on all mobile machinery.

10.80 In addition to the noise mitigation measures incorporated into the site design, good site management practices and other specific measures would also provide additional noise mitigation. These measures would include:

- activities within the review site would be undertaken in locations where noise attenuation from existing landforms would maximise the benefit to the noise-sensitive properties;
- internal haul routes would, wherever possible, be routed such that separation distances to the noise sensitive properties is maximised;
- all haul roads would be kept clean and maintained in a good state of repair to avoid unwanted rattle and "body slap" from vehicles;
- all mobile plant used at the proposed extension would have noise emission levels that comply with the limiting levels defined in EC Directive 86/662/EEC and any subsequent amendments;
- all mobile plant and heavy goods vehicles entering the site will move in a circular pattern to minimise, as far as is practical and safe, noise from reverse warning systems;
- plant would be operated in a proper manner with respect to minimising noise emissions, for example, minimisation of drop heights and no un-necessary engine revving;
- plant would be subject to regular maintenance. All plant at the site would be fitted with effective exhaust silencers and would be maintained in good working order to meet manufacturers' noise rating levels. Defective silencers would be replaced immediately;
- plant that is used intermittently, would be shut down when not in use; and,
- pumps, generators and compressors would be located behind existing screening mounds or landform, would be electrically powered and fitted with an acoustic covers where necessary. Diesel powered pumps, generators and compressors, if used, will be installed within acoustic enclosures.

10.81 In view of the calculated levels for receptors on the western boundary it is proposed that a noise management plan would be prepared. This plan would detail noise monitoring to be undertaken at the receptors, the mitigation measures to be employed and the procedures to be followed should a breach of the noise limits occur. This noise management plan is given in **Appendix 10/3**.

CONCLUSIONS

10.82 This noise assessment has considered the potential for noise generated by the proposed Hatfield Quarry development to give rise to noise impacts at the nearest noise-sensitive receptors to the application site. The assessment has been made against noise limits derived in accordance with the relevant guidance based on the results of baseline noise measurements made during a period representative of a typical working day. The assessment has found that:

- worst-case noise levels generated by construction operations would remain below the 70dB(A) noise limit adopted for the assessment. It should also be noted that construction noise levels would also remain below the 55dB(A) noise limit derived in accordance with the relevant guidance for day-to-day operations except during construction of the perimeter screening mounds to the south and west;
- worst-case noise levels generated by operational activities, including all truck movements on the access road, would be at or below the noise limits derived in accordance with the relevant guidance at most locations. At Location 5b (Nimrod Gardens), the noise limit has been marginally exceeded, but the level is below 55dB and so is considered acceptable in accordance with Paragraph 022 of PPG;
- the cumulative effects of operational noise from both the proposed Hatfield and Astfield quarries would result in an impact of 'None' at all of the receptors, apart from Location 5b (Nimrod Gardens) where the impact is considered to be 'Minor'. Consequently, the level of

effect at all of the receptors is 'None', apart from Location 5b (Nimrod Gardens) where the level of effect is 'Minor.

10.83 Based on the results of the assessment, it is considered that all practical means have been employed in the design of the site to protect the amenity of the nearby noise-sensitive receptors. A number of good site practice measures have been suggested to further reduce the risk of any potential adverse noise impacts.

10.84 It is concluded that noise should not pose a material constraint for proposed development.

APPENDIX 01
Glossary of Terminology

To assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0dB (the threshold of hearing) to over 120dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table 01-1
Sound Levels Commonly Found in the Environment

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

Acoustic Terminology

dB (decibel) — The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).

dB(A) — A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

LAeq — LAeq is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.

L10 & L90 — If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L10 is the level exceeded for 10% of the time and as

such can be regarded as the 'average maximum level'. Similarly, L90 is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L10 index to describe traffic noise.

LAmax

L_{Amax} is the maximum - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

APPENDIX 02

Measured Baseline Noise Levels

Table 02-1
Measured Noise Levels, Popefield Farm (representative position), free-field, dB

Date	Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
28/06/2021	13:45	57.7	51.6	60.1	71.2
28/06/2021	14:00	57.3	51.8	60	69.8
28/06/2021	14:15	60.5	54.3	62.9	77.3
28/06/2021	14:30	58.3	52.8	60.7	73.9

Table 02-2
Measured Noise Levels, 403 St Albans Road West / The Lodge, free-field, dB

Date	Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
27/05/2021	10:45	73.3	56.7	77	86.1
27/05/2021	11:00	73.6	57.9	77.3	88.8
27/05/2021	11:15	73.4	55.3	77.1	86.4
27/05/2021	11:30	73.4	56.8	77.3	88

Table 02-3
Measured Noise Levels, 616 Hatfield Road, free-field, dB

Date	Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
27/05/2021	10:45	72.6	63	76.1	83.1
27/05/2021	11:00	72.6	58.3	76.3	86.6
27/05/2021	11:15	71.9	59.5	75.5	83.5
27/05/2021	11:30	71.8	61.7	75.2	87.9

Table 02-4
Measured Noise Levels, Pasture View, free-field, dB

Date	Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
28/06/2021	12:30	45.1	42.3	46.6	61.2
28/06/2021	12:45	44.9	42.4	46.3	58.8
28/06/2021	13:00	45.5	42.9	47	59.6
28/06/2021	13:15	45.2	42.1	46.8	56.8
28/06/2021	13:30	45.8	43.2	47.7	57.7
28/06/2021	13:45	44.2	41.8	45.9	54.5
28/06/2021	14:00	45.6	42.5	47.5	60.1
28/06/2021	14:15	46.4	43.9	47.8	59

28/06/2021	14:30	46	43.1	47.6	59.1

Table 02-5
Measured Noise Levels, Walker Grove, free-field, dB

Date	Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
27/05/2021	10:15	47.8	33.6	46.8	75.5
27/05/2021	10:30	36.5	32.4	38.2	60
27/05/2021	10:45	44.5	31.9	40.9	64.3
27/05/2021	11:00	38.4	32.1	39	59.6

Table 02-6
Measured Noise Levels, Jove Gardens, free-field, dB

Date	Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
28/06/2021	11:15	46	42.3	48.1	54.1
28/06/2021	11:30	46.9	40.9	48.1	64.9
28/06/2021	11:45	45.2	42.5	46.9	56.4
28/06/2021	12:00	45	41.1	46.8	58.5
28/06/2021	12:15	46.2	40.5	49.7	64.1
28/06/2021	12:30	47	41.7	49.7	62.9
28/06/2021	12:45	47.2	42.3	50.6	58
28/06/2021	13:00	43.9	41.2	45.2	57.9
28/06/2021	13:15	45.1	40.9	47.3	58.8
28/06/2021	13:30	42.8	40	44.2	63.5
28/06/2021	13:45	42	39.2	43.3	64.9
28/06/2021	14:00	43.8	40.9	44.2	64.5
28/06/2021	14:15	45.5	42.1	47	69
28/06/2021	14:30	46.3	40.5	49.5	71

APPENDIX 03
Noise Management Plan

General Noise Management

Plant Operations

Within the constraints of efficient site operations and the requirements of the relevant British Standards, the following is advisable;

- limit the use of particularly noise plant, i.e. do not use particularly noisy plant early in the morning;
- limit the number of plant items in use at any one time;
- plant maintenance operations should be undertaken as far away from noise-sensitive receptors as possible;
- reduce the speed of vehicle movements;
- ensure that tailgates are shut and locked before leaving the tipping area;
- ensure that operations are designed to be undertaken with any directional noise emissions pointing away from noise-sensitive receptors where practicable;
- when replacing older plant, ensure that the quietest plant available is considered wherever possible; and
- sequence activities so that early development provides screening to the nearby noise-sensitive receptors from subsequent operations.

Training

The current site induction programme and site rules should be revised to include good working practice instructions for site staff/managers and contractors to help minimise noise whilst working on the site.

Good working practice guidance/instructions should include, but not be limited to, the following points:

- avoid un-necessary revving of engines;
- plant used intermittently should be shut down between operational periods;
- avoid reversing wherever possible;
- ensure that tailgates are shut and locked before leaving the tipping area;
- driving carefully and within the site speed limit at all times; and
- report any defective equipment/plant as soon as possible so that corrective maintenance can be taken.

Maintenance

A weekly inspection of all plant shall be made to ensure that:

- Any plant found to be requiring interim maintenance should be identified by the operator and repairs undertaken by a qualified engineer as soon as possible;

- Regular and effective maintenance of plant can play an important part in keeping noise levels under control; and
- Always ensure that doors fitted to acoustic enclosures around fixed plant remain closed; the fitting of self-closing mechanisms is advisable.

Public Relations

It is essential to maintain good public relations with local residents at nearby noise-sensitive receptor locations:

- endeavour to be good neighbours, i.e.:

  - Get to know the neighbours; be concerned about them and try to understand their problems; encourage them to know the site personnel; listen as well as talk,
  - hold regular liaison meetings and provide information as freely as possible,
  - create a good impression by running a tidy and efficient site,

- ensure there are lines of communication, e.g.:

  - nominate a point of contact for issues relating to the site,
  - support a liaison committee,
  - give advance notice and explanation of activities that might cause complaint,
  - keep systematic records of complaints and the remedial actions taken,
  - follow up complaints with correspondence and action,

- ensure that site staff are environmentally aware and are trained to cope with issues;
- do not rely on the letter of the law where there are obvious problems, but culpability cannot be easily proved;
- be prepared to be flexible, and
- try to co-operate and avoid being adversarial.

Action Plan

A noise monitoring scheme, outlined in the following section, details the actions which should be undertaken following a complaint being received by a local resident.

Noise Monitoring Scheme

In the event of a noise complaint being received the noise monitoring scheme will prompt remedial actions to ensure ongoing future compliance.

Noise Sensitive Locations

The closest noise-sensitive receptors are considered to be:

- Pasture View, Nursery Gardens and Jove Gardens to the west;
- 616 Hatfield Road, Popefield Farm, 403 St Albans Road West and The Lodge to the south; and
- Walker Grove and Nimrod Drive to the east.

Where possible, the noise monitoring locations selected should allow noise information that is representative of the identified locations to be gathered without the necessity to access private land.

Noise Measurement Equipment

Environmental noise levels shall be measured using sound level meters conforming to Type 1 or better of the latest versions of British Standard EN 61672-1:2003 *Electro-acoustics, Sound Level Meters, Specifications*.

The sound level meters shall be field-calibrated before and after monitoring using an acoustic calibrator conforming to the latest version of British Standard EN 60942:2003 *Electro-acoustics – Sound Calibrators*.

All sound level meters shall be calibrated to a traceable standard by a UKAS-accredited laboratory, or equivalent, within a 24-month period before the survey and all acoustic calibrators shall be calibrated to a traceable standard by a UKAS-accredited laboratory, or equivalent, within a 12-month period before the survey.

Noise Survey Methodology

Noise measurements shall be undertaken by a suitably qualified person at the complainant's property. The noise measurements shall be undertaken during a normal working day, during typical working hours, avoiding meal breaks and times when plant and equipment within the site are not operational.

Noise levels shall also be measured during a period when the site is not operational, for example during a lunch break or shift change, to enable the noise levels attributable to site operations alone to be determined by decibel subtraction.

The sound level meter shall be positioned such that the microphone is located 1.2 to 1.5 metres above local ground level in free-field conditions, i.e. at least 3.5 metres from the nearest vertical, reflecting surface, at all survey locations.

Operational noise levels shall be measured over a minimum of a one-hour period during the normal working day.

A note of the prevailing weather conditions shall be made at the time of the survey and the audibility of the site shall be noted at each measurement location during each measurement period.

Reporting

On completion of each noise survey a report shall be required in a format suitable for submission to the Local Planning Authority.

The report shall contain, as a minimum:

- the results of the noise survey, i.e. noise levels during site operations and noise levels with the site not operating, in terms of the L_{Aeq}, and L_{A90} noise indices;
- details of the instrumentation used including calibration details;
- details of the prevailing weather conditions on the day of the survey;
- details of the audibility of the site; and
- details of any extraneous noise sources that influenced the noise climate.

Non-compliance with Noise Limits/Receipt of Complaint

If it is determined that the measured noise levels from Site operations are exceeding the consented noise limits at the complainant's property an investigation shall be instigated within one working day to identify the cause of the non-compliance

Such an investigation may involve the identification and cessation of the activity or activities considered to be the cause of the non-compliance/complaint and/or the investigation of mitigation measures to reduce the noise emission levels from the activity or activities, for example the replacement of noisy plant with quieter alternatives and/or the use of temporary screening mounds.

Any deviation from agreed working practices shall be identified immediately and conformance to the working practice reinstated.

A further noise survey shall be undertaken as soon as possible following the implementation of mitigation to re-assess the noise levels against the consented noise limits.

A complaints response system shall be maintained by Robert Brett & Sons Limited for the site, enabling any complaints regarding noise to be reported and appropriate action taken.

Data Retention

The noise survey data obtained during the monitoring shall be retained by Robert Brett & Sons Limited or by agreement by their sub-consultant for the full duration of the permitted operations.

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INTRODUCTION

11.1 Hatfield Aerodrome lies between the conurbations of Hatfield to the east and St Albans to the west on land to the north of the A1057. The airfield ceased operation in the 1990's and the easternmost part, on the fringe of Hatfield itself and incorporating the former hangars and other main buildings, was redeveloped in the 1990s/00s. That area now houses a business park, the University of Hertfordshire campus, areas of housing and a landscaped linear park.

11.2 The remaining undeveloped areas of former airfield are identified in the adopted Hertfordshire Minerals Local Plan 2007 as a 'Preferred Area' for sand and gravel extraction[1]. Pursuant to this allocation, Brett Aggregates Limited instructed Bioscan (UK) Ltd in July 2014 to commence a programme of ecological surveys to inform the design and subsequent assessment of a proposal for mineral extraction on leasehold land within the western part of the Preferred Area. This ecological assessment is contained within Chapter 11 of the "2016 ES" and associated Appendices which accompanied a planning application lodged in January 2016 (refer to Chapter 1 above). This application was refused in January 2021.

11.3 Brett Aggregates Limited commissioned SLR in March 2021 to conduct an updated Ecological Impact Assessment (EcIA) and targeted update of the ecological baseline (*i.e.* wintering bird surveys, habitat survey and great crested newt *Triturus cristatus* Habitat Suitability Index (HSI) Assessment) to inform a re-application for a similar development proposal. In addition to updating baseline and ecological assessment for this proposed development, a Biodiversity Net Gain metric assessment, using the Natural England Metric 3.0[2], has been undertaken and is reported separately (see **Appendix 11/1**). This chapter of the ES therefore presents the findings of the updated EcIA and follows the format of the earlier ES Chapter contained in the 2016 ES.

11.4 The proposal is for the phased extraction of approximately eight million tonnes of sand and gravel, with on-site processing, and for progressive restoration. Further details of the proposed development are set out in Chapter 3 of this ES. In the light of the recent refusal to grant planning permission, the scheme has been amended from that assessed in the 2016 ES as follows:

- the erection and operation of a concrete batching plant has been removed;
- no de-watering of the lower mineral horizon (LMH) and the standoff for mineral extraction in the LMH to the bromate plume has been increased to 100m;
- The access road from the quarry entrance has been moved 5m east and additional screening is proposed.

11.5 The undeveloped parts of the airfield have since the early 2000's been managed as an informal country park (Ellenbrook Fields) and are today crossed by permissive paths with interpretation sign-boards stationed at a few key locations. Parts are also actively grazed or mown. The restoration scheme has been drawn up with the intention of reinstating similar uses in the future, and in cognisance of national and local nature conservation objectives, the site's geology and its historical and present-day ecology.

[1] https://www.hertfordshire.gov.uk/services/recycling-waste-and-environment/planning-in-hertfordshire/minerals-and-waste-planning/minerals-planning/minerals-planning.aspx

[2] Natural England (July 2021) http://publications.naturalengland.org.uk/publication/6049804846366720

As part of this process the Hertfordshire and Middlesex Wildlife Trust have been actively consulted in drawing up the restoration proposals.

11.6 This Ecological Impact Assessment (EcIA) considers the likely significant effects of the proposal on ecological resources following the guidelines set out by the Chartered Institute of Ecology and Environmental Management (CIEEM 2006, 2016, 2018)[3]. The following chapters set out the information sources that have informed the assessment (including the methodologies and results of surveys undertaken); the baseline ecological conditions existing at the site; the key ecological receptors; the likely significant ecological effects on these receptors arising; the mitigation measures proposed if and where appropriate to prevent, reduce or compensate for any of these effects adjudged to be significant and adverse; and finally the predicted residual effects after these measures have been employed (including any positive benefits arising).

ECOLOGICAL CONTEXT AND PRE-EXISTING SURVEY DATA

Physical and Ecological Context of the Site

11.7 As noted from Chapter 2 above, the application site covers an area of 87.1ha occupying the western part of the former British Aerospace landholding, as illustrated on Drawing HQ 2/1 in Chapter 2 above (and edged in red on **Drawing HQ 11/1** to this chapter – see **Appendix 11/3**). It is bordered to the south by the A1057, with a nursery/garden centre and small-scale development off Oaklands Road bordering the site to the south-west. An existing sand and gravel quarry (Hatfield CEMEX Quarry) adjoins the site to the northwest, with the CEMEX landholding also including the mature woodland of Home Covert immediately to the north. Bordering the application site to the north-east is the remaining undeveloped area of the former airfield, with the University of Hertfordshire sports pitches adjoining the site to the south-east.

11.8 The mineral deposit comprises glacio-fluvial origin sands and gravels in two horizons lying over the Upper Chalk (Upper Mineral Horizon (UMH) and Lower Mineral Horizon (LMH)) and separated by a boulder clay interburden layer. In the natural condition, the upper deposit would be covered by chalky boulder clay and silty drift soils, mapped as belonging to the Hamble 2 association[4], and tending to moderately droughty with some seasonal waterlogging[5]. However, the modern depth of soil cover on the site has been influenced by significant episodes of disturbance during the 20th Century and there are localised areas on the site where more stony and gravelly subsoils are apparent at the surface.

11.9 In terms of regional ecological characteristics and restoration priorities, the application site sits within Hertfordshire's "Hornbeams and Heaths" Character Area (Part of NCA111 – North Thames Basin) as described by the Hertfordshire Ecological Network Mapping project[6]. The nature conservation priorities for this area include neutral and acid grassland, heathland and open woodland and parkland.

[3] CIEEM (2018) Guidelines for Ecological Impact Assessment. https://cieem.net/resource/guidelines-for-ecological-impact-assessment-ecia/

[4] Jarvis et al (1984). Soils and their Use in Eastern England. Soil Survey of England and Wales Bulletin No. 13. Harpenden

[5] Other sources (e.g. De Haviland Plain landscape character area description) identify Gresham series soils as present on the airfield site

[6] https://www.hertswildlifetrust.org.uk/sites/default/files/2018-07/Hertfordshire%27s%20ecological%20networks%20report%20-%20Final%20Aug%202014.pdf

Pre-existing Surveys

11.10 The former airfield has been subject to several previous campaigns of ecological surveys dating back to 1999. These have been undertaken in connection with the now completed redevelopment of the easternmost portion, the subsequent management of the remainder as an informal country park, and more recently the promotion of the eastern area for housing. These studies are discussed in chronological order below.

11.11 Cresswell Associates reported on an ecological appraisal of the airfield in June 1999, and subsequently produced a management plan for the undeveloped balance of the site in July 2001, a report on botanical surveys (also in July 2001) and a report on ground-nesting birds and brown hare surveys (December 2001). Esus Forestry and Woodland also produced a survey and management plan for Home Covert, Round Wood and Cut Field Wood, north of the airfield, in April 2001.

11.12 This body of work was reviewed and updated in an ecological assessment produced in 2008[7] . This report also set out the results of an updated desk study, Phase 1 habitat survey and a protected species assessment. It assessed the grassland resource on the site as falling short of qualification as a County Wildlife Site, identifying the adjoining Home Covert as of greater habitat and botanical interest. The site's population of great crested newts was assessed as unlikely to be of more than local value, although no surveys of population size were carried out. The report refers to both slow worm and grass snake having been recorded in 1999-2001 and suggested that common lizard and/or adder could also be present, by virtue of the extent of suitable habitat. Barn owl was noted as present (in both 2001 and 2008) and attention was drawn to the high density of skylark and meadow pipit, and the presence of other declining farmland birds (lapwing was recorded as a breeding species in 2001). Reference was made to local records of four bat species, and to the presence of a number of mature trees and buildings potentially suitable for use by roosting bats, although no bat surveys were carried out. The presence of brown hare was also noted, with signs of badger, but no setts, found.

11.13 Based on recommendations for further survey work set out in the above study, and to inform proposals to open up the remainder of the airfield for public recreation, further targeted surveys were commissioned and carried out during 2010[8] . These included detailed surveys for great crested newts, reptiles, breeding birds and water voles. These surveys identified:

- a 'medium' population of great crested newts occupying ponds scattered across the airfield site and potentially linked to a wider metapopulation centred on the adjoining gravel pits to the north;
- no reptiles, despite the availability of abundant suitable habitat;
- a breeding bird assemblage assessed to be of 'importance in a local context' with high densities of skylark, meadow pipit and whitethroat and with cuckoo and barn owl also present;
- no evidence of water voles or otter *Lutra lutra*; and

[7] Cresswell Associates/Hyder Consulting (2008) Ecological Appraisal of Hatfield Green. Report No. WX82186/C1186/V1 Produced for Goodman UK Ltd.

[8] Cresswell Associates/Hyder Consulting (2010) Hatfield Green Summary of Ecological Surveys. Briefing document Produced for Goodman UK Ltd

- the presence of badger setts.

11.14 The above survey work informed a review and updated ecology assessment carried out by LDA Design in 2013[9] in connection with the promotion of land to the east for residential development, although no further survey work was commissioned at that time.

11.15 Separately, in 2013, the Wildlife Sites Survey team of the Hertfordshire and Middlesex Wildlife Trust carried out a series of habitat and botanical survey visits, focussed on the eastern and northern part of the airfield, but covering around half of the Brett application site[10] . They classified the areas of former airfield they surveyed as a mixture of species-poor and locally quite species-rich, predominantly neutral, grasslands, with ranker areas and areas of scrub and ponds. They also noted a number of local indicator species and concluded that much of the site met the criteria for designation as a Local Wildlife Site (LWS).

11.16 Further baseline survey work for the land to the east of the application site was commissioned by Goodman in 2015. This survey work, which was carried out by LDA Design in parallel with the Bioscan surveys of the application site, and in some instances overlapping, included an Extended Phase 1 Habitat Survey and a great crested newt habitat suitability survey[11] and latterly a great crested newt eDNA survey of certain ponds[12] . The results have been shared with Bioscan and, where relevant to the assessment, are assimilated into the baseline conditions section of this chapter.

11.17 Brett Aggregates commissioned SLR to update baseline surveys at the application site in 2021 with the agreed scope to include wintering bird surveys, habitat survey and great crested newt Habitat Suitability Index (HSI) Assessment. Results of these surveys are reported in this Chapter.

SCOPING

Scoping Submission

11.18 In connection with the EIA reported in the 2016 ES a request for a scoping opinion was submitted to Hertfordshire County Council in June 2015.

11.19 A subsequent request for Scoping Opinion was provided to Hertfordshire County Council in March 2021. SLR's report sets out that the likely effects are to populations of protected fauna, notably great crested newts and badgers, and that mitigation for these species is proposed. The report also highlights that short-term impacts on existing biodiversity resources, including grasslands and associated species, would be offset by the proposed restoration of the site and creation of new habitats with potential to provide a net biodiversity gain. The request for scoping opinion stated that the EIA would include a chapter on biodiversity, with an updated EcIA supported by a refreshed desktop study, updated walkover survey and a baseline feasibility approach to Biodiversity Net Gain (BNG) Assessment.

[9] LDA Design (2013) Hatfield Green Ecology Assessment. Report produced as Appendix 2 to a 'Landscape and Energy Strategy' for Goodman UK Limited.

[10] Wise, et al (2013) Wildlife Site Survey Report for: Ellenbrook Fields. Unpublished report for Hertfordshire and Middlesex Wildlife Trust.

[11] LDA Design (2015). Hatfield EIP Allocation – Ecology Appraisal. Report for Goodman UK Ltd.

[12] LDA Design (2015). Hatfield EIP Allocation: GCN eDNA Report. Report for Goodman UK Ltd.

Previously prescribed mitigation measures for great crested newt, bats, badgers, barn owl and reptiles were summarised therein and would be reviewed and updated where appropriate.

Scoping Responses

11.20 Hertfordshire County Council's formal scoping opinion was received in July 2021. In brief, this response stated:

- Baseline surveys should be updated to ensure that habitats and species are accurately recorded;
- Proposals to avoid further habitat loss and fragmentation and make provisions for net biodiversity gain should be delivered at each stage of the project;
- Proposals should provide net gains for biodiversity and contribute to local ecological networks;
- Support and maintain green infrastructure and landscape.

BASELINE DATA COLLECTION

Methodology

Desk Study & Data Review

11.21 A broad range of data sources have been consulted and in many instances re-consulted over time in assembling information on the baseline ecological conditions on the site, and putting it into the appropriate context, as follows:

Web-based and Archive Search

11.22 A search of relevant internet sources included the on-line 'Magic' database managed by Natural England (http://magic.defra.gov.uk/home.htm) for information on statutory designations and priority habitats, the planning portals of both Welwyn Hatfield and St Alban's Council for information from any ecological surveys submitted with current or recent planning applications for adjoining land, and web-based literature on the relevant Natural Area and on the Hertfordshire and Middlesex Wildlife Trust's 'Living Landscapes' and ecological networks projects. Local special-interest websites, including the Hertfordshire Natural History Society, Herts Bird Club and Herts and Middlesex Bat Group were also accessed for sighting data and other records pertaining to the site, and to put the records obtained from fieldwork into context.

11.23 A review of Bioscan's in-house data archive was also conducted to support the 2016 ES, with results included in the summarised data below.

Environmental Records Centre

11.24 A formal data request was submitted to the Hertfordshire Environmental Records Centre (HERC) in October 2015 and again in May 2021. Information was received on protected / notable species records as well as areas designated for their nature conservation interest. HERC were asked to provide records within a 2km radius of the centre of the site (taken as TL199083).

Herts and Middlesex Wildlife Trust

11.25 As part of the consultation exercise for the 2016 ES, the Herts and Middlesex Wildlife Trust were consulted on appropriate restoration principles and objectives, and a visit to their offices was made in order to review data related to the ecological networks project and unpublished information they held from surveys of the site carried out in 2013. The latter survey data was later obtained once appropriate landowner release-permissions had been secured.

Previous Consultancy Survey Reports

11.26 The reports of previous ecological surveys of the airfield were obtained from LDA Design in October and November 2015. These reports comprise the following:

- Ecological Appraisal of Hatfield Green (Cresswell Associates/Hyder 2008)
- Hatfield Green Summary of Ecological Surveys (Cresswell Associates/Hyder 2010)
- Hatfield Green Ecology Assessment (LDA Design 2013)
- Hatfield Ecology Appraisal (LDA Design 2015)
- Hatfield GCN eDNA Report (LDA Design 2015)
- Chapter 11 'Ecology' and supporting baseline Appendices within the 2016 ES (BioScan and SLR Consulting Ltd, 2015 - 2016)

11.27 The data within these reports is summarised and drawn upon where relevant in the description of baseline conditions.

Barn Owl Nest Box Monitoring Data

2014

11.28 By agreement with Goodman, four barn owl nest boxes and one kestrel nest box have previously been erected on mature trees falling within the application site, with additional boxes in other parts of the Goodman and/or adjoining CEMEX landholdings. These boxes are monitored by Barry Trevis[13], who is also the warden of the nearby Herts and Middlesex Wildlife Trust reserve at Lemsford Springs. Information from the monitoring undertaken of these boxes is supplied by Mr Trevis to Goodmans, who in turn supplied a report (relating to the 2014 breeding season) to Bioscan. Mr Trevis also supplied the same information to Bioscan via the Wildlife Trust.

2021

11.29 The current landowner was contacted in May 2021 to share any knowledge of ongoing barn owl and kestrel box monitoring and whether he receives data as per the previous landowner. Detail is provided in the baseline section below.

11.30 Information from all the above listed sources has been used in this assessment where corroborated by

[13] British Trust for Ornithology Ringing Licence Number A3821

up-to-date survey or otherwise considered to still be relevant to assessing the baseline ecological status of the land.

Habitat Surveys

2014/15

11.31 An extended Phase 1 survey of the application site by Bioscan took place over several dates during the course of 2014 and 2015. An initial walkover survey and Phase 1 habitat mapping was carried out in July 2014, with completion and refinement taking place on subsequent visits and ultimately finalised in November 2015. The many visits for bird surveys and other purposes between these two dates were also used to augment and refine the mapping and botanical recording element, ensuring coverage across all seasons. In this way, a detailed picture of current habitat distribution and quality has been built up using the Phase habitat 1 survey approach (Joint Nature Conservation Committee, 2016)[14]. This technique provides an inventory of the broad habitat types present on the site and targets areas of more interest which are then subject to more detailed examination either at the time or on subsequent visits. Additional detail was provided in the form of representative lists of species compiled for each habitat (an 'extended' Phase 1 survey).

11.32 The habitats on the site were also assessed to see if any qualify as 'priority' habitats, as listed by the Government further to the provisions of sections 40-41 of the Natural Environment and Rural Communities Act 2006. Where appropriate this involved consideration of grassland community assemblages up to NVC/Phase 2 level (i.e. against the community classifications set out in the National Vegetation Classification[15]).

11.33 The Habitat Map (Figure 1 from Chapter 11 of the 2016 ES) is contained in **Appendix 11/2** of this Chapter for completeness.

11.34 The site's hedgerows were further assessed for their potential to meet the ecological criteria of an 'Important' hedgerow as defined by the Hedgerows Regulations 1997. This involved assessing the number of woody species (as listed on Schedule 3 of the Hedgerows Regulations 1997) in a sample 30m stretch of hedgerow (for hedgerows between 100m and 200m in length two 30m stretches of hedgerow were surveyed and an average taken, and for hedgerows in excess of 200m in length, three 30m stretches of hedgerow were surveyed and an average taken). Relevant features along each hedgerow were recorded, such as ditches, banks, standard trees, lack of gaps, parallel hedgerows, multiple connections with other hedgerows/woodland/ponds, and woodland ground flora (as listed on Schedule 2 of the Hedgerows Regulations 1997).

11.35 A hedgerow is considered to be 'Important' under the Regulations if it, amongst other criteria, has:

- An average of at least 7 woody species per 30m length;
- Averages at least 6 woody species per 30m and has at least 3 qualifying additional features (e.g. ditches and banks);

[14] JNCC, (2016), Handbook for Phase 1 habitat survey - a technique for environmental audit

[15] Rodwell, J (ed) British Plant Communities Volumes 1-5. Cambridge

- Averages at least 5 woody species per 30m and has at least 4 qualifying features;
- Averages at least 6 woody species per 30m including one of: black poplar *Populus nigra*, large-leaved lime *Tilia platyphyllos*, small-leaved lime *Tilia cordata* or wild service-tree *Sorbus torminalis*; and
- Averages at least 4 woody species per 30m, has at least 2 qualifying features and is adjacent to a public right of way (PROW).

11.36 For the purposes of this assessment, a hedgerow was also considered to be 'species-rich' if it contained five or more native woody species per 30m section on average, and 'species-poor' if it contained four or fewer native woody species per 30m section on average.

2021

11.37 An updated habitat survey was conducted on the 16th and 22nd April 2021 in accordance with the UK Habitat Classification (UKHab) methodology. The habitats were mapped (**Appendix 11/3**) using the UKHab Primary Habitat Hierarchy including mandatory secondary habitat codes (numbers 10-41), for all locations within the site, where accessible. The minimum mapping unit (MMU) used was 25m^2.

11.38 During the habitat survey, attention was afforded to searching for any signs of protected or notable plant or faunal species that could constitute a material consideration in planning terms (e.g. evidence of badger sett creation and activity and potential bat roosting opportunities). These incidental records were recorded and are presented on a separate map[16]. The results were used to inform and/or augment the separate targeted work on great crested newts, reptiles, bats, badgers, birds and invertebrates that is described below.

Bat Surveys

Bat Activity Survey

2015

11.39 Bat surveys were conducted in 2015.

11.40 The principal aim of the bat activity surveys was to assess the overall levels of bat activity within the site, the bat species composition, and to identify any landscape features used for commuting/foraging. The methodology for this survey was derived from the industry-standard BCT Survey Guidelines at that time. The survey effort is in line with the updated BCT Survey Guidelines[17] for a large site of low quality bat habitat. The guidelines state for this category that there should be '*one visit per transect each season (spring, summer and autumn)*'.

11.41 Transect surveys were undertaken in June, July and September 2015. During the June visit the site was walked as a continuous transect by a single surveyor, and for the July and September visits two surveyors each covered separate areas of the site (broadly the northern part of the site and the

[16] Also contained in the Hatfield Aerodrome Confidential Badger Appendix (Appendix 11-5) for detail relating to this species (not included within this assessment for confidentiality).

[17] Collins, J. (ed.) (2016). *Bat Surveys for Professional Ecologists: Good Practice Guidelines* 3rd edition. Bat Conservation Trust.

southern). The transects not only followed existing landscape features such as hedgerows, footpaths, woodland edges, but due to the relative paucity of upstanding landscape features, the transect also covered the more open aspects of the site (see Figure 2 for the transect routes walked on each survey).

11.42 Surveyors were equipped with an Anabat (SD1, SD2 or Express) and a Pettersson D240X time expansion and heterodyne bat detector connected to a MP3 recorder. The Pettersson is employed in addition to the Anabat to aid real-time identification in the field, to allow reactive effort to be directed towards obtaining good recordings of any unusual or uncertain species and to provide supplementary recordings for use in corroboration of the Anabat data more generally.

11.43 The June transect survey commenced at around sunset and the subsequent July and September 2015 transect surveys commenced approximately one hour after sunset, following on from emergence surveys (see below). Table 11-1 below provides the details of each survey.

Table 11-1:
Dates, Timings and Weather for each Bat Activity Survey in 2015

Date	23/06/2015	29/07/2015	07/09/2015
Cloud	1/8	8/8	3/8 at start to 0/8 at end
Wind	Little/ none	Little/ none	Little/none
Moon	1st quarter	Not visible	Not visible
Start temperature (°C)	16	13	14
End temperature (°C)	12	12	9.5
Start time	21:33	21:53	20:35
End time	23:40	23:46	22:11
Sunset	21:25	20:53	19:35

11.44 Analysis of the survey recordings was undertaken at the Bioscan offices using propriety software (Analook for the Anabat recordings and Batsound v10.0 software for the D240X recordings).

11.45 The Anabat system records in 15 second segments when sound (bats or otherwise) triggers the detector. For example, if one bat is detected for two seconds one sound file is created; if four bats are recorded continuously for 15 seconds again one sound file is created. Identifying and labelling bat calls within recording segments was undertaken with the aid of published species call parameters[18] , as well as Bioscan's in-house library of calls. The label(s) for each sound file were then tallied to produce the file count for each transect. It should be noted that registration or call tallies derived from Anabat recordings reflect the number of sound files for each species rather than reflecting the number of bats present. The D240X recordings were used to corroborate and/or cross-check uncertain or difficult calls

[18] J Russ, (2012). British Bat Calls: A Guide to Species Identification. Pelagic Publishing

identified from the Anabat analysis.

2021

11.46 Bat surveys were not updated in 2021.

Automated Bat Survey

2015

11.47 Additional detectors were deployed at various locations around the site in 2015 to collect data over a longer time-series, helping to improve certainty about the overall species-composition present, but also providing additional data on foraging and commuting activity specific to certain landscape or habitat features. The methodology for this survey was derived from the BCT Survey Guidelines[19] for a large site of low quality bat habitat. This category recommended that there should be '1 [automated detector] location per transect. *Data to be collected on 4 consecutive nights each season (spring, summer and autumn)'.*

11.48 Anabat Express detectors were deployed in three different locations in each of June, July and September 2015 and were left to record for a minimum of four nights (Figure 2 provides the locations where each Anabat Express was deployed). Table 11-2 below provides details of the duration and weather conditions of each static survey period.

Table 11-2:
Details of the Automated Bat Detector Surveys

Month of Survey	June	July	September
Deployment location	A1	A2	A3
Start date	23/06/2015	29/07/2015	07/09/2015
End Date	29/06/2015	12/08/2015	16/09/2015
Total number of nights recorded	6	15	9
Average mean night-time temperature over each survey period (°C)[20]	14.7	14.6	11.7
Lowest recorded night-time temperature over each survey period (°C)[20]	9	6	7.5

2021

[19] Hundt, L. (2012). Bat surveys – good practice guidelines, 2nd edition. Bat Conservation Trust.

[20] The Anabat Express contains a temperature logger and records the temperature approximately every five minutes. This temperature information is downloaded concurrently with the extraction of the bat calls.

11.49 No bat activity surveys were conducted in 2021.

Bat Tree Roost Assessment

2015 and 2021

11.50 The mature trees within the application site were subject to an initial (ground-based) examination to identify any features that could be of potential use for roosting bats (such as splits, cracks, rot holes, coverings of ivy, peeling bark, or similar), using binoculars where necessary. The potential of each tree to support roosting bats was then ranked in accordance with the following criteria:

- **Negligible Potential**: Trees which lack any significant opportunities for bats to roost.
- **Low Potential**: Trees with minor roosting opportunities such as loose bark plates, small cracks in limbs or ivy cover.
- **Medium Potential**: Trees with medium roosting opportunities such as significant areas of flaking bark or relatively large splits or cracks.
- **High Potential**: Trees with major roosting opportunities such as woodpecker holes or large, deep cracks or fractures, thereby having the potential to support roosting bats all year round.

Built Structure Inspection

2015 and 2021

11.51 One built structure within the application site (B1 on Figure 2 in **Appendix 11/2**) is a former radio beacon/aerial lighthouse building located in the east of the application site. This was subject to an external and internal structural inspection (from the ground only – the internal structure being visible from that level) for evidence of bats, and the likelihood of it being utilised by roosting bats assessed.

Bat Emergence Survey

2015

11.52 Two trees were identified on the site that appeared to a) fall within the proposed extraction area and b) contained features that could be utilised by roosting bats (see T1 and T2 on Figure 2 for their location). Two surveyors undertook emergence surveys of these trees prior to the July and September 2015 bat activity surveys. The surveys commenced approximately 15 minutes prior to sunset and were concluded approximately one hour after sunset when it became too dark to determine with certainty if any bats subsequently detected had emerged.

2021

11.53 No bat emergence surveys were conducted in 2021.

Great Crested Newt survey

2015

11.54 Few ponds are indicated as being present on the site by OS mapping; however, it rapidly became apparent during the early phases of survey work that in addition to these the site contains a number of both well-established and recent artificial ponds not shown on OS maps. Whilst undertaking the wintering bird survey visits of the site, the locations of all waterbodies present within and immediately adjacent to the site were therefore recorded on a map. In total eight waterbodies or waterbody complexes were found within the application site boundary, with an additional three accessible for survey outside of the site but within close proximity. Figure 3 in **Appendix 11/4** provides the locations of these waterbodies.

11.55 Around one of these, Pond P1, fencing has been erected and a sign indicates that great crested newts are present. Efforts were made to establish the origin of this sign and whether it related to past mitigation work (e.g. speculated to relate to the use of the site as a film set in the 1990's). However neither Goodman nor the Hertfordshire and Middlesex Wildlife Trust were able to confirm its origin.

11.56 Presence/absence and population size class assessment surveys for great crested newts were carried out between April and June 2015 following industry-standard methodology[21] . Survey visits were conducted between the 29th April 2015 and 9th June 2015. The commencement of the survey was deliberately delayed because of the exceptional run of low overnight temperatures experienced in southern England during spring 2015. In the event, sub-optimal overnight temperatures lasted well into May, but it was evident from the survey results that this did not preclude amphibian activity.

11.57 During each survey visit a minimum of three survey techniques were used. The techniques were primarily egg-searches, torching and bottle trapping; although, netting was deployed in later visits within certain waterbodies that were close to drying out. A minimum of four survey visits to each waterbody was made in this period, with those ponds confirmed as supporting great crested newts subject to a total of six visits to obtain data from which to derive a broad population 'size class' for assessment purposes.

11.58 Each waterbody was also assessed for its habitat quality and/or potential to support great crested newts using the Habitat Suitability Index[22] (HSI) system. This allocates scores to ten physical attributes of the waterbody and its surrounding environment that are known to affect the likelihood of newt presence, and is now the standard repeatable technique applied when assessing how suitable a waterbody is for great crested newts. A HSI score of 1 suggests optimal habitat and 0.01 suggests unsuitable habitat; although, the system has to be applied with caution as it is not sufficiently precise to be able to conclude that a pond with a high score would support newts, or that a pond with a low score would not[23].

2018 and 2021

11.59 In 2018, SLR conducted an update HSI and presence/absence population size class assessment survey

[21] Following English Nature (2001*): Great Crested Newt Mitigation Guidelines*

[22] Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M. (2000). Evaluating the suitability of habitat for the Great Crested Newt *(Triturus cristatus).* Herpetological Journal 10(4), 143-155.

[23] Amphibian and Reptile Groups of the United Kingdom advice note 5: Great Crested Newt Habitat Suitability Index. ARG UK May 2010

of Ponds 1-11, between April and May. Survey visits were conducted between the 12th April 3rd May which is within the peak breeding time of mid-April to mid-May.

11.60 In 2021, SLR conducted an update HSI survey of Ponds 1-11. The survey was conducted across two survey dates alongside the habitat survey on the 16th and 22nd April. Although, presence/absence surveys were not undertaken on this occasion, submergent vegetation was inspected for the presence of newt eggs where accessible.

Reptile Survey

2015

11.61 The presence of reptiles was assessed on the initial visits as being likely, due to the large expanses of suitable habitat in the form of rough grassland over the majority of the site. In order to sample the species assemblage and derive broad population size-class assessments, a reptile survey using artificial refugia was conducted over the spring and early summer of 2015. A total of 466 refugia, comprising a mixture of corrugated bitumen sheeting and roofing felt approximately 0.5m^2 in size, were placed within the five areas of highest quality reptile habitat within the site. The refugia were placed in each of these areas to a density of approximately ten per hectare. For general surveying purposes a minimum of five to ten refugia per hectare was recommended[24] . Therefore, the density of the refugia placed on the site was on the higher side of that suggested by applicable best practice guidelines. Each refugium was checked on at least seven occasions throughout the survey period (due to the high number of refugia deployed not all could be checked during suitable weather conditions during one visit).

11.62 Refugia of this type heat up faster than the surrounding substrate, and they therefore serve as an attractant for reptiles to bask on and shelter beneath in order to attain optimal body temperature more efficiently. The technique thereby allows these often elusive animals to be detected more readily.

11.63 Table 11-3 below provides the number of refugia used in each reptile survey area R1-R5 and the size of each area. Figure 3 provides the locations of these areas.

Table 11-3:
Size and Number of Reptile Refugia uses in each Area

Reptile Area	Approximate Size of Area (ha)	Number of Refugia Deployed
R1	14	140
R2	7.5	80
R3	11	110
R4	9	126
R5	1	10
Total	**42.5**	**466**

[24] Froglife (1999) Reptile Survey: an introduction to planning, conducting and interpreting surveys for snakes and lizard conservation. Froglife Advice Sheet 10. Froglife, Halesworth

2020/21

11.64 Incidental sightings of reptiles and notes on changes to suitable habitat were recorded during the wintering bird surveys of 2020/21 and the habitat survey of 2021. Detailed surveys for reptiles were not updated.

Bird Survey

Wintering Birds

2014/15

11.65 Continuous transect surveys of wintering bird activity within the application site were undertaken in each of November 2014, December 2014, January 2015 and February 2015. The methodology essentially replicated the territory mapping technique used for breeding surveys and based on the British Trust for Ornithology's (BTO) Common Bird Census[25] technique. The surveyor attended the site soon after sunrise in the morning of each visit and walked a continuous transect around the site taking in all field boundaries and concentrations of scrub, as well as more open habitats, and recording all visual and aural registrations of birds present onto a large scale map using standard species identification and activity notation. The start and end point and direction of travel along transects was varied between visits to avoid sequential bias.

11.66 Due to the known historic use of the site by owls, including in particular short-eared owl *Asio flammeus* and barn owl *Tyto alba*, a visit was made in the late afternoon/ early evening of the January visit in order to detect these species. The visit involved walking the site as a transect concentrating on areas perceived to offer high quality owl foraging habitat.

11.67 Table 11-4 below provides the details of each wintering bird survey visit.

Table 11-4:
Details of Wintering Bird Survey Visits

Date	28/11/2014	15/12/2014	20/01/2015	20/01/2015	25/02/2015
Start time	07:25	08:10	08:10	15:27	06:55
End time	10:30	11:15	11:30	17:10	11:35
Sunrise	07:41	08:02	07:57	-	07:01
Sunset	-	-	-	16:27	-
Cloud	8/8	0/8 to 8/8	0/8 to 8/8	8/8	8/8
Wind	Breezy at times	Little/no wind	Little/no wind	Little/no wind	Little/no wind

[25] Bibby, C. J., N.D. Burgess, D.A. Hill, and S.H. Mustoe. 2000. Bird census techniques. 2nd ed. Academic Press, London and San Diego, Calif. 302 p.

Temperature	10°C	6°C to 8°C	-3.5°C rising to 4°C	4°C dropping to 3.5°C	5°C to 8°C
Notes	Survey commenced prior to sunrise in order to detect owls		Heavy frost	Dusk survey	Light drizzle through most of survey. Clearing towards end.

2020/21

11.68 Three wintering bird surveys were conducted by SLR between mid-January and early March 2021, following the same methodology as described above. Two of the surveys were conducted just after sunrise and a third survey was conducted later in the day, taking in the dusk period, in order to increase the chances of detecting barn owl.

11.69 Table 11-5 below provides the details of each wintering bird survey visit.

Table 11-5:
Details of Wintering Bird Survey Visits 2020/21

Date	15/01/21	09/02/21	09/03/21
Start time	08:00	11:55	06:50
End time	13:05	17:35	12:00
Sunrise	08:00	-	06:28
Sunset	-	17:04	-
Cloud	8/8 to 7/8	7/8 to 8/8	0/8 to 1/8
Wind	Light wind	Moderate wind	Light wind
Temperature	1°C to 3°C	1°C to 2°C	3°C to 12°C
Notes	Dry	Light snow flurries at the beginning and end	Dry

Breeding Birds

2015

11.70 A continuous transect breeding bird survey of the application site was undertaken during each of April, May and June 2015. The methodology is based up the application of the territory mapping technique as forms the basis of the British Trust for Ornithology's (BTO) Common Bird Census[26] approach. The

[26] Bibby, C. J., N.D. Burgess, D.A. Hill, and S.H. Mustoe. 2000. Bird census techniques. 2nd ed. Academic Press, London and San Diego, Calif. 302 p.

surveyor attended the site just after sunrise and walked a continuous transect around the site taking in all field boundaries, as well as the more open aspects of the site, recording all visual and aural observations of birds present onto a large scale map using standard species identification and behavioural notation. Table 11-6 below provides the details of the breeding bird survey visits.

Table 11-6
Details of Breeding Bird Survey Visits

Date	15/04/2015	21/05/2015	24/06/2015
Start time	06:15	05:30	05:31
End time	10:25	10:00	09:48
Sunrise	06:04	04:58	04:41
Cloud	0/8	0/8	7/8- high cloud
Wind	Little/no wind	Little/no wind	Westerly 2-3
Temperature	5.5°C to 12.5°c	4.5°C to 13.5°C	14°C to 18°C

11.71 Surveys were only carried out during suitable weather; conditions that could suppress bird activity or otherwise compromise the effectiveness of the technique (e.g. strong wind, rain) were avoided.

11.72 Each species recorded during the survey was assigned to one of the following evidence categories[27] to assess the likelihood of breeding within the study area. The highest category observed over the three visits is used to inform the breeding status assessment for each species.

- Non-breeding
  - Flying over.
  - Feeding on the site only (likely to be breeding off-site).
- Possible Breeder
  - Species observed in suitable nesting habitat.
  - Singing male in suitable nesting habitat.
- Probable Breeder
  - Pair present in suitable nesting habitat.
  - Territory present between survey visits.
  - Courtship/ displaying.
  - Visiting probable nest.
  - Agitated behaviour from a parent bird.

[27] Derived from the methodology of the UK Breeding Bird Atlas 2007-11

- Nest building.

- Confirmed Breeding
  - Recently fledged young in suitable nesting habitat.
  - Adults entering or leaving a nest site.
  - Adult carrying a faecal sac or food.
  - Nest with eggs.
  - Nest with young.

11.73 At the completion of the three surveys, the visit maps were analysed and the number of apparent territories, based on individual singing males or other indications of territory holding/breeding, were counted to arrive at a site territory total for each species.

2020/21

11.74 Incidental sightings of breeding birds were recorded during the survey over 2020 and 2021. These are included within **Appendix 11/4**.

Barn Owl Monitoring

11.75 SLR is aware of the location of three of the owl boxes on site (refer to **Appendix 11/4** and **Appendix 11/6**). The bases of the trees on which they were located were checked for the presence owl pellets during the habitat walkover survey in April 2021.

Badger Survey

2014/15

11.76 Badger field signs searched for include prints, push-throughs, snagged hair, latrines, foraging evidence, paths and active or disused setts. Setts, if noted, were assessed for activity and classified according to standard criteria[28]. Incidental observations of badgers, where made, were recorded during the bat and bird surveys undertaken during 2014 and 2015.

2020/21

11.77 Incidental observations of badger setts and signs of their activity were searched for during the wintering bird surveys of 2020/21 and the habitat survey of 2021. Results are provided in a confidential map and **Appendix 11/5** (that would not be made available in the public domain).

Invertebrate Survey

2015

11.78 A specific assessment of the invertebrate interest of the study area was conducted between June and

[28] Harris, Cresswell & Jefferies (1989) Surveying Badgers. The Mammal Society. Blandford Forum, Dorset.

October 2015. Three different surveyors, with different specialist skills, were involved in the site visits in order to maximise the potential for recording different invertebrate groups.

11.79 The site was visited and terrestrial invertebrates were sampled on a total of five occasions as follows:

- 13th May 2015;
- 12th June 2015;
- 7th August 2015;
- 7th September 2015; and
- 7th October 2015.

11.80 On these dates, terrestrial invertebrate sampling was undertaken by direct observation and by the following active sampling methods:

- Sweep-netting. A stout hand-held net was moved vigorously through vegetation to dislodge resting insects. The technique may be used semi-quantitatively by timing the number of sweeps through vegetation of a similar type and counting selected groups of species;
- Beating trees and bushes. A cloth tray, held on a folding frame, was positioned below branches of trees or bushes and these were sharply tapped with a stick to dislodge insects. Black or white trays were used depending upon which group of invertebrates was being targeted for search. Insects were collected from the tray using a pooter – a mouth-operated suction device; and
- Suction sampling. This consisted of using a converted leaf blower to collect samples from grass and other longer ground vegetation. The sample was then everted into a net bag and the invertebrates removed with a pooter. The advantage of suction sampling is that it catches species which do not fly readily or which live in deep vegetation. It is particularly productive for Coleoptera, some Diptera and Arachnida.

11.81 In addition, overnight moth trapping was undertaken over the following nights:

- 13-14th June 2015;
- 28th-29th July 2015;
- 12th-13th August 2015; and
- 7th-8th October 2015.

11.82 The methods used during each nocturnal visit comprised the following:

- MV light-trapping. Mercury-vapour (mv) light bulbs were used to attract nocturnal insects - especially moths. These bulbs emit ultra-violet light at a wavelength which causes moths to be attracted, but the wavelength used is harmless to humans. The bulbs were mounted over catching chambers filled with cardboard egg-trays. Moths that entered the chambers and settled on these trays were examined. Bulbs were powered from portable generators. Light trapping is the single most effective method of recording moths. It is also valuable for recording some other nocturnal insect groups; and

- Actinic light trapping. Small size actinic traps, operated from 12-volt burglar-alarm batteries were left running from early evening to the following morning. These units are discrete because, whilst still having an output in the safe zone of the UV range, their light output in the visible part of the spectrum is reduced; thus, they can be tucked away in undergrowth at the side of a track without passers-by noticing them. For the same reasons, they attract moths and other insects from a much shorter distance and so the resultant catch is usually more representative of the habitat selected, in comparison with that in mercury vapour traps which attract flying species from a much wider area of the countryside.

11.83 The moth recording was not designed to be exhaustive. The objective was to obtain representative samples of the moth fauna from the various habitats present to ensure complete sampling coverage.

11.84 Passive sampling. This occurs in the absence of the surveyor. The use of a malaise trap for this purpose was regarded as highly desirable, but given the near constant presence of the general public on the site it was judged likely that the trap would probably not survive. Consequently, malaise trapping was judged impractical, and pitfall trapping was used.

- Pitfall trapping. Vending-machine cups or similar were placed in the ground with the rim flush at, or slightly below, the surface. A fluid was added, containing ethylene glycol, sodium chloride and formalin with a little detergent to reduce surface tension. Traps may be covered or uncovered and are typically left in position for a month at a time. Holes made in the sides of the cups a couple of centimetres below the rim permit flood or rain water to drain without the traps over-flowing and the catch becoming lost. Invertebrates simply fall into the traps. This is the single most effective means of recording ground beetles *(Carabidae)* but is also effective for rove beetles *(Staphylinidae),* some other beetle groups, spiders and most non-insect soil-dwelling arthropods.

11.85 Survey constraints. The main constraint of the invertebrate survey related to the digging up of the pitfall traps by dogs or foxes. Therefore, a limited amount of data was obtained from using this survey technique.

2021

11.86 Dedicated invertebrate surveys were not repeated in 2021; however, the surveyors were tasked with recording evidence of presence as incidental records within other surveys carried out.

Baseline Conditions

Nature Conservation Designations

11.87 The application site is not subject to any statutory or non-statutory nature conservation designation.

11.88 There are no International/European Statutory designated sites within 10km of the site boundary.

11.89 Table 11-7 below lists additional (non-International/European) Statutory designated sites within 5km of the application site boundary.

Table 11-7

Statutory Nature Conservation Sites within 5km of the Application Site Boundary

Site Name	Designation	Brief Description	Distance and Orientation from Site
Colney Heath	Local Nature Reserve	One of the few remaining acid heathlands in Hertfordshire.	South. 1.9km
Howe Dell	Local Nature Reserve	Comprises a stream lying at the bottom of a deeply incised valley containing a woodland.	East. 2.3km
Oxleys Wood	Local Nature Reserve	A woodland providing habitat for insects and common birds.	South East. 2.4km
The Wick Wood	Local Nature Reserve	Ancient semi-natural woodland, with a seasonal pond and an informal playing field.	West. 2.5km
Stanborough Reedmarsh	Local Nature Reserve	A wet woodland, reed marsh, and river bank.	North East. 3.3km
Watercress Wildlife Site	Local Nature Reserve	Old watercress beds and allotments. Bounded by the River Ver.	South West. 4.6km
Wheathampstead Development Centre	Local Nature Reserve	Secondary woodland with scrub and unimproved neutral grassland.	North West. 4.7km

11.90 In 2015, HERC notified of 23 non-statutory Local Wildlife Sites (LWS) within 2km of the application site boundary. In 2021 this was restricted to 15 LWS sites. Maps for the 2021 search are provided within **Appendix 11/7** with a list of the sites and a description (the previous chapter details the desk study in 2015).

11.91 The nearest LWS is 'Home Covert & Round Wood' LWS which adjoins the northern boundary of the application site. The description provided by HERC for this site states the following:

> *'Two areas of ancient semi-natural broadleaved woodland. Home Covert is predominantly Pedunculate Oak (Quercus robur) and Ash (Fraxinus excelsior) with remnant Hazel (Corylus avellana) coppice with some old Hornbeam (Carpinus betulus), including pollards, around the woodland edge. Sycamore (Acer pseudoplatanus) is frequent and Pedunculate Oak has been planted. Other canopy species include Betula pendula, Field Maple (Acer campestre) and rare Beech (Fagus sylvatica). The ground flora supports woodland indicators such as Bluebell (Hyacinthoides non-scripta), Dog's Mercury (Mercurialis perennis), Yellow Archangel (Lamiastrum galeobdolon) and Common Dog-violet (Viola riviniana) along with a good fern flora of Broad Buckler-fern (Dryopteris dilatata) and Male Fern (Dryopteris filix-mas). Round Wood is primarily a Hornbeam coppice with some Ash and Silver Birch standards and an occasional Holly (Ilex aquifolium) with Bluebell below. The bank along the eastern margin supports old coppiced Hornbeam, and Pedunculate Oak and Field Maple also occur at the woodland edge. Wildlife Site criteria: Ancient Woodland Inventory site; woodland indicators.'*

11.92 Reviewing the Ancient Woodland Inventory provided by HERC highlighted that Home Covert was not

mapped as an Ancient Woodland Inventory site, and a review of old map evidence similarly suggested it was secondary in origin. Subsequent correspondence with HERC revealed that the site was designated as a LWS on the basis of the presence of ancient woodland indicator species, rather than due to it being ancient woodland per se.

11.93 In 2015, HERC noted a total of seven Ancient Woodland Inventory Sites present further afield and within 2km of the application site boundary. In 2021 three sites were identified within the same boundary. The closest, Oak Wood, is located approximately 0.75km to the north-west. **Appendix 11/7** provides the list of these sites provided for the 2021 desk study request.

11.94 The application site is identified as lying within an opportunity area for 'acidic' grassland and/or heath creation in the Hertfordshire Ecological Networks Project.

Habitats

2015

11.95 The application site contained the following main habitat types in 2015 (categorised in accordance with the JNCC Phase 1 habitat survey methodology):

- Unmanaged neutral grassland
- Species-poor semi-improved mown grassland
- Grazed neutral grassland
- Neutral to acidic grassland
- Early succession communities with calcareous element
- Tall ruderal
- Hedgerows
- Scattered / dense scrub
- Recent plantation
- Waterbodies
- Watercourse / wet ditches
- Recently disturbed/bare ground
- Hard surfaces

11.96 A description of each habitat recorded, with an account of the dominant or more notable plant species recorded in each, is fully described within Chapter 11 of the 2016 ES; along with a full list of vascular plant species recorded on the application site.

2021

11.97 This updated assessment describes the habitats on site with reference to the UKHab methodology, making mention of notable differences to the previous habitat conditions described using the JNCC

methodology.

- Primary habitat classifications include:
  - Other lowland dry acid grassland
  - Other neutral grassland
  - Modified grassland
  - Hedgerow (Priority Habitat)
  - Eutrophic standing waters
  - Standing open water and canals
  - Lines of trees
  - Blackthorn scrub
  - Bramble scrub
  - Mixed scrub
  - Building
  - Other lowland mixed deciduous woodland
  - Developed land/sealed surface
- Secondary habitat classifications include:
  - Scattered scrub
  - Scattered trees
  - Scattered rushes
  - Tall herb
  - Ruderal/ephemeral
  - Plantation
  - Semi-natural woodland
  - Secondary woodland
  - Fresh water man-made
  - Freshwater natural
  - Grazed
  - Bare ground
  - Unmanaged
  - Green lane
  - Nature reserve
  - Temporary water bodies
  - Ditch
  - Recreation ground

11.98 A description of each habitat follows below, with an account of the dominant or more notable plant species recorded in each. The primary habitats are discussed in full and the secondary habitats are discussed in context with primary habitats that they are contained within.

u1b5 - Building

11.99 A former radio beacon/aerial lighthouse building is located on the eastern edge of the application site (shown as B1 on Figure 2 in **Appendix 11/2**). The building is a small, single storey height structure with a flat roof covered with roofing felt, constructed from redbrick (single skin), steel ceiling beams, antenna array and mast. The building is open on two sides where a door and window would have

originally been, therefore is open to the elements. Internally, there are a few electrical fixtures and metal cabinets left over from when the building was in use.

g3c Other Neutral Grassland (Previous Phase 1 Designation: Unmanaged Neutral Grassland

11.100 This is the dominant habitat type across large areas of the site, presenting itself as a more or less homogenous expanse of tall graminoid dominated vegetation punctuated by scattered saplings and small bushes, which locally become closer-spaced and mark a transition to scrub. The community owes much of its outward homogeneity to the dominance of a few bulky grass species, of which false oat-grass *Arrehantherum elatius* is the most typical; although, in some areas it is subordinate to cocksfoot *Dactylis glomerata* in cover. A broad range of other grass species make up the rest of the bulk in these outgrown swards, typically including timothy *Phleum pratense*, Yorkshire fog *Holcus lanatus*, couch *Elytrigia repens*, meadow foxtail *Alopecurus pratensis* and occasionally, tall fescue *Festuca arundinacea*. Finer leaved species include rough meadow grass *Poa trivialis*, creeping bent *Agrostis stolonifera* and red fescue *Festuca rubra* – the increasing dominance of the last of these marking a transition to typically more herb-rich examples. Of more scattered occurrence are perennial rye-grass *Lolium perenne,* soft brome *Bromus hordaceus*, barren brome *Anisantha sterilis,* sweet vernal grass *Anthoxanthum odoratum*, common bent *Agrostis capillaris,* smooth meadow grass *Poa pratensis* and more localised still are wood false brome *Brachypodium sylvaticum*¸ tufted hair-grass *Deschampsia cespitosa* and crested dog's-tail *Cynosurus cristatus*. A few clumps of the non-native pampas grass *Cortaderia sp*. and pendulous sedge *Carex pendula* (here likely to derive from imported material or of garden-escape origin) are also present in the central part of the site.

11.101 Herb diversity in these swards varies from areas where ruderals are prominent, to fairly species-rich swards, within which are a restricted suite of species indicative of semi-natural 'unimproved' conditions. The former areas are characterised by the presence of stinging nettle *Urtica dioica*, creeping thistle *Cirsium arvense*, hogweed *Heracleum sphondylium* and cleavers *Galium aparine* while the latter areas, the most diverse of which are often signposted by an increase to co-dominance of red fescue amongst the graminoid component, are commonly characterised by stands of common knapweed *Centaurea nigra*, with a variety of other herb species. These include, variously, wild carrot *Daucus carota*, bird's-foot trefoil *Lotus corniculatus*, stone parsley *Sison ammomum*, common toadflax *Linaria vulgaris,* ox-eye daisy *Leucantheum vulgare,* goat's-beard *Tragopogon pratensis*, smooth tare *Vicia tetrasperma,* tufted vetch *Vicia cracca*, red clover *Trifolium pratense,* hedge bedstraw *Galium mollugo,* lady's bedstraw *Galium verum,* red bartsia *Odontites vernus*, hawkweed ox-tongue *Picris hieracioides* meadow vetchling *Lathyrus pratensis* and hairy tare *Vicia hirsuta.* A notable find was the county-rare green-winged orchid *Orchis morio,* present in a relatively short-sward area in the central part of the site (see target note 1).

11.102 In general, there appears to be a good representation of the various sub-communities of *Arrehatherum elatioris* grassland recognised as community MG1 in the NVC. The F. rubra subcommunity MG1a, including both the *Bromus sterilis* and *Epilobium angustifolium* variants is certainly present, as is the *Urtica dioica* sub-community MG1b (including the *Artemisia vulgaris* variant). The more species-rich knapweed-dominated stands on the site also conform to the *Centaurea nigra* sub-community MG1e, with a particular concentration of these in the central part of the site along the course of the former run-way, and potentially indicative of the exposure of low-fertility soils beneath the now-removed concrete. In some ways, the chief interest of these grasslands, which are not dissimilar to the type of unmanaged grasslands commonly found on road-verges, over and above their unbroken extent (which is unusual), is the presence in one place of several sub-communities of MG1.

11.103 In 2021, the main difference across the grassland is the amount of scrub present. More areas have self-set with new scrub growth and the previous scattered saplings and small bushes have matured into small trees or merged into larger areas of scrub. Only a few additional species were recorded due to the time of year that the update survey was carried out. Some of the species listed above were not recorded, for example green-winged orchid flowers between May to June as do many of the other species described above. Also, the weather in the weeks preceding the survey has been poor for April. Additional species recorded within the grassland include; drooping brome, common ragwort, wild marjoram, germander speedwell, broad-leaved dock, broad-leaved willowherb, dog violet, cinquefoil, white dead nettle, spear thistle, black medick, hawkweed sp., lesser chickweed, couch, colt's-foot, oxeye daisy, ribwort plantain, common sorrel and greater plantain. A few rushes are present within the grassland close to waterbodies in the centre of the site where these areas become flooded seasonally.

11.104 Ant hills are found predominantly in the central and southern areas of the application site.

g3c, 520 – Other Neutral Grassland, Recreation Ground (Previous Phase 1 Designation - Species-poor Semi-improved Mown Grassland)

11.105 This habitat occurs in the western part of the application site, occupying one large irregularly shaped area that is maintained by periodic mowing. It is essentially little different in composition to the more species-poor examples of NVC MG1/ UKHab g3c described above; although, false oat-grass is sub-dominant in this area and the increased presence of species such as perennial rye-grass and robust fodder varieties of timothy and meadow foxtail testify to some input of fertiliser or other nutrients, either recently or in the past. Herb-wise, this area is very poor in species, with species such as creeping buttercup *Ranunculus repens*, ribwort plantain *Plantago lanceolata* and creeping cinquefoil *Potentilla reptans* being typical. Bird's-foot trefoil was still noted in one area.

11.106 In 2021, this area still shows signs of management with the majority comprising of short-sward grassland with a few smaller areas of longer grassland around the margins, but not completely unmanaged as no tussocks have formed. Additional species recorded than those above include; cock's-foot, red fescue, common bent, Yorkshire fog, sweet vernal, yarrow, white clover, common ragwort, dandelion, sheep's sorrel, creeping thistle, wild marjoram, common hogweed and cut-leaved geranium. The continued management in this area is the likely reason that it remains almost free of scrub, except a young oak and a few young hawthorns.

g4, 10, 11, 58 – Modified Grassland, Scattered Scrub, Scattered Trees, Grazed (Previous Phase 1 Designation: Grazed Neutral Grassland)

11.107 The eastern part of the application site encompasses part of a fenced-in enclosure that is subject to grazing by longhorn cattle. The sward here is close-cropped; although, punctuated by scattered taller individuals of less palatable species (such as ragwort Senecio jacobaea and knapweed), and with scattered topiaried survivals of pre-existing scrub, indicating that these areas were much like any other neglected area on the airfield prior to the comparatively recent introduction of grazing. More established thickets of (predominantly willow) scrub in this area are also developing a clear browse-line. The grassland species diversity here is quite high, probably reflective of the choice of location for the grazing enclosure more than a response to the grazing, with species such as wild carrot, yarrow *Achillea millefolium*, bird's-foot trefoil, common sorrel *Rumex acetosa*, meadow buttercup *Ranunculus acris,* hoary ragwort *Senecio erucifolius* and self-heal *Prunella vulgaris* noted here. The alien species goat's rue *Galega officinalis* is also present in this part of the site, probably introduced with disturbance

associated with the break-out of the former runway.

11.108 In 2021, this area is still grazed by longhorn cattle regularly keeping the sward close-cropped which helps to reduce the amount of ruderals and scrub. The description above is still relevant with bird's-foot trefoil, meadow buttercup, yarrow and clover sp., being most abundant at this time of year.

g1a6, 10 – Other Lowland Dry Acid Grassland, Scattered Scrub (Previous Phase 1 Designation: Neutral to Acidic Grassland)

11.109 This habitat occurs mainly in an area of rabbit-grazed short sward in the northern part of the site, with outlying representations occurring to the north and east of here at the boundaries of Home Covert. It is distinguished by the presence of certain species collectively indicative of a change in soil chemistry, and by the differing proportions of more broad-tolerance species such as common bent and sweet vernal grass, which become more prominent. In the main area, between Pond P1 (see above) and Home Covert, rabbit grazing acting in concert with past disturbance and compaction, has resulted in an expanse of close-cropped short turf with localised ruts and depressions that hold water after rain and during the winter.

11.110 The grassland is comprised mainly of red fescue, common bent, creeping bent, Yorkshire fog, smooth meadow grass and annual meadow grass *Poa annua* with the moss *Rhytidiadelphus squarrosus* abundant throughout. Herb species recorded here include bird's-foot trefoil, lesser trefoil *Trifolium dubium*, common centaury *Centaurium erythraea,* self-heal, dove's-foot cranesbill *Geranium molle,* sticky mouse-ear *Cerastium glomeratum*, sheep's sorrel *Rumex acetosella,* wall speedwell *Veronica arvensis,* thyme-leaved speedwell *Veronica serpyllifolia*, changing forget-me-not *Myosois discolor*, procumbent pearlwort *Sagina procumbens*, common centaury, parsley piert *Aphanes arvensis* and creeping cinquefoil. In seasonally damp ruts and depressions, creeping bent becomes prominent with creeping buttercup, procumbent pearlwort, fleabane *Pulicaria dysenterica*, marsh cudweed *Gnaphalium uliginosum* and the moss *Calliergonella cuspidata* with upstanding clumps of compact rush *Juncus conglomeratus* and hard rush *Juncus inflexus*, and a little toad rush *Juncus bufonis* also found. A seedling stage, green-leaved sedge assumed to be false-fox sedge *Carex otrubae* was also recorded here. Bracken *Pteridium aquilinum*, lesser stitchwort *Stellaria graminea* become prominent components of the drier and taller woodland edge grasslands eastwards of here and adjoining Home Covert, and similarly indicate a more acidic substrate. Additional species recorded in this area in 2021 include field wood-rush *Luzula campestris*.

11.111 In 2021, two additional areas were identified which fit this habitat definition in the northwest of the site. These areas are adjacent and comprise of a tightly grazed sward (rabbit grazed) with fine grasses, low-growing herbs, lichens and mosses. The grassland component included red fescue, common bent, sheep's-fescue and annual meadow-grass. Herbs recorded here include dove's-foot cranesbill, sticky mouse-ear, sheep's sorrel, procumbent pearlwort, parsley piert, common dog-violet and cat's-ear *Hypochaeris radicata*. Field wood-rush was also recorded occasionally. In July 2021, a further survey visit identified additional small areas of short sward rabbit grazed herb-rich grasslands with an acidic character. These areas were typically too small to map as distinct stands within other grassland vegetation.

g3c Other Neutral Grassland (Previous Phase 1 Designation: Neutral-calcareous Grassland)

11.112 In a very few areas of the application site, recent episodes of disturbance appear to have exposed lenses

of quite calcareous boulder clay, or disturbed soils have otherwise been admixed with crushed concrete or other calcium-rich artificial substrates. In these areas, and in addition to the more typical suite of neutral grassland species, a very limited suite of *calcicoles* is found, including blue fleabane *Erigeron acer* but with wild marjoram *Origanum vulgare*, hawkweed ox-tongue, and wild basil *Clinopodium vulgare* also noted, alongside typically higher cover of bird's-foot trefoil, knapweed and wild carrot.

11.113 In 2021 field surveys, this habitat type was less distinct than as described above from the remaining areas of unmanaged grassland sward, typically comprising an abundance of competitive grasses. A Dead heads of wild marjoram, knapweed and wild basil were sparsely distributed within the other neutral grassland habitat type described above.

g3c, 16, 17 - Other Neutral Grassland, tall herb, ruderal/ephemeral and g3c, 16, 73 – Other Neutral Grassland, tall herb, bare ground. (Previous Phase 1 Designation - Early Succession Communities)

11.114 Grass-poor and herb-rich communities with a high proportion of bare ground occur in certain areas of the site that have been subject to disturbance in the relatively recent past. Examples include the steep banks bordering pond P7, and locally along the course of and around the end of the former runway, with similar, although more species-poor, examples also found encroaching onto tarmac at the edges of the former taxiway.

11.115 Typical dominants in these areas include creeping cinquefoil, smooth hawk's-beard *Crepis capillaris*, dove's-foot cranesbill, black medick *Medicago lupulina*, ribwort plantain, daisy *Bellis perennis*, scented mayweed *Matricaria recutita*, perforate St. John's wort *Hypericum perforatum*, colt's-foot *Tussilago farfara*, scarlet pimpernel *Anagallis arvensis*, American willowherb *Epilobium ciliatum* and Canadian fleabane *Conyza canadensis*. Less frequent are more robust rosette-forming herbs such as teasel *Dipsacus fullonum*, weld *Reseda luteola* and great mullein *Verbascum thapsus*.

11.116 In 2021, much of the areas around Pond 7 and along the former runway, as discussed above, have grown up and are indistinguishable from the rest of the unmanaged grassland. There are still some sparser areas along the former runway and many of the species listed above are still present. Stands of similar vegetation are present around the two areas of bare ground towards the centre of the application site and on the adjacent bunds.

g3c, 16, 10 – Other Neutral Grassland, Tall Herb, Scattered Scrub (Previous Phase 1 Designation - Tall Ruderal)

11.117 This habitat is found on raised banks of loosely consolidated material, associated with two main areas of the site. Growing on these are tall, near monotypic stands of stinging nettle, with other species including elder, broad-leaved dock *Rumex obtusifolius*, hogweed and mugwort *Artemisia vulgaris.*

11.118 In 2021, these areas are much the same with a slight increase in the amount of scrub. Additional species recorded in 2021 include; hemlock, creeping thistle, ragwort, garlic mustard, broad-leaved willowherb, hawthorn and blackthorn.

Hedgerows

11.119 The hedgerow resource within the application site is relatively sparse given the extent of land area, reflecting rationalisation of Enclosure-age field boundaries and later 20th century removals to create the open area of the airfield. Consequently, most of the hedgerows on the site occur as remnant

stretches, with the most robust examples demarcating the western and southern boundaries of the former airfield. Each hedgerow is described below with reference to Figure 1 (**Appendix 11/2**). Note that hedgerows are mapped as polygons; although, converted to linear features for the purposes of Biodiversity Net Gain.

h2a Hedgerow (Priority Habitat) - Hedgerow H1

11.120 This hedgerow extends into the site from the eastern boundary, is partly sited on an indistinct bank, and adjoins a public right of way. It is dominated by hawthorn *Crataegus monogyna*, field maple *Acer campestre* and blackthorn *Prunus spinosa*, the last of which is suckering outwards into the adjoining grasslands in places. Less frequent woody species include hazel *Corylus avellana,* holly Ilex *aquifolium,* elder *Sambucus nigra*, oak *Quercus robur,* ash *Fraxinus excelsior* and hornbeam *Carpinus betulus*. There are a small number of standards, comprised of ash, oak and field maple, some of which are multi-stemmed from past cutting, with hornbeam at the western end. The ground-flora is species-poor, in part due to intense rabbit activity; although, hedge garlic *Alliaria petiolata,* wood dock *Rumex sangineus* and wood false brome are present. Woody species-diversity is around five species per 30m, which in conjunction with the adjoining public footpath, qualifies it as 'Important' under Schedule 2 of the Hedgerows Regulations 1997.

11.121 In 2021, the hedgerow the description above remains relevant, the main difference is the increase in hawthorn and blackthorn scrub, predominantly on the northern side growing outwards into the grassland. Only one further additional species was recorded, a single cherry *Prunus sp*.

11.122 There is more management on the southern side of the hedgerow to stop it encroaching onto the adjacent footpath.

h2a Hedgerow (Priority Habitat) - Hedgerow H2

11.123 This is an eastward continuation of H1 above, although without the adjoining public right of way. The same complement of species is present, with standards comprised of ash, hornbeam and field maple. The hedgerow is close to the qualification threshold for an 'Important' hedgerow set out under Schedule 2 of the Hedgerows Regulations but likely to fall just short.

11.124 In 2021, the hedgerow description above remains relevant, and as above the main difference is the increase of hawthorn and blackthorn scrub along the northern boundary.

11.125 As with hedgerow 1, there is more management on the southern side of the hedgerow to stop it encroaching onto the adjacent footpath.

Hedgerow H3 (defined in 2021 as Scrub)

11.126 This is a relict stretch of hedgerow extending part-way into the former airfield site from the southern boundary and with a shallow associated ditch. It comprises remnant lengths or isolated shrubs of woody vegetation, in between which are gaps filled with linear thickets of bramble *Rubus fruticosus agg*, itself permeated with ruderals such as stinging nettle and rosebay willowherb *Chamerion angustifolium.* Woody species diversity averages around 2-3 per 30m, comprising hawthorn, with elder and suckering elm *Ulmus procera* at the southern end, an area of dense blackthorn thicket in the central stretch, two small oak standards and one ash. The ground flora contains no woodland species. This

hedgerow does not meet the criteria for importance under Schedule 2 of the Hedgerows Regulations 1997.

11.127 In 2021, this is no longer regarded as a hedgerow as it is more than 5m wide and is not managed as a hedge. The feature has become incorporated into the surrounding scrub and wouldeventually become part of the woodland to the west and is currently partly joined to the woodland at the southern end.

h2a Hedgerow (Priority Habitat) (Hedgerow H4)

11.128 Another stretch of relict hedgerow extending a short way northwards into the site from Popefield Farm. The longest stretch is almost entirely dominated by blackthorn, which has expanded outwards to form a dense domed thicket. Closer to Popefield Farm the species mix includes goat willow *Salix caprea*, hawthorn and oak. This hedgerow does not meet the criteria for importance under Schedule 2 of the Hedgerows Regulations 1997.

11.129 In 2021, the hedgerow description above is still relevant. The only additional species was a couple of ash saplings.

11.130 There was previously a short section that bordered the northern grounds of Popefield farm, but this has since been removed leaving only the hedgerow bordering the western boundary.

h2a Hedgerow (Priority Habitat) (Hedgerow H5)

11.131 This mature hedgerow runs along the southern boundary of the application site adjoining the A1057 Hatfield Road. It is an unmanaged feature with a significant complement of large mature trees, including specimens of probably 19th century planted origin east of Popefield Farm. The woody species complement, in approximate order of abundance, includes hawthorn, oak, field maple, blackthorn, elder, ash, hazel, holly, wild cherry, common lime, beech, field maple and Norway maple, the last five of which occur as standards in the easternmost section. West of Popefield Farm the standards are mostly oak, with some ash. Ground flora includes wood avens, wood dock, rough meadow grass, lords and ladies, wood false brome and herb Robert. East of Popefield Farm, the northern side of this hedgerow is gradually beginning to merge with adjoining scrub, with a intervening transitional band of the non-native snowberry *Symphoricarpos alba* present here. This hedgerow averages between five and six qualifying woody species per thirty metres and in conjunction with other features meets the criteria for importance under Schedule 2 of the Hedgerows Regulations 1997.

11.132 In 2021, the hedgerow description above is still relevant. At the western end the area of grassland that was previous between the hedgerow and the planted woodland to the north has been largely scrubbed over. It is likely that this section of hedgerow with eventually become incorporated into the woodland. The same is true for part of the eastern end where the scrub within the grassland has matured and is now considered to meet the UKHab classification for woodland.

h2a, 94 - Hedgerow, Green Lane (Priority Habitat) (Hedgerow H6)

11.133 A mature hedgerow, locally a double-rowed feature on indistinct banks, which forms the south-western boundary of the site and adjoins a public right of way. It is a neglected feature, suffering from the effects of damage from foot traffic, dumping (including of garden waste) and shading due to proximity of buildings, but retains a fine complement of mature standards, mostly of oak but with some ash. Other

woody species include hazel, hawthorn, hornbeam, field maple and holly. Ground flora includes greater stitchwort *Stellaria holostea*, wood avens, wood dock and hedge garlic. This hedgerow averages between five and six qualifying woody species per thirty metres and in conjunction with other features such as the presence of the public right of way within or adjoining it, meets the criteria for importance under Schedule 2 of the Hedgerows Regulations 1997.

11.134 In 2021, the hedgerow description above is still relevant. The western hedgerow is in a poor state, gappy and very narrow against adjacent fence/buildings. The western hedgerow is predominantly Leyland cypress at the southern end. Additional species to those listed above include; sycamore saplings, blackthorn, elder, herb Robert and white dead nettle.

11.135 A few bluebells were noted at the northern end towards hedgerow H1.

h2a Hedgerow (Priority Habitat) - Hedgerow H7

11.136 A short section of hedgerow H7 falls within the application site and has been identified as meeting the priority habitat description.

w1g6 - Line of Trees

11.137 Two lines of trees are present within the site. One adjoins the western end of Hedgerow H1 and comprises semi-mature trees which are mainly hornbeam, with oak, ash, hawthorn and a small field maple. The other comprised of *Salix Sp.* is located a short distance north of Pond 7.

H3a – Blackthorn Scrub, H3d – Bramble Scrub, H3H – Mixed Scrub (Previous Phase 1 Designation Scattered / Dense Scrub)

11.138 Scattered self-sown scrub is an ever-present feature over the majority of the grasslands on the site, the main exception being the regularly mown areas in the south-west. Generally, it comprises shrubs and small trees up to around 3-4m in height occurring as isolated individuals, small groups or more concentrated patches which are beginning to occlude the remaining areas of grassland and influence their composition through light competition.

11.139 The make-up of the scrub across the site appears to vary based on soil conditions and/or the history of past disturbance. In the driest and least-disturbed areas, hawthorn is generally the most prevalent species, with localised dense thickets of blackthorn, but there are also areas in the southern part of the site east of Popefield Farm where oak seems to be dominant or co-dominant. Over most of the central and eastern portion of the site, these species give way to willow, variously goat willow, white willow *Salix alba* or (very locally) *osier Salix viminalis* and grey willow *Salix cinerea*, with hybrids between these also appearing to be present. More locally encountered are dog rose *Rosa canina* and field maple.

11.140 Scattered through this backdrop of hawthorn, oak or willow dominated scrub are various other species, some of which have evidently arrived as garden throw-outs or in otherwise imported material, have been actively planted or in some instances may be bird-sown. They include cherry plum *Prunus cerasifera var 'Atropurpurea'*, damson *Prunus domestica*, laburnum *Laburnum anagyroides*, golden willow *Salix alba var 'Vitellina'*, apple *Malus domestica,* silver birch *Betula pendula*, false acacia *Robinia pseudoacacia*, Italian alder *Alnus cordata*, buddleia *Buddleja davidii* and broom *Cytisus scoparius.*

11.141 The expanse of occluding scrub cover in the south-western part of the site is influencing the composition of the grasslands beneath, with an increase in shade-tolerant species such as male fern *Dryopteris filix-mas* and increases in the cover of mosses such as *Brachythecium rutabulum*.

11.142 In 2021, the descriptions above are still relevant, the only changes have been the maturing of small trees from 3-4m in height to 5m and above and an increase in more self-set scrub.

11.143 As per the UKHab classification these areas have been split into three categories where blackthorn and bramble are the dominant species and a third category for areas of mixed scrub.

w1f7, 38 – Other Lowland Mixed Deciduous Woodland – Secondary Woodland

11.144 The UKHab definition of a wood is land with more than 25% cover of trees more than 5m in height. Previously the scattered/dense scrub consisted of small trees up to 3-4m in height in 2016. In 2021, many of the trees are at least 5-6m tall and where this represents more than 25% within the grassland habitats (densely grouped areas, canopy's touching), these areas have been reclassified as woodland.

11.145 If the site is left without management in the future, it is likely that more areas wouldqualify as woodland under the UKHab classification.

w1f7, 37, 99 – Other Lowland Mixed Deciduous Woodland – Semi-Natural Woodland – Nature Reserve

11.146 A small section of semi-natural woodland falls within the application boundary and this forms part of the larger Home Covert Wood to the north of the site. The area which falls within the boundary was predominantly mature beech and carpets of bluebell *Hyacinthoides non-scripta.*

w1f7, 36 – Other Lowland Mixed Deciduous Woodland, Plantation (Previous Phase 1 Designation: Recent Plantation)

11.147 There are three small discrete areas of recent tree and shrub planting present in the south-western part of the application site, at the edges of the open area of mown grassland. The complement of species used is diverse, with blackthorn, field maple, goat willow, hornbeam, hawthorn and dog rose present, alongside dogwood *Cornus sanguinea*, silver birch, wild privet *Ligustrum vulgare*, guelder rose *Viburnum opulus* and other species that are otherwise scarce on the site.

11.148 Additional species recorded in 2021 include: alder (*Alnus glutinosus*), wayfaring tree (*Viburnum lantana*) and bramble. The understorey is predominantly bare ground with areas of patchy grasses, ruderals and herbs including cock's-foot, false oat-grass, red fescue, common nettle, wood avens, lords and ladies, cow parsley, germander speedwell and garlic mustard.

11.149 A fourth, slightly larger rectangular area in the south west corner of the site also contains, silver birch, oak, cherry sp., hazel, ash, hawthorn, dogwood, wayfaring tree, goat willow and blackthorn. These have been planted very close together and as such, the understorey is predominantly bare ground with a few grasses and common nettle.

r1a – Eutrophic Standing Waters (Waterbodies)– 41 Freshwater – Natural or 39 Freshwater – Man-made

11.150 There are seven waterbodies contained within the application site. Each is described below with reference to Figure 3 (in **Appendix 11/2**). Only those ponds falling within the application site boundary

are fully described below, hence the numbering is not sequential. Ponds 10 and 11 fall outside of the application site boundary, and sufficiently distant to be outside the zone of likely influence of the proposed activities, are therefore not discussed further in this chapter.

11.151 Where ponds have been given the UKHab Secondary Code 19 (Ponds – Priority Habitat), these have met the criteria due supporting protected species, great crested newt. This has also been assigned based on the most recent survey conducted in 2018 by SLR.

11.152 Ponds 1-4 and 6-11 have been given the Secondary Code 41 – freshwater – natural as, although some of them comprise of water-filled sand and gravel pits or land drains, they can be identified on 19th Century mapping and as such are natural, or at least long-established. The only pond that is a more recent addition is Pond 5 and therefore, this has been given the Secondary Code 39 – Freshwater – man-made. Ponds that were dry (Pond 2 and 9) were assigned Primary Habitat codes of the habitat adjacent to the feature.

Pond P1

11.153 Bioscan identified that this pond was present on19th century maps as a former small gravel pit, consisting of two adjoining basins (P1a and P1b) set within an area of scrub and mature trees and enclosed within post and wire fencing of recent origin. P1a was the larger, western depression and the more heavily shaded, with emergent vegetation restricted to a little reed canary grass *Phalaris arundinacea* and yellow flag *Iris pseudacorus* at the southern end. The pond appeared to dry out annually; although, in the summer the invasive non-native aquatic plant New Zealand pigmyweed *Crassula helmsii* was abundant. P1b was partly unshaded, and it also appeared to dry up annually or near-annually, supports a much more luxurious complement of emergent vegetation, including reed canary grass, yellow flag, soft rush *Juncus effusus*, gypsywort *Lycopus europeaus*, bittersweet *Solanum dulcumara*, clustered dock *Rumex conglomerates*, marsh bedstraw *Galium palustre*, pale persicaria *Persicaria lapathifolia*, common duckweed *Lemna minor*, marsh cudweed, water forget-me-not *Myostotis scorpiodes*, and a drawdown zone with rough meadow grass, chickweed *Stellaria media* and many-seeded goosefoot *Chenopodium polyspermum*. Moorhen nested in this pond.

11.154 In 2018, SLR refers to the pond as Pond 1 instead of two adjoining basins as the water had flooded across both basins, joining them as one. Water levels only receded slightly over the duration of the GCN surveys.

11.155 In 2021, the pond contained water and contained a moderate amount of aquatic vegetation. There has been a slight increase in perimeter scrub encroachment,

Pond P2

11.156 Bioscan referred to Pond 2 as a group of three very small depressions (potentially bomb craters left over from the WWII film set), close to P1 and overshaded by grey willow. During the Bioscan surveys two retained standing water in the early part of the year; although, the only vegetation associated with them was a mat of creeping bent.

11.157 In 2018, only two of these small depressions, containing water were identified by SLR and are therefore separately referred to as Ponds 2 and 3. Water levels only receded slightly over the duration of the GCN surveys.

11.158 In 2021, this pond was dry and was therefore assigned Primary Habitat codes of the habitat adjacent to the feature.

Pond 3

11.159 Bioscan identified this waterbody as a somewhat larger, crater-like, steep-sided depression close to P1. It retained standing water in the early part of the year and was shaded on two sides by dense willow, bramble, dog rose and tall ruderals. Wetland vegetation comprised mainly a dense mat of creeping bent, but there was also a little creeping buttercup, gypsywort and water forget-me-not.

11.160 This pond was not evident to SLR in 2018 and as described above, SLR reference to Ponds 2 and 3 is not the same. Water levels only receded slightly over the duration of the GCN surveys.

11.161 In 2021, Pond 3 contained water and very little aquatic vegetation.

Pond P4

11.162 Bioscan identified this pond as a length of steep-sided ditch forming part of the course of the Nast that retained standing water for much of the winter and the early part of the year. It only appeared to function as part of a flowing water system in periods of high precipitation and surface water run-off. Emergent vegetation included tufted hair grass, lesser pond sedge *Carex acutiformis*, water mint, meadow vetchling, compact rush, hoary willowherb *Epilobium parviflorum*, and bittersweet with, of some note, sneezewort *Achillea ptarmica* and he hybrid mint *Mentha x verticillata* also noted *acutiformis,* water mint, meadow vetchling, compact rush, hoary willowherb *Epilobium parviflorum*, and bittersweet with, of some note, sneezewort *Achillea ptarmica* and he hybrid mint *Mentha x verticillata* also noted.

11.163 In 2018, SLR recorded only a slight recession in water levels during the GCN surveys.

11.164 In 2021, the pond contained water and there was a good amount of emerging and aquatic vegetation, including mint, floating grass and pond weed sp.). The pond was highly turbid and a dog was witnessed jumping in and out stirring up the sediment. An increase in scrub is apparent at the western end.

Pond P5

11.165 Bioscan identified this is an artificial waterbody of recently created origin and set down between steep raised banks. It appears to hold standing water on a semi-permanent basis and has a reasonable complement of emergent vegetation including reedmace *Typha latifolia*, water plantain *Alisma plantago-aquatica,* common spike rush *Eleocharis palustris*, jointed rush *Juncus articulatus,* marsh bedstraw*,* branched bur-reed *Sparganium erectum* and cyperus sedge *Carex pseudocyperus*, with grey willow saplings.

11.166 In 2018, SLR recorded only a slight recession in water levels during the GCN surveys.

11.167 In 2021, the pond contained water and the scrub within and around the margins had greatly increased from previous surveys.

Pond P7

11.168 Bioscan identified this as a complex of small, very shallow depressions within a stand of willow, and supporting sparse but tall growth of common reed *Phragmites australis*. They all dry up by late spring/early summer.

11.169 In 2018, SLR recorded only a slight recession in water levels during the GCN surveys.

11.170 In 2021, this pond contained very low water levels and is likely to dry up entirely.

Pond P8

11.171 Bioscan identified this waterbody, close to Popefield Farm at adjoining the southern boundary of the application site, pre-dates the airfield and appears on 19th Century maps. It was a moderate size but silted, shallow and heavily shaded feature by virtue of the adjoining outgrown hedgerow and associated dense scrub. It retained little emergent vegetation. It appeared to also receive surface water run-off from the adjoining A1057 which may affect its water quality.

11.172 In 2018, SLR recorded only a slight recession in water levels during the GCN surveys.

11.173 In 2021, the pond contained water, moderate levels of aquatic vegetation and there has been an increase in the amount of scrub around the perimeter.

Pond P9

11.174 Bioscan identified that this was a section of the surface water drainage ditch system that carried the flow of the Nast watercourse. This section was immediately upstream of the culvert that takes the Nast below the airfield, and the frequency of standing water here may be a symptom of backing up of flow (for example if the culvert capacity was compromised by collapse or silting up). Mostly it was densely overshaded with no aquatic or emergent vegetation, but there were unshaded lengths with dense stands of great willowherb *Epilobium hirsutum,* lesser pond-sedge and/or reed canary grass.

11.175 In 2018, the water levels started to recede during the second GCN survey visits and by the third visit the pond was completely dry.

11.176 In 2021, this pond was dry and was therefore assigned Primary Habitat codes of the habitat adjacent to the feature.

r1a, 191 – Eutrophic Standing Waters, Ditch (Previous Phase 1 Habitat Designation - Watercourse / Wet Ditches)

11.177 Crossing the northern part of the application site is a narrow ditch carrying a minor watercourse known as the Nast. South of Home Covert this watercourse enters a culvert which takes it beneath the main area of the former airfield, to re-emerge at a point adjacent to the A1057 Hatfield Road. The remaining sections of open channel are for much of the year dry or only damp; although, locally holding ponded lengths of static water in the spring (see P4 and P9 above).

11.178 Where not densely overshaded by adjoining scrub, the dampest areas support wetland vegetation distinct from the surrounding grasslands. In places this is merely stands of great willowherb, but there are also sections dominated by lesser pond sedge and reed canary grass with associates including clustered dock, soft rush and false fox-sedge *Carex otrubae*. In other (typically no more than damp)

stretches, species include creeping bent, tufted hair-grass, bittersweet, water mint and meadow vetchling. In the section described above as P4, sneezewort and the hybrid *Mentha x verticillata* were recorded.

11.179 In 2021, apart from the main section of ditch at Pond 4 and a short section of ditch in the north east of the site, the remaining ditches were dry. The main change across all sections of ditch is the increase in scrub at the perimeters.

g3c, 17, 73 - Other Neutral Grassland, Ruderal/Ephemeral, Bare Ground (Previous Phase 1 Designation: Recently disturbed / bare ground)

11.180 This habitat occurs in two distinct areas of the site – a patch of ground in the northern part of the site which appears to have been recently stripped and laid to hardcore, and a fenced-off mounded area, and adjacent spoil heaps, in the central part of the site comprised of crushed concrete and other materials, and which is evidently still being regularly treated with herbicide to address Japanese knotweed contamination. The complement of pioneer species found in these areas is close to that described under 'Early Succession Communities' above, but with certain ruderals and opportunists such as teasel, colt's-foot, buddleia and American willowherb being particularly prevalent. These areas have been assigned a UKHab Primary Habitat code based on the most dominant adjacent habitat, grassland.

11.181 These areas are still largely bare ground in 2021 with sparse vegetation. Additional species recorded include; black medick, sticky mouse-ear, bird's-foot trefoil, dog violet, scarlet pimpernel, ribwort plantain, thyme-leaved speedwell, red fescue, annual meadow-grass, and sheep's sorrel.

11.182 Planted daffodils *Narcissus* sp. are also present around the area in the northern part of the site.

11.183 Other areas with ephemeral/bare ground include the footpaths present throughout the site. These areas receive a relatively high footfall and are maintained, keeping the vegetation low.

u1b Developed Land; Sealed Surface (Previous Phase 1 designation: Hard surfaces)

11.184 This habitat type is restricted to the still-sealed concrete surface of the former taxiway and a series of compacted unbound aggregate footpaths/pathways throughout the site. Some of the aggregate pathways have become vegetated with short sward grassland but are still well-used and maintained. No additional plant species were recorded that haven't already been recorded elsewhere within the site. Apart from the former taxiway, footpaths/pathways have not been mapped on the 2021 UK Habitat Classification map (Drawing HQ 11/1) as the majority are less than 1m wide or are becoming vegetated and incorporated into the adjacent grassland. These have therefore been assigned Primary Habitat codes of the habitat adjacent to the feature.

Bats

Desk Study

11.185 In 2015, HERC provided a total of 71 bat records for the search area, with these records relating to soprano pipistrelle *Pipistrellus pygmaeus*, common pipistrelle *Pipistrellus pipistrellus*, pipistrelle sp., brown long-eared bat *Plecotus auritus*, *noctule Nyctalus noctula*, Natterer's bat *Myotis nattereri* and unspecified 'bat species'. No bat records were listed as specific to the application site itself, although

brown long-eared bat, Natterer's bat and common pipistrelle records were provided for the three 1km squares[29] in which the site sits. These are the only pre-existing data obtained - none of the previous surveys of the airfield reviewed earlier in this chapter incorporated specialist bat surveys.

11.186 In 2021, HERC provided a total of 430 bat records for the search area with these records relating to Chiroptera sp., Western barbastrelle *Barbastella barbastrellus*, serotine *Eptesicus serotinus*, Natterer's bat, Whiskered/Brandt's bat *Myotis mystacius/brantii,* Daubenton's bat *Myotis daubentonii, lesser noctule Nyctalus leisleri*, *Nyctalus Sp.,* Myotis Sp., common pipistrelle, pipistrelle sp., brown long-eared, long-eared Plecotus sp. and unidentified species records.

11.187 The majority of records related to field observations and aural detector records with a lesser number of records of grounded bats, road casualties, other casualties and roosts. The roosts related to the following species: common pipistrelle, soprano pipistrelle and brown long-eared bats including one maternity roost of the latter.

Bat Activity Surveys

2015

11.188 Figures 4 to 6 (**Appendix 11/2**) afford an appreciation of the distribution of bat registrations recorded on each of the three transect surveys carried out in June, July and September 2015. Table 11-8 below lists the species recorded and the number of sound files for each recorded on each survey visit.

Table 11-8:
Species and Number of Sound Files Recorded for each Species during each Bat Transect Survey

Species	Scientific Name	23/06/2015	29/07/2015		07/09/2015		Total	Percentage of Files
Area		All	South	North	South	North		
Common Pipistrelle	*Pipistrellus pipistrellus*	35	39	40	31	16	161	69.1
Pipistrelle sp. (Nathusius'/common)[30]	*Pipistrelle sp.*	1	8	4	4	5	22	9.4
Pipistrelle sp. (common/soprano)[31]	*Pipistrelle sp.*	6	1	0	4	0	11	4.7
Soprano Pipistrelle	*Pipistrellus pygmaeus*	13	1	3	3	1	21	9
Noctule	*Nyctalus noctula*	3	4	1	2	3	13	5.6

[29] TL1907, TL2008 and TL1908

[30] Where Pipistrelle calls were around 40kHz these have been noted to genus level only, as the calls could not be definitively attributed to either Nathusius' or common pipistrelle.

[31] Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both species can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.

Long-eared bat[32]	*Plecotus sp.*	1	0	0	1	0	2	0.9
Daubenton's bat[33]	*Myotis daubentonii*	0	0	0	1	0	1	0.4
Whiskered/Alcathoe/ Brandt's bat[33]	*Myotis mystacinus/ Myotis alcathoe/ Myotis brandtii*	0	0	0	0	2	2	0.9

11.189 By far the most frequently recorded species on the transect surveys was common pipistrelle, which accounted for at least 69% of all registrations. Much less frequently encountered were soprano pipistrelle (at least 9% of registrations), noctule (5.6%), Daubenton's bat (0.4%) and whiskered/Alcathoe/Brandt's bat (0.9%). A significant number of registrations around the 40kHz frequency were made, but none were conclusively attributable to the rare Nathusius' pipistrelle, and it remains possible that the species labelled as 'Pipistrelle sp. (Nathusius'/common)' in Table 11-8 may be common pipistrelle bats calling at unusually low frequency.

11.190 Figure 7 (**Appendix 11/2**) shows the locations of confirmed foraging and other constant activity recorded across the study area over all of the surveys. The areas of the site most frequently utilised by bats were, not surprisingly, locations which held water, mature trees and/or shelter (e.g. hedgerows).

2021

11.191 Bat activity surveys were not updated in 2021. Habitat quality in relation to bat foraging and commuting potential is not considered to have altered significantly in the 5 years since 2015 and therefore the baseline conditions described above are considered relevant to the current assessment.

Automated Bat Survey

2015

11.192 Table 11-9 below provides the results of the automated bat surveys carried out on the site during each of June, July and September 2015.

Table 11-9:
Number of Files for each Species at each Automated Survey Point

[32] Almost certainly brown long-eared bat.

[33] The use of the 'slope' function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to species); however, where slope is ambiguous these have been noted as *Myotis* sp. Calls attributed to Daubenton's bat and to the WAB group (whiskered/Alcathoe/ Brandt's bat) are 'probable' identifications.

Survey Period	June 2015		July 2015		September 2015		Total	
Detector Location (see Figure 2)	A1		A2		A3			
Species	No. of Files	%	No. of Files	%	No. of Files	%	No. of Files	%
Common pipistrelle	124	59.62	1512	84.19	69	41.07	1705	78.5
Pipistrelle (Nathusius'/common)[34]	44	21.15	106	5.90	0	0.00	150	6.9
Noctule	12	5.77	30	1.67	32	19.05	74	3.4
Pipistrelle (common/soprano) [35]	5	2.40	83	4.62	27	16.07	115	5.3
Long-eared bat[36]	7	3.37	4	0.22	15	8.93	26	1.2
Natterer's bat[37]	0	0.00	2	0.11	19	11.31	21	1.0
Myotis sp.[37]	5	2.40	21	1.17	3	1.79	29	1.3
Soprano pipistrelle	5	2.40	28	1.56	1	0.60	34	1.6
Nathusius' pipistrelle	4	1.92	2	0.11	1	0.60	7	0.3
Whiskered/Alcathoe/Brandt's bat[37]	1	0.48	0	0.00	0	0.00	1	0.0
Bat (unidentified)[38]	1	0.48	2	0.11	1	0.60	3	0.1
Daubenton's bat[37]	0	0.00	1	0.06	0	0.00	1	0.0
Serotine/Noctule[39]	0	0.00	5	0.28	0	0.00	5	0.2

11.193 Broadly speaking, the automated results mirror those obtained on the transect surveys with again by far the most frequently recorded species being common pipistrelle (at least 78% of all registrations). Non-Pipistrellus species cumulatively make up less than 10%; they include noctule, long-eared bat (almost certainly brown long-eared), Daubenton's, Natterer's and whiskered/Alcathoe/Brandt's bat, with five sound-files (0.28% of the total) possibly attributable to serotine.

[34] Where calls were around 40kHz these have been noted to genus level only, as the calls could not be definitively attributed to either Nathusius' or common pipistrelle.

[35] Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both species can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.

[36] Likely to be brown long-eared bat.

[37] The slope function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to a specific species); however, where slope is ambiguous these have been noted as *Myotis* sp. The *Myotis* species above (Daubenton's bat, Natterer's bat, whiskered/Alcathoe/ Brandt's bat) are probable identifications and are in addition to the number of *Myotis* files.

[38] This label has been used where it is possible to identify that a bat was present, but where there was insufficient call data to attribute the registration to Family or Genus level.

[39] This label was used where a 'big bat' (Eptesicus/Nyctalus sp) was present but due to the quality of the call it was difficult to determine the species.

2021

11.194 No automated bat surveys were conducted in 2021.

Assessment of Roosting Potential

2015

11.195 Table 11-10 below provides the results of the bat tree roost assessment of the two mature trees near the centre of the site (T1 and T2), and of the Airfield Radio Beacon / Aerial Lighthouse building adjoining the eastern boundary (B1).

Table 11-10
Bat Roosting Assessment

Tree/Building Reference	Bat Roosting Potential	Notes
T1	High	Two woodpecker holes- 12m east. Decaying branch on south-east with raised bark and cracks present.
T2	Medium/high	Decaying branch on south side, with knot holes at end of branch and at fork. Rotted knot hole on south side of main trunk
B1	Negligible	Brick built single storey structure, with a flat roof and no void. Small gaps behind barge-boarding filled with cobwebs or too narrow for bat access. No bat droppings noted inside and interior signs of both vandalism and use by cattle.

11.196 The two trees (T1 and T1) were additionally subject to emergence surveys in July and September 2015, with no bats found to emerge.

2021

11.197 In 2021, SLR noted the presence of a single Schwegler 2F bat box on a hornbeam during the habitat survey. The box was not inspected due to it being out of reach from a ground survey. However, the positioning of the box on the tree reduces its suitability for roosting bats substantially; at almost a 45-degree angle, tilted backwards, which would allow the box to fill up with water when it rains.

11.198 The BRP of the building was not re-assessed with the previous assessment of Negligible value being taken forward in this assessment.

Evaluation of Bat Interest of the Application Site

11.199 By far the most frequently detected bat species during the bat activity and automated surveys was common pipistrelle. This species is Britain's and Hertfordshire's[40] most common bat species and can be

[40] http://hmbg.org.uk/bats-in-hertfordshire-middlesex/

found in a wide range of habitats[41]. Common pipistrelle is showing long-term (and short-term) increases in population trends in the UK[42]. This species is a generalist being found in a wide variety of habitats, and its occurrence on the site is entirely to be expected.

11.200 Soprano pipistrelle was also encountered on the site, but to a substantially reduced degree compared with common pipistrelle. This is likely to be due to the relative lack of this species' preferred foraging habitats, which tend to be more focused on riparian and wetland habitats than the more generalist common pipistrelle. As with common pipistrelle, this species is a common bat in both Britain and Hertfordshire[36].

11.201 There were low levels of activity indicated for Nathusius' pipistrelle on the site, with seven registrations recorded during the automated bat survey element. Nevertheless, there were approximately 170 records/files of pipistrelles calling within the 40kHz range, some of which could also be Nathusius' pipistrelle. This species is considered by Hertfordshire and Middlesex Bat Group (HMBG) to be widespread, but scarce. Nationally this species is considered rare, and confirmed roosts are not often found, but there has been an increase in records in recent years. This may be due to an increase in bat surveyors looking for this species coupled with advances in technology and analysis software.

11.202 Noctule was regularly though sparsely recorded during the surveys, with most registrations being of bats flying high over the site, often very soon after sunset, and possibly indicative of transient bats commuting over the site to more favoured foraging habitats (possibly the gravel pit settling ponds to the north). HMBG describes the status of this species as "*widespread, but relatively scarce*". The species has shown population declines in Britain in the past due to the loss of good feeding habitats, mainly from agricultural intensification. However, there does not appear to currently be a significant change in the population trend for this species.

11.203 Due to the difficulty of identifying bats from the Myotis genus to species level, especially where foraging in terrestrial environments rather than over open water, many of the Myotis species records from the site have been identified to genus level only. However, probable identification to species level was attempted using the recordings from the Anabat and the 'slope' feature in Analook. This analysis identified probable Daubenton's bat, probable Natterer's bat and probable whiskered/Alcathoe/Brandt's bat, but it should be stressed that these are probable identifications; the most conclusive method of identifying these species is through capture and identification in the hand. Of these species, Natterer's has been recorded from the locality in the past [source: HERC data].

11.204 Different *Myotis* species prefer different habitats but the habitat requirements of the above species assessed to be present on the site are met, particularly given the presence of mature woodland adjoining the application site to the north. On balance it is considered likely that the majority of the unspecified Myotis registrations made wouldbe from, Natterer's, Daubenton's and whiskered or Brandt's bats.

11.205 Daubenton's bat population trends are showing a very slight steady increase, whilst for whiskered/Brandt's bat the trend has shown an increase with a slight decrease in the last few years[43].

[41] Hundt (2012). Bat Surveys- Good Practice Guidelines, 2nd Edition. Bat Conservation Trust, London.

[42] Bat Conservation Trust (2014) The State of the UK's bats- National Bat Monitoring Programme Population Trends 2014. BCT

[43] Bat Conservation Trust (2014) The State of the UK's bats- National Bat Monitoring Programme Population Trends 2014.BCT

Daubenton's bat is fairly widespread in Hertfordshire[44] and the UK, whilst whiskered bat is assumed to be rare[45].

11.206 Although there were 28 registrations of long-eared bats encountered on the site, this is likely to be unrepresentative due to the difficulty that bat detectors have in picking up the very quiet calls from the Plecotus genus. The most likely Plecotus on the site, brown long-eared bat, is one of the UK's and Hertfordshire's commonest bat species. Its habitat preferences include woodland, as well as rivers, lakes and grassland. Brown long-eared bats are currently showing a slight long-term and short-term decrease in population; the reasons for this are unknown but may be related in part to the management neglect of woodlands and the loss of traditional agricultural buildings to neglect or conversion.

11.207 Overall, the bat activity recorded on the site was comparatively low in consideration of the site area. This is not unexpected given the open nature of the site, the relative lack of upstanding features and habitat 'edges' and the sparseness of favoured foraging resources such as woodland, waterbodies, and hedgerows.

Other Protected/Notable Mammals

Desk Study

11.208 In 2021, HERC provided four historical records of water vole *Arvicola amphibius* from between 1967 and 1987 with nothing more recent. Similarly, one historical record of red squirrel Sciurus vulgaris was noted from 1945. Due to the historical nature of the records and the lack of specific location these are considered not to be relevant in this assessment. No records of otter *Lutra lutra* were returned.

Field Survey

11.209 No signs of presence of these species was detected in surveys of the site.

Great Crested Newt Survey

Desk Study

11.210 In 2015, HERC provided fifteen great crested newt records for the search area, with the nearest relating to a site 0.4km to the west, and the latest record from 2006.

11.211 The 2008 Cresswell Associates report stated that in 1999, two ponds (P1 and P3 on Figure 3) contained a small population of great crested newts. A site walkover in 2010 by Cresswell Associates also encountered a great crested newt under a refugium near a bund approximately 30m south-east of P3. An update survey by Cresswell in 2010 again found great crested newts in P1 and P3, with this species also confirmed in P5 and P8 (see Figure 3). It was assessed at this time that there was a 'medium-sized' population on the site.

11.212 In 2015 LDA Design undertook a great crested newt eDNA survey of 13 waterbodies within the vicinity

[44] http://hmbg.org.uk/bats-in-hertfordshire-middlesex/

[45] Bat Conservation Trust (2010) BCT Brown long-eared - Species information leaflet. Bat Conservation Trust

of the northern part of Ellenbrook Fields. Two of the surveyed waterbodies (P7 and P10 on Figure 3) were also encompassed within the scope of the great crested newt surveys undertaken by Bioscan in 2015. The results from the eDNA survey confirmed the presence of great crested newt within three of the waterbodies; these comprised a waterbody to the north of Home Covert, a pond within the Ellenbrook Linear park at the eastern edge of the airfield and P7 immediately east of the application site. A negative result was also returned for P10 (off-site and within Home Covert).

11.213 Further great crested newt records for ponds to the north and north-west of the application site were obtained from a review of the St Alban's District Council planning portal. These relate to a live planning application for restoration of part of the CEMEX Hatfield Quarry, the supporting information for which refers to positive records for great crested newts in ponds at Beech Farm (c.300m NW of the application site) and Ball's Copse (just under 375m north of the application site).

11.214 In 2021, HERC provided 72 records of this species with the most recent from 2020 to confirm their local presence in recent years.

Ponds Surveyed

2015

11.215 Habitat descriptions of each waterbody within the application site are given earlier in this section. Table 11-11 below lists further details of the suitability of each of these for great crested newts, including HSI scores, as well as equivalent details for three further waterbodies outside the application site, but which were also included within the great crested newt surveys carried out in 2015 by Bioscan and/or LDA Design. The locations of each of these waterbodies are indicated on Figure 3 (**Appendix 11/2**).

Table 11-11:
Waterbody Information and HSI Results - 2015

Waterbody Reference	Approximate Size (m^2)	Notes/Brief Description (see also habitat descriptions above)	HSI Score	Suitability for GCN
P1a and P1b	P1a- 190 P1b- 100	The water level in P1a became very low by the end of the newt surveys, whilst P1b had dried up by the fifth visit.	P1a- 0.78 P1b- 0.58	P1a- Good P1b- Below average
P2	3	Two to three crater-like depressions to the east of P1. These had dried up by the third newt survey visit.	0.36	Poor
P3	30	Few suitable egg laying plants were noted. The water level decreased through the newt surveying season, and by the sixth visit no water remained.	0.59	Below average
P4	30	Part of the Nast ditch system. It was very shallow and became dry by the third visit.	0.55	Below average
P5	70	A deep linear feature near Home Covert. A wide variety of invertebrates were noted. The water level decreased during each survey visit, but it did not dry out.	0.75	Good

Waterbody Reference	Approximate Size (m^2)	Notes/Brief Description (see also habitat descriptions above)	HSI Score	Suitability for GCN
P6	480	A linear feature just outside of the site boundary. Surrounded by young willows, although the waterbody is still relatively open. Dry by the summer. Appears to be used by the grazing cattle as a watering resource.	0.79	Good
P7	40	Shallow depressions in a stand of trees. Dried up by the fourth visit.	0.40	Poor
P8	200	Immediately adjacent to the A1057 (Hatfield Road). It is fairly shallow and looks to be fed from surface water run-off from the road.	0.63	Average
P9	150	Part of the Nast ditch system and on the edge of Home Covert. Large parts of the periphery of waterbody are overgrown with vegetation. Dry by the second visit.	0.51	Below average
P10	1900	A large long-established pond in Home Covert. The waterbody has a small island. Due to the large amounts of leaf litter the depth of the waterbody could not be determined. The presence of spent shotgun cartridges suggests this waterbody is used for shooting waterfowl. It may also have fish.	0.65	Average
P11	80	Two shallow depressions next to a path. Likely to be used by the grazing cattle as a water resource. Dried up by the fourth visit.	0.49	Poor

2018

11.216 Great crested newt surveys were undertaken at ponds within and adjacent to the application site in accordance with standard survey methods between 12th April and 2nd May 2018. Pond survey methods included torching, bottle trapping where water depths allowed and egg searching of suitable vegetation. Surveys in some ponds were constrained by their ephemeral nature, meaning that ponds dried during the survey period, even though this limitation was mitigated as far as possible by conducting surveys early in the season. Water turbidity and vegetation cover is highlighted as a possible survey limitation at 5 ponds, although GCN were reported as present in 2 of these ponds. In the context of the survey results, neither of these limitations identified are considered to significantly affect interpretation of the results. Table 11-12 summarises GCN survey data collected in 2018.

Table 11-12:
Summary GCN Survey and HSI Results (2018)

Pond Ref.	Gt. Crested Newts Detected?	Peak Adult Count	Pop Size Class	HSI	Low Detect-ability Warning*	Peak Count Visit Number	Eggs
P1	Yes	7	Small	0.78	Caution	3	Yes

Pond Ref.	Gt. Crested Newts Detected?	Peak Adult Count	Pop Size Class	HSI	Low Detect-ability Warning*	Peak Count Visit Number	Eggs
P1b (note same pond basin as P1 above)	No	0		0.58			
P2	No	0		0.36	Caution		No
P3	No	0		0.54	Caution		No
P4	Yes	1	Small	0.55		3	No
P5	Yes	0		0.73	Caution		Yes
P6	Yes	11	Medium	0.79		2	Yes
P7	No	0		0.40			No
P8	No	0		0.63			No
P9	No	0		0.51			No
P10	Yes	1	Small	N/A	-	2	No
P11	Yes	3	Small	N/A	Caution	2	Yes

*Low detectability warning is an automatic warning relating either to high turbidity or dense vegetation cover, which may inhibit detection of GCN in pond surveys. This information is taken directly from the Natural England GCN Method Statement prepared for the previous application.

2021

11.217 Table 11-13 below provides the details of the 2021 HSI survey. Note, that SLR refers to Ponds P1a and P1b as Pond 1.

Table 11-13:
Waterbody Information and HSI Results (2021)

Waterbody Reference	Approximate Size (m^2)	Notes/Brief Description (see also habitat descriptions above)	HSI Score	Suitability for GCN
P1	290	Seasonal pond due to water logging of surrounding area	0.59	Below Average
P2	3	Very small ephemeral pond. Dry	N/A	N/A
P3	3	Ephemeral pond. Very small pond with no vegetation.	0.37	Poor
P4	30	Part of the Nast ditch system. Likely to be a seasonal pond due to the amount of waterlogging in the surrounding area.	0.66	Average

Waterbody Reference	Approximate Size (m^2)	Notes/Brief Description (see also habitat descriptions above)	HSI Score	Suitability for GCN
P5	70	A deep linear feature near Home Covert. Pond with ground and surface water feeds.	0.60	Average
P6	480	A linear feature just outside of the site boundary. Surrounded by young willows, although the waterbody is still relatively open. Used by the grazing cattle as a watering resource, heavily poached. Considered to be a seasonal pond due to the amount of waterlogging of the surrounding area.	0.62	Average
P7	40	Shallow depressions in a stand of trees. Seasonal pond due to water logging of the ground in the surrounding area.	0.52	Below Average
P8	200	Immediately adjacent to the A1057 (Hatfield Road). It is fairly shallow and looks to be fed from surface water run-off from the road. Likely to contain water all year round.	0.76	Good
P9	150	Part of the Nast ditch system and on the edge of Home Covert. Large parts of the periphery of waterbody are overgrown with vegetation. Dry.	N/A	N/A
P10	1900	A large long-established pond in Home Covert. The waterbody has a small island. Due to the large amounts of leaf litter the depth of the waterbody could not be determined. Can be topped up via connecting ditches.	0.76	Good
P11	80	Shallow depression next to a path. Used by the grazing cattle as a water resource, heavy poaching evident. Considered to be a seasonal pond due to water logging in the surrounding area.	0.54	Below Average

GCN Presence/Likely Absence and Population Size Class Survey Results

2015

11.218 Five of the 11 waterbodies surveyed in 2015 within and immediately adjacent to the application site were found to support great crested newt, although only two of these were confirmed as in use for breeding or attempted breeding. Table 11-14 below shows the peak number of great crested newts encountered whilst torching and bottle trapping, together with the results of the egg searches.

Table 11-14:
Peak Number of Great Crested Newts Recorded from Torching and Bottle Trapping over the Survey Period and the Results of the Egg searches for each Waterbody - 2015

Waterbody reference (Fig 3)	Maximum number of GCN recorded during torching	Maximum number of GCN recorded during bottle trapping	Maximum number of GCN recorded from both methods	GCN eggs present?
P1a	26	12	26	Yes
P1b	2	1	2	No
P2	0	0	0	No
P3	2	1	2	No
P4	0	0	0	No
P5	1	1	1	No
P6	8	2	8	Yes
P7	0	0	0	No
P8	0	0	0	No
P9	2	1	2	No
P10	0	0	0	No
P11	0	0	0	No

11.219 Terrestrial surveys for the species were not carried out, but during the reptile survey a great crested newt was found under a reptile refugium along a bank in the western corner of area R1 (see Figure 3, **Appendix 11/2**) during a visit on the 30th April 2015.

11.220 The results of the eDNA sampling undertaken by LDA Design in 2015 of the two off-site waterbodies P7 and P10 corroborate the simultaneous Bioscan surveys of these ponds, with great crested newt confirmed in P7 and a negative result returned for P10.

2018

11.221 2018 survey results are provided in Table 11-12 above.

2021

11.222 Updated great crested newt pond surveys were not undertaken in 2021. The existing baseline information, which includes data from the site from the period 1999 – 2018 is considered sufficient to adequately describe the baseline conditions for the purposes of ecological impact assessment.

Evaluation

11.223 The local meta-population of great crested newts is classed as medium based upon 2015 and 2018 survey results. HSI and habitat surveys conducted in 2021 indicate that conditions are largely unchanged and the status of the population is considered unlikely to have changed since previous surveys.

11.224 There was a peak count of 8 individuals in 3 ponds within the application site (P1, P4, P5) and a peak count of 15 (i.e. a medium population) focussed on neighbouring ponds, e.g. P6, P10 and P11 (2018 survey results presented above). The population is therefore considered to be a medium meta-population at the lower end of this size class. In 2015, GCN were recorded in different ponds, i.e. P1, P3, P9, P5, but with broadly similar population size, i.e. lower end of medium meta-population. These data indicate the breeding adults within this meta-population are relatively small and mobile and not restricted to any specific pond or ponds. GCN are also known to be present at CEMEX Furzefield[46] and CEMEX Cutfield[47] quarries to the north. The latter supports a low medium population, although these are more than 500m from breeding ponds within the application site and therefore there is unlikely to be major dispersal between them, even though there are no major barriers. Andrews' Ecology[48] states "*population within Cutfield is part of a meta-population, with newts recorded in six ponds at Suttons Farm (c. 500m north of Cutfield) and one pond at Sheepfold (c 1.2 km north-east of Cutfield)*". Due to the distance from Cutfield and Furzefield meta-populations, limited connectivity between these two offsite populations is predicted.

11.225 GCN appear to attempt to breed regularly in P1 within the application site, although breeding is unlikely to be successful in all years due to regular drying during summer months, e.g. as observed in June 2017. Other ponds within the development site where GCN have been recorded in recent years, i.e. P3, P4, P5, P9 appear to have been largely unsuitable for successful breeding in recent years and remain largely unsuitable for breeding success, especially P3 and P9. Using the population size class assessment system[49] , the results from collated field data indicate that the site supports a 'medium' population of great crested newts, widely distributed in habitats of low-moderate suitability.

Other Amphibians

11.226 In 2008 Cresswell Associates reported the presence of common frog *Rana temporaria* and common toad *Bufo bufo* on the site. These species were also recorded by Bioscan in 2015 whilst carrying out the great crested newt surveys, along with good numbers of smooth newts. Table 11-15 provides the peak count of smooth newt and the results of the egg searches for each waterbody shown on Figure 3 (**Appendix 11/2**).

Table 11-15
Peak Count of Smooth Newt and the Results of the Egg Search for Each Waterbody

Waterbody Reference	Maximum Number of Smooth Newt Recorded During Torching	Maximum Number of Smooth Newt Recorded During Bottle Trapping	Maximum Number of Smooth Newt Recorded from Both Methods	Smooth Newt Eggs Present?
P1a	18	32	32	Yes
P1b	4	0	4	No

[46] eDNA positive in one Pond, reported in baseline data supplied by Andrews Ecology (2015)

[47] GCN reported as present in 3 ponds outside the application site to the north (Playdell-Smithyman, 2015)

[48] Ref: Andrew Ecology, Natural England Method Statement EPSL 2017-32651-EPS-MIT

[49] English Nature (2001) Great crested newt mitigation guidelines. English Nature

Waterbody Reference	Maximum Number of Smooth Newt Recorded During Torching	Maximum Number of Smooth Newt Recorded During Bottle Trapping	Maximum Number of Smooth Newt Recorded from Both Methods	Smooth Newt Eggs Present?
P2	0	0	0	No
P3	18	35	35	Yes
P4	2	0	2	No
P5	36	32	36	No
P6	18	6	18	Yes
P7	3	1	3	No
P8	2	7	7	No
P9	0	0	0	No
P10	2	3	3	No
P11	3	1	3	No

11.227 In total, smooth newts were encountered in nine waterbodies, with a 'medium' population[43] of this species on the site. Higher numbers of individuals were found in P5, P3 and P1a.

Reptile Survey

Desk Study

11.228 In 2015, HERC provided 14 records of reptiles for the search area. Of these records, eleven relate to grass snake *Natrix natrix*, three for slow-worm *Anguis fragilis* and one for common lizard *Zootoca vivipara*. The closest records to the application site relate to grass snake, the nearest being 0.65km to the south-west of the application site boundary. The most recent reptile record provided by HERC is from 2007.

11.229 Creswell Associates reported in their 2008 report on the results of a survey of the whole Ellenbrook Fields site in 1999 when *"small numbers of slow-worm were … recorded within the grassland and a single grass snake was also found".* It is unknown which part of Ellenbrook Fields these individuals were recorded from. However a later reptile survey undertaken in 2010 by Cresswell Associates of 'strategic locations across the site' did not confirm the presence of any reptiles.

11.230 In 2021, 17 records of reptiles were returned including; three of common lizard, 13 of grass snake and one slow worm record.

Field Survey

2015

11.231 Table 11-16 provides a summary of the results of the reptile survey carried out during 2015. Just one reptile, a grass snake, was encountered on the site during the total of seven surveys (the location of this individual is provided on Figure 3, **Appendix 11/2**). This individual was found on the last reptile survey visit, 24th June 2015, in the eastern part of R4.

Table 11-16:
Results of the Reptile Survey during 2015

Reptile Area	Number of Grass Snake Recorded
R1	0
R2	0
R3	0
R4	1
R5	0
Total	**1**

2021

11.232 No incidental records of reptiles were noted in surveys conducted within 2021.

Evaluation

11.233 Whilst population sizes derived from refugia data are notoriously unreliable, the results from the survey would suggest, based on Froglife's population score system[50], that the site supports a 'low' population of grass snake. At first pass this is somewhat surprising given the presence of large areas of what appears to be suitable reptile habitat on the site. A combination of factors could explain the apparent absence of reptiles, including the historic use of the site as an aerodrome (and the likely intensive mowing of any grassland at that time), the lack of reptile populations within the vicinity from which colonisation of the site could occur once it became neglected and more suitable, the presence of roads surrounding the site which may act as further barriers for reptile colonisation, and the regular waterlogging of the site during the winter which may reduce opportunities for reptile hibernation.

Bird Survey

Desk Study

11.234 The results from the data request from HERC in 2015 produced 18,168 bird records for the search area (nearly 93% of all the records provided by HERC). A total of 402 of these records relate directly to either 'Ellenbrook Fields' and/or 'Hatfield Aerodrome'. It should be noted that both Ellenbrook Fields and Hatfield Aerodrome comprise a larger area than the application site; nevertheless, all records with

[50] Froglife (1999) Reptile Survey: an introduction to planning, conducting and interpreting surveys for snakes and lizard conservation. Froglife Advice Sheet 10. Froglife, Halesworth

these site names have been included in the analysis given below. In addition, 113 bird records are made at a coarser 1km scale, and relate to the three 1km squares in which the application site sits, not necessarily to the site itself.

11.235 In total, 75 species were noted for Ellenbrook Fields, Hatfield Aerodrome or for the three 1km squares straddled by the application site. This is broken down into 54 species for Ellenbrook Fields/Hatfield Aerodrome and 43 for the three 1km squares as shown by Table 11-17 below.

Table 11-17:
Number of Records relating to Ellenbrook Fields and Hatfield Aerodrome, and for the three 1 km squares in which the Sit sits

Species	Number of records pertaining to 'Ellenbrook Fields' and/or 'Hatfield Aerodrome'	Number of records for the three 1km squares in which the site sits
Barn Owl	13	0
Black Redstart	2	0
Black-headed gull	0	7
Black-tailed Godwit	1	0
Blue tit	0	5
Bullfinch	4	1
Buzzard	9	3
Canada goose	0	1
Coal tit	0	1
Common gull	0	2
Cuckoo	58	1
Curlew	1	0
Dunnock	0	6
Fieldfare	21	2
Goldcrest	0	1
Goldfinch	2	5
Grasshopper Warbler	20	0
Great spotted woodpecker	0	3
Great tit	0	6
Green Woodpecker	4	5

Species	Number of records pertaining to 'Ellenbrook Fields' and/or 'Hatfield Aerodrome'	Number of records for the three 1km squares in which the site sits
Grey Partridge	8	0
Grey Plover	1	0
Grey Wagtail	3	0
Hen Harrier	1	0
Herring gull	0	2
Hobby	4	1
House Martin	6	0
House Sparrow	1	6
Kestrel	4	0
Lapwing	5	1
Lesser black-backed gull	0	1
Lesser Redpoll	1	1
Lesser Spotted Woodpecker	2	0
Linnet	4	2
Little owl	0	1
Mallard	0	3
Mandarin Duck	16	0
Marsh Harrier	1	0
Meadow Pipit	10	0
Moorhen	0	2
Peregrine	1	0
Pied wagtail	0	5
Pochard	0	1
Quail	1	0
Red Kite	24	1
Redshank	5	0
Redstart	5	0
Redwing	11	2

Species	Number of records pertaining to 'Ellenbrook Fields' and/or 'Hatfield Aerodrome'	Number of records for the three 1km squares in which the site sits
Reed Bunting	3	0
Ring Ouzel	4	0
Robin	1	7
Sand Martin	1	0
Short-eared Owl	16	0
Skylark	12	0
Snipe	10	0
Song thrush	0	3
Sparrowhawk	4	1
Spotted Flycatcher	5	0
Starling	3	5
Stock dove	0	1
Stonechat	3	0
Swallow	7	2
Swift	2	1
Tawny Owl	2	0
Teal	0	1
Tufted duck	0	1
Waxwing	2	0
Wheatear	24	1
Whinchat	16	0
Whitethroat	14	1
Willow Warbler	9	1
Woodcock	4	0
Wren	0	5
Yellow Wagtail	5	0
Yellowhammer	1	3

11.236 The background records listed at Table 11-17 above indicate that the site is fairly well monitored by local ornithologists and that it supports a range of resident and transient species that is typical of inland airfield sites. This includes scarcer wintering species not uncommonly found on airfield sites by virtue of their open nature, such as short-eared owl, barn owl and peregrine, as well as passage migrants attracted to open country such as wheatear and ring ouzel, and scarcer or declining breeding species present at least in some years by virtue of the large expanses of grassland, such as grasshopper warbler, grey partridge and cuckoo.

11.237 The 2008 Cresswell Associates report stated that "*in 2001 the site supported a number of bird species of conservation concern, including song thrush, skylark and lapwing. The presence of these species on the site was reconfirmed in 2008*".

11.238 A breeding bird survey was undertaken by Cresswell Associates in 2010 of the northern part of Ellenbrook Fields. The 2010 report stated "*The collated results suggest that the site of County Importance for ground nesting birds including skylark, meadow pipit and cuckoo; and scrub-nesting species including whitethroat. This is indicated by the large numbers of these species recorded on site during each survey visit and can be attributed to the extent of suitable nesting and foraging habitat and the relative lack of disturbance.*"

11.239 An annual report (2014) produced for Goodman by Barry Trevis in relation to the barn owl and kestrel nest boxes erected on the site revealed that of the four barn owl boxes on the site three were used to successfully rear barn owls in that year. Other species noted to be nesting in the boxes include stock dove *Columba oenas*, and Mandarin duck *Aix galericulata* (with 25 eggs present- probably from two females); however, this nest was abandoned, possibly due to the box having been taken over by a pair of barn owls. No kestrels were reported to have nested on the site in 2014. It was stated in the report that in previous years barn owl use and occupation of the nest boxes on the site "*was considered to be generally low taking into account the amount of suitable foraging habitat*". However, 2014 was more successful, and this appears to have mirrored the national trend for this species for that year, with the Barn Owl Trust stating that "*2014 turned out to be an exceptional year for barn owls across the UK*[51]". The reason/s for the breeding success of barn owl in 2014 could have been due to the larger small mammal populations, the previous milder winter, and a dry and warm spring and summer.

11.240 The Birds of Hertfordshire publication[52] (largely incorporating data from the 2007-2011 BTO-run bird atlas survey) reports that short-eared owls have been regular at Ellenbrook Fields (along with other sites such as the adjacent Beech Farm Gravel Pits) and the site now has a certain notoriety for this species amongst local ornithological circles, albeit with concerns that increasing public use may be suppressing its interest for disturbance- sensitive species.

11.241 The desk study in 2021 returned 16,838 records of birds within 2km of the application site exhibiting a largely comparable species assemblage to the previous desk study.

11.242 Records of note that are near to the Hatfield/Ellenbrook Fields area and not captured in the previous desk study included:

[51] http://www.barnowltrust.org.uk/wp-content/uploads/State-of-the-UK-Barn-Owl-Population-2014-updated-links.pdf

[52] Smith, K., Dee, C., Fearnside, J. & Ilett, M. (2015) Birds of Hertfordshire. *Hertfordshire Natural History Society*

- the most recent record of barn owl was from 2018 (exact location not disclosed). Recent records from Hatfield Aerodrome site and Ellenbrook Fields were provided from 2016.
- two counts of red crossbill *Loxia curvirostra* observed flying overhead in close proximity to site.
- 32 counts of kingfisher *Alcedo atthis* including three records from Ellenbrook Fields and four from Hatfield Aerodrome site.
- 141 records of green sandpiper *Tringa achropus* including from Ellenbrook Fields.
- one record of greylag goose *Anser anser* flying overhead near the site.
- one record of nightingale *Luscinia megarhynchos* flying over Ellenbrook Fields.
- one record of crane *Grus grus* flying overhead Ellenbrook Fields.
- one barnacle goose *Branta Leucopsis* flying over Ellenbrook Fields.
- two, potentially up to five, records of little egret *Egretta garzetta* from the Hatfield area.
- numerous records of non-native ring-necked parakeet *Psittacula krameri* and Canada goose *Branta canadensis.*

11.243 In 2021, additional baseline ecology information relating to avifauna was provided from a 2019 Ellenbrook Fields ES submission[53]:

> *'Immediately adjacent areas do not provide suitable habitat for any of the Schedule 1 species except red kite and barn owl. Red kite could breed in woodland at the west of the Site. However, no signs of nests of this species were seen during the survey. Barn owl was recorded hunting in grassland at the Application Site in surveys carried out in 2010 (Cresswell Associates, 2010), and was recorded as nesting in Home Covert and Round Wood LWS and roosting in a derelict radar building south of the Application Site (Cresswell Associates, 2010).*
>
> *A barn owl nest box is present on the western boundary of the grassland area in adjacent woodland but was in use by stock dove Columba oenas in 2016 and was full of woody nesting materials (making it unsuitable for barn owl) in 2018. A barn owl was heard in the south-western part of the Application Site [Ellenbrook Fields] in April 2016 (during bat surveys), confirming that this species is present in the area. The grassland at the Application Site provides suitable foraging habitat for this species.*
>
> *Short-eared owl, which is not listed on Schedule 1, but which is an amber-listed species in Eaton et al. (2015)[54] is noted as a regular winter visitor to Ellenbrook Fields, i.e. the Application Site (Smith et al. 2015)[55].'*

11.244 The barn own box being referred to above is at this location (approx. grid reference TL 2018 0937);

[53] R Moxon, pers comm

[54] *Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746.* https://www.britishbirds.co.uk/wpcontent/uploads/2014/07/BoCC4.pdf *[accessed 20/04/17].*

[55] *Smith K. W., Dee C. W., Fearnside J. D. and Ilett M. (2015) Birds of Hertfordshire. Hertfordshire Natural History Society.*

immediately north west of the Hatfield Aerodrome site.



Figure 11-1:
Figure 1: Location of Barn Owl Box[56]

Wintering and Breeding Bird Surveys

2015

11.245 A total of 57 bird species were noted on the site over the wintering and breeding bird survey visits. This is broken down into 41 species recorded during the wintering bird survey, and 47 species recorded during the breeding bird survey. Figures 8 to 11 (**Appendix 11/2**) provide the results of each wintering bird survey, and figures 12 to 14 provide the results of each breeding bird survey visit. Table 11-18 below summarises the number of individuals recorded during the wintering bird survey, and the number of territories assessed to be present during the breeding season.

[56] R. Moxon – pers. comm.

Table 11-18:
Results of the Wintering (2014/15) and Breeding Bird Survey (2015)

Common Name[57]	Conservation status*	Number of individuals during wintering bird survey				Breeding bird survey	
		28/11/2014	15/12/2014	20/01/2015	25/02/2015	Estimated number of territories in 2015	Highest breeding evidence
Barn owl	Sch1	0	0	1	2	1-3	Pair occupying box
Blackbird		29	34	21	14	4-8	Permanent territory
Blackcap		0	0	0	0	5-8	Permanent territory
Blue Tit		18	30	31	16	8-12	Fledged young
Bullfinch	SPI/Amber	3	5	2	1	2-3	Suitable habitat
Buzzard		0	0	1	0	0-1	Suitable habitat
Carrion Crow		1	0	1	3	0-1	Suitable habitat
Chaffinch		2	2	2	9	4-7	Permanent territory
Chiffchaff		0	0	0	0	4-6	Permanent territory
Coal tit		0	0	2	0	-	-
Cuckoo	SPI/Red	0	0	0	0	0-1	Permanent territory
Dunnock	SPI/Amber	17	8	8	18	12-17	Permanent territory
Fieldfare	Sch1/Red	37	1	8	0	-	-
Garden warbler		0	0	0	0	0-1	Singing
Goldcrest		2	0	0	1	1-2	Singing
Goldfinch		18	2	10	13	0-1	Suitable habitat
Great Spotted Woodpecker		1	0	0	0	0	Suitable habitat
Great Tit		11	7	31	20	2-4	Fledged young
Green Woodpecker		5	5	2	3	0-1	Suitable habitat
Greenfinch		2	0	1	0	0-1	Suitable habitat
Grey Heron		2	0	0	0	0	Flying over
Jackdaw		0	0	0	0	0	Not breeding

[57] See Appendix 11/2 for the scientific names of each species

Common Name[57]	Conservation status*	Number of individuals during wintering bird survey				Breeding bird survey	
		28/11/2014	15/12/2014	20/01/2015	25/02/2015	Estimated number of territories in 2015	Highest breeding evidence
Jay		3	5	0	2	0	Flying over
Kestrel	Amber	2	1	2	1	0-1	Flying over
Lapwing	SPI/Red	0	0	0	0	0	Flying over
Lesser whitethroat		0	0	0	0	0-1	Singing
Linnet	SPI/Red	4	0	1	6	8-10	Permanent territory
Long-tailed Tit		11	4	9	7	1-3	Suitable habitat
Magpie		16	8	11	17	5-8	Suitable habitat
Mallard	Amber	4	0	0	4	0-1	Suitable habitat
Meadow Pipit	Amber	7	17	18	56	0-1	Suitable habitat
Moorhen		0	0	0	0	1	Suitable habitat
Partridge sp.		0	0	3	1	-	Suitable habitat
Pheasant		3	6	4	2	1-3	Suitable habitat
Pied Wagtail		6	1	2	1	-	Suitable habitat
Red-legged partridge		0	0	0	0	1-2	Suitable habitat
Red Kite	Sch1	0	1	0	1	0	Flying over
Redwing	Sch1/Red	17	4	10	6	-	Not breeding
Reed Bunting	SPI/Amber	8	4	2	6	6-8	Permanent territory
Reed warbler		0	0	0	0	0-1	Singing
Robin		18	11	13	21	10-14	Permanent territory
Sedge warbler		0	0	0	0	0-1	Singing
Skylark	SPI/Red	1	3	1	12	8-11	Permanent territory
Snipe	Amber	1	0	3	1	-	Not breeding
Song Thrush	SPI/Red	10	8	13	15	1-2	Permanent territory
Sparrowhawk		2	0	0	0	-	Not breeding
Starling	SPI/Red	0	0	0	0	0	Not breeding

Common Name[57]	Conservation status*	Number of individuals during wintering bird survey				Breeding bird survey	
		28/11/2014	15/12/2014	20/01/2015	25/02/2015	Estimated number of territories in 2015	Highest breeding evidence
Stock Dove	Amber	0	3	2	3	1-3	Pair
Stonechat		2	0	3	3	-	Not breeding
Swallow		0	0	0	0	0	Flying over
Wheatear		0	0	0	0	0	Migrant
Whitethroat		0	0	0	0	26-31	Permanent territory
Willow warbler	Amber	0	0	0	0	5-7	Permanent territory
Woodcock	Red	3	2	3	4	-	Not breeding
Woodpigeon		13	24	9	5	2-3	Permanent territory
Wren		16	23	12	8	6-8	Permanent territory
Yellowhammer	SPI/Red	1	1	0	0	-	Not breeding

***Notes:**

Sch.1: Schedule 1 species that are specially protected under Part 1 of the Wildlife and Countryside Act 1981 (as amended)

SPI: Species of Principal Importance further to s.40 of the Natural Environment and Rural Communities Act 2006.
Red/Amber List: Species having undergone a decline of >50% in the 25 years to 2009 (Red List) or a 25-49% decline over the same period (Amber List). (After Eaton *et al.* (2015)[58]

11.246 During the targeted owl survey undertaken in the late afternoon/early evening of the January visit, two barn owls were noted. The first bird was noted at 15:30 hunting over a small field of rough grassland immediately north-west of the application site (outside the site boundary). The second bird was noted at 16:08 hunting in the south-east of the application site. No short-eared owls were noted.

11.247 Whilst undertaking the targeted owl visit in January, a relatively large number of corvids, particularly jackdaw as well as magpie, were noted to enter a roost within the dense scrubby area in the south-west of the site.

11.248 Birds were also recorded just outside the site boundary whilst undertaking the bird survey visits, and these species may overfly or otherwise use the site on occasion. Such species included common gull *Larus canus* (sitting on the University playing fields to the south-east), great spotted woodpecker *Dendrocopos major*, jay *Garrulus glandarius*, nuthatch *Sitta europaea*, treecreeper *Certhia familiaris*

[58] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746

and woodpigeon (>1000 leaving roost) in Home Covert and both coot *Fulica atra* and water rail *Rallus aquaticus* in the reedbed/ gravel pits to the north of the site. Species of note recorded just outside the site during the breeding bird survey include great spotted woodpecker, jay and treecreeper (in Home Covert), and little grebe *Tachybaptus ruficollis* and reed warbler *Acrocephalus scirpaceus* in the CEMEX reedbeds to the north.

2018

11.249 In 2018, whilst conducting great crested newt surveys, SLR surveyors recorded barn owl quartering the fields in the north of the site at dusk on 12th April and at dawn on 13th April 2018.

2021

11.250 SLR undertook three wintering bird survey visits in 2021 and the results are presented below.

11.251 A total of 37 bird species were noted within or flying over the site during the wintering bird survey visits and the results are present in **Appendix 11/6** (Visits 1-3). An additional five bird species were recorded during the UKHab survey in April 2021. Table 11-19 below summarises the number individuals recorded during the wintering bird survey.

Table 11-19:
Results of the Wintering Bird Survey (2021)

Common Name	Conservation status*	Number of Individuals during wintering bird survey			Other species encountered during UKHab survey (April)	Comments
		15/01/21	09/02/21	09/03/21		
Blackbird		12	8	10		
Blue Tit		21	8	15		
Black-headed Gull	Amber	1	1	4		
Bullfinch	Amber/S.41	5	1	1		
Buzzard		-	1	4		
Carrion Crow		30	5	20		
Chaffinch		6	13	5		
Chiffchaff		-	-	-	10	
Collard Dove		1	-	1		
Cuckoo	Red/S.41	-	-	-	1	
Dunnock	Amber/S.41	5	4	9		

Common Name	Conservation status*	Number of Individuals during wintering bird survey			Other species encountered during UKHab survey (April)	Comments
		15/01/21	09/02/21	09/03/21		
Fieldfare	Sch1/Red	4	6	-		Winter migrant
Goldfinch		4	4	6		
Great Tit		5	2	8		
Green Woodpecker		4	1	2		
Grey Wagtail	Red	-	-	-	1	
Jackdaw		-	-	12		
Jay		-	-	1		
Lesser Black-backed Gull	Amber	1	4	-		
Linnet	Red/S.41	3	-	5		
Long-tailed Tit		-	-	10		
Magpie		6	9	12		
Meadow Pipit	Amber	17	12	8		
Moorhen		2	-	-		
Pheasant		-	-	2		
Pied Wagtail		-	2	-		
Red-legged partridge		3	-	-		
Red Kite	Sch1	2	1	3		
Redwing	Sch1/Red	13	5	2		Winter migrant
Reed Bunting	Amber/S.41	-	-	-	1	
Ring-necked Parakeet		-	-	2		Introduced
Robin		3	6	10		
Skylark	Red/S.41	-	-	3		
Snipe	Amber	1	-	-		
Song Thrush	Red/S.41	1	2	5		
Starling	Red/S.41	13	-	-		

Common Name	Conservation status*	Number of Individuals during wintering bird survey			Other species encountered during UKHab survey (April)	Comments
		15/01/21	09/02/21	09/03/21		
Stock Dove	Amber	-	-	1		
Stonechat		1	1	3		
Whitethroat		-	-	-	3	
Willow Warbler	Amber	-	-	-	2	
Woodpigeon		6	1	10		
Wren		16	10	13		

***Notes:** Sch.1: Schedule 1 species that are specially protected under Part 1 of the Wildlife and Countryside Act 1981 (as amended) Section 41 (41) of the Natural Environment and Rural Communities (NERC) Act. Red/Amber List: Species having undergone a decline of >50% in the 25 years to 2009 (Red List) or a 25-49% decline over the same period (Amber List). (After Eaton *et al.* (2015)[59]

11.252 Bioscan recorded a total of 41 wintering bird species over four surveys conducted in 2014 and 2015. Birds recorded within the site in 2014 and 2015 but not in 2021 by SLR include coal tit, goldcrest, great spotted woodpecker, greenfinch, grey heron, kestrel, mallard, reed bunting (although recorded in April 2021), sparrowhawk, woodcock and yellowhammer.

11.253 A grey wagtail *Motacilla cinerea* was also recorded just outside of the site, adjacent to Pond 11. Grey wagtail is a Red List species.

11.254 Other species encountered on site during the habitat survey on 22nd April 2021 includes a cuckoo *Cuculus canorus* heard in calling in the northeast of the site, Chiffchaff *Phylloscopus collybita* calling from the various locations within woodland and hedgerows, willow warbler *Phylloscopus trochilus* and reed bunting *Emberiza schoeniclus* in the southern half of the site. Cuckoo is a Red List and S.41 species. Willow warbler and reed bunting are Amber List. Reed bunting is also a S.41 species.

11.255 There is reference to the building on site being used as a barn owl roost (http://www.hatfield-herts.co.uk/aviation/dh_reminders.html): however, there was no evidence of use by barn owl at the time of survey. No owl boxes have been installed internally or externally and no other nests were recorded. There are no suitable ledges for nesting inside the building, as the only surface, comprising of metal cabinets, are approx. 1m high and barn owls generally roost at least three metres above ground level.

[59] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746

11.256 In 2021, during the wintering bird surveys conducted by SLR, three owl boxes were observed within the application site. There is understood that a fourth owl box and the single kestrel box are also present on the site, although locations are unconfirmed. Of the boxes identified, a single owl pellet was recorded beneath one owl box and a further two owl pellets were recorded beneath a second owl box. The locations of the boxes and owl pellets are shown in the Drawing within **Appendix 11-4.**

Evaluation

11.257 In order to place the results into the local context, the species list and the numbers present on the site were assessed against the requirement for record submission by Hertfordshire Bird Club (HBC). This revealed that no species found on the site are considered to be 'rare'. There are, however, seven species that fall within the 'All' category (i.e. all records of a species are required). The presence on the 'All' list is likely to indicate that a species is uncommon in the county or otherwise of elevated local interest. These species comprise barn owl, cuckoo, red kite, snipe, stonechat, wheatear and woodcock. Records of breeding for selected species are also requested by HBC; with these species on the site comprising bullfinch, goldcrest, kestrel, linnet, reed bunting, skylark and stock dove (and possibly buzzard, green woodpecker, meadow pipit, red-legged partridge and reed warbler). HBC also request records of minimum numbers of individuals of certain species; the following species were found to exceed the quoted numbers on the site; blue tit, fieldfare, goldfinch, great tit, long-tailed tit, magpie, meadow pipit, reed bunting and skylark.

11.258 No short-eared owls were recorded during the bird surveys of the site, and it would appear based on the data from HERC and from BirdTrack[60] that this species has not been regularly recorded at Hatfield Aerodrome since the end of 2011. The reason/s for the absence of this species from what appears to have been a regular site is not known but could be related to the increase in scrub cover and/or the increasing levels of diurnal human activity.

11.259 Overall, the bird interest of the site is not atypical of what would be expected on any inland airfield site of equivalent size that has undergone transition from a more intensively managed operationally active site with short grass to a neglected site with coarse grassland and developing scrub. That transition is likely to be implicated or a contributing factor in the loss of breeding lapwing from the site since the early 00s, but is likely to have increased the suitability of the site for other species, including barn owl, snipe, stonechat and woodcock. The breeding bird assemblage is again typical of the habitats present, although the high number of whitethroat territories is of note, as well as the number of breeding territories of dunnock, linnet, reed bunting and willow warbler. Other breeding species of elevated interest include cuckoo and barn owl. The site also evidently receives passage use by species such as wheatear and, in some years, ring ouzel.

Badger Survey

Desk Study and Field Survey

2015 and 2021

11.260 Refer to the Hatfield Aerodrome Confidential Badger Report in **Appendix 11/5** for detail relating to this

[60] http://app.bto.org/birdtrack/main/data-home.jsp

species.

Evaluation

11.261 Refer to the Hatfield Aerodrome Confidential Badger Report for detail relating to this species.

Invertebrates

Desk Study

11.262 In 2015, a total of 1,140 invertebrate records were provided by HERC for the search area. Approximately half of the records relate to butterflies, with the other half largely relating to moths. Of the 1,140 records, 12 relate to 'Ellenbrook Fields'/'Hatfield Aerodrome' with all 12 of these pertaining to the small heath *Coenonympha pamphilus* butterfly.

11.263 In 2021, 2,604 records of moths, 772 records of butterfly, and 123 other invertebrates (including caddis flies, grasshoppers, damselfly, dragonflies, lacewings, grass ants, true bugs, true flies and beetles) were returned by HERC for the 2km study area.

Field Survey

2015

11.264 A total of 806 terrestrial invertebrate species were recorded on the site, of which 248 were moths. **Appendix 11/4** provides the full invertebrate species list obtained, with a summary of the more notable species set out below under the relevant tiers of formal conservation status:

Species of Principal Importance/ Priority Species/Section 41 species (former UK BAP species).

11.265 UK BAP priority species were those that were identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan (UK BAP). The original list of UK BAP priority species was created between 1995 and 1999. In 2007, a revised list was produced, following a 2-year review of the priority species and habitats lists. Following the review, the list of UK BAP priority species increased from less than 600 to 1150.

11.266 As a result of devolution, and new country-level and international drivers and requirements, much of the work previously carried out by the UK BAP is now focussed at a country-level rather than a UK-level, and in July 2012, the UK BAP was succeeded by the UK Post-2010 Biodiversity Framework. However the UK list of priority species remains an important reference source and was used to draw up statutory lists of species and habitats of principal importance in England, Scotland, Wales and Northern Ireland pursuant to the obligations levied by the Natural Environment & Rural Communities Act, 2006 (sections 40-42).

11.267 No UKBAP priority invertebrates or invertebrate species of principal importance were noted to be present on the site.

Red Data Book

11.268 Eight of the species recorded are listed in the British Red Data Books[61],[62]. Table 11-20 below provides each of these Red Data Book species along with notes regarding their ecology and current conservation status.

Table 11-20:
Red Book Data Book Species Recorded on the Site

Species	English Name	Notes
Hecatera dysodea	Small Ranunculus moth	This species has re-colonised Britain after one hundred years of apparent extinction. Caterpillars feed on developing seeds of prickly lettuce *Lactuca serriola* and great lettuce *Lactuca virosa*. The species is now widely recorded on neglected and brownfield land in the home counties and the formal Red Data status is no longer warranted.
Stictopleurus abutilon	A ground beetle	Another species formerly believed to be extinct in Britain. It is now recorded fairly widely in warm open flower rich grassland in the south-east. The Endangered status is no longer warranted; a review of the conservation status of several invertebrates is currently in progress and the status of this species may be formally reduced to Nationally Local when it is published.
Stictopleurus punctatonervosus	A ground beetle	As for above species.
Cistogaster globosa	A tachinid fly	This species is known from a few localities in southern England, and given its distinctiveness it is unlikely to be overlooked; it is thus probably genuinely rare, though very recently there seems to be an expansion in range and frequency of both host and fly. It parasitises shield bugs, especially *Aelia acuminata*. The fly appears to favour dry grassland where the host is usually found. Adult flies have been seen nectaring on wild carrot but other species of plant are also likely to be visited.
Datonychus urticae	A weevil	This species is found in tall herb communities and at woodland edges and may be a component of the fauna that occupies transitional zones (edge habitats). The larvae feed in hedge woundwort *Stachys sylvatica*, almost certainly internally within the stems. It is present in southern England and is apparently rare; however, it might be overlooked in some places as it closely resembles another more common species.
Lygus pratensis	A plant bug	This species has apparently always been a polyphagous species in Europe, found in weedy species, but in Britain it has long been regarded as an indicator of quality ancient woodland. In the last few years, however, this species has been widely recorded away from woodland in the south of England. The status of Near Threatened is currently unwarranted.
Tephritis matricariae	A picture-winged fly	This species has until recently been recorded in Kent and Essex only. Its

[61] Shirt, D. B., (1987). *"British Red Data Books: 2. Insects."* NCC

[62] Bratton, J. H., (1991). *"British Red Data Books: 3. Invertebrates other than insects."* NCC

Species	English Name	Notes
		host plants are probably *Crepis vesicaria* ssp. *Taraxacifolia* and *Crepis capillaris*. It is currently provisionally classified as a Red Data species within the 'unknown' category K.
Liorhyssus hyalinus	A bug	This species has historically regarded as a rare vagrant to Britain, it has appeared much more frequently since the 1990s and has become established in some areas. Foodplants include storksbill and various composites.

Nationally Scarce Species.

11.269 Twenty-six Nationally Scarce species were recorded on the site, with eight of these in the former Nationally Notable Na category. Table 11-21 below provides the Nationally Scarce species in the former Nationally Notable Na category.

Table 11-21:
Nationally Scarce Species in the former Nationally Notable Na category recorded on the site

Species	English Name	Notes
Eupithecia millefoliata	Yarrow Pug	Mainly confined to the south-east of Britain. There were no records for this species prior to 1987, and it is now likely to be expanding its range.
Hylaeus cornutus	Yellow-faced Bee	This species is largely confined to the south-central and south-eastern counties of Britain. It is largely found where wild carrot and other white umbellifers are numerous.
Lasius brunneus	Banded Tree Ant	There are insufficient historic records of this species to plot changes in abundance and distribution; however the overall impression is that it has become more common in the south-east in recent years.
Phalacrus championi	Smut Beetle	There is little known information regarding this species beyond the fact that it seems to be rare.
Platynaspis luteorubra	A ladybird	This species is largely found to the south-east of a line between the River Severn and the Wash. The Herts Beetle Recorder has indicated that this is an extremely rare species in this county.
Rhinocyllus conicus	Thistle-head Weevil	This species is widespread, but apparently very localised in the southern coastal counties of Britain. Despite this species largely pertaining to coastal areas, the identification of this species was confirmed by the County Beetle Recorder and therefore represents a significant record.
Rhyzobius chrysomeloides	A ladybird	This species was first found in Britain in 1996 in Surrey. Since then it has spread and therefore its formal conservation status as nationally scarce is probably inappropriate.
Xantholinus elegans	Rove Beetle	This species' precise requirements are unknown, but other members of the group are found in tussocks and the adults may be predatory on other invertebrates.

11.270 A further 18 of these Nationally Scarce species are in the former Nationally Notable Nb category or are uncategorised Nationally Scarce ('Notable') Diptera. These are listed at Table 11-22 below. Several of these species do not appear on the latest version of the JNCC 'Taxon designations' spreadsheet, indicating that they have been demoted from the nationally scarce category following recent reviews, most commonly due to significant expansions in population and range (e.g. in the case of Roesel's bush cricket):

Table 11-22:
Nationally Scarce (Categories Nb and N) Invertebrates Recorded on the Site

Species	English name	Main ecological associations
Agnocoris reclairei	a mirid bug	Willows, especially *Salix alba*, in Fens and gravel pits
Athysanus argentarius	a plant hopper	in a variety of grassland habitats, usually near the coast
Bembecia ichneumoniformis	Six-belted Clearwing	*Lotus*, *Anthyllis* and *Hippocrepis* – in the rootstock
Bianor aurocinctus	a spider	dry, ruderal sites
Drymus latus	a plant bug	amongst vegetation litter, moss etc
Evergestis pallidata	a pyralid moth	cruciferous plants - especially *Barbarea vulgaris*
Hippodamia variegata	variegated ladybird	ruderal or sandy habitats
Idiocerus herrichi	a plant hopper	on Poplars and Willows and also on Alder
Longitarsus dorsalis	a flea beetle	Ragworts (*Senecio* species) – now a fairly common species in the south
Metrioptera roeselii	Roesel's Bush-cricket	tall grassland, now everywhere in the south of England
Microplontus triangulum	a weevil	associated with *Achillea millefolium*; the larvae feed inside flowering stems
Philodromus albidus	a spider	lower branches of broad-leaved trees at the edge of woodland rides
Poecilium alni	a longhorn beetle	larvae feed in small branches and twigs of various tree species
Ptilodon cucullina	Maple Prominent	field maple, very rarely on sycamore
Sibinia primitus	a weevil	dry sandy areas
Sitona waterhousei	a weevil	*Lotus corniculatus*
Trichosirocalus barnevillei	a weevil	Yarrow (*Achillea millefolium*) in ruderal habitats
Merzomyia westermanni	a picture-winged fly	various ragwort species

Nationally Local Species

11.271 Twenty-five species are listed formally as Nationally Local. Table 11-23 below provides a list of the

Nationally Local species recorded on the site.

Table 11-23:
Nationally Local Invertebrates Recorded on Site

Species	English name	Main ecological associations
Acidia cognata	a picture-winged fly	*Tussilago* and *Petasites* plants – mining the leaves
Acupalpus dubius	a ground beetle	damp moss, damp litter and similar habitats
Agalenatea redii	a spider	lower than one metre in heather and gorse, and also in rough grassland
Amara tibialis	a ground beetle	open, sandy areas, especially costal dunes
Anaceratagallia ribauti	a plant hopper	on the ground amongst grasses in dry places - common in the south-east
Anomoia purmunda	a picture-winged fly	Larva feeds in the flesh of hawthorn Berries
Aphrodes bicinctus	a plant hopper	grasses in dry situations
Aphthona euphorbiae	a leaf beetle	widely polyphagous
Apolygus lucorum	a plant bug	low plants
Bruchidius villosus	a leaf beetle	On broom
Byrrhus pilula	a pill beetle	associated with moss or rabbit-grazed turf, in open situations.
Centrotus cornutus	a froghopper	oak, aspen and other sapling trees
Chorthippus albomarginatus	Lesser marsh Grasshopper	grasslands - has spread inland from coastal stations
Chrysotoxum festivum	a hoverfly	grassland with open scrub - the larvae feeding on root aphids
Chrysotoxum verralli	a hoverfly	grassland with associated scrub
Cordylepherus viridis	a beetle	a common grassland species
Coremacera marginata	a snail-killing fly	dry habitats, especially grasslands
Corizus hyoscyami	a plant bug	Stork's-bill, mainly south-western
Crossocerus nigritus	a sand wasp	nests in broken stems of shrubs and reedmace (*Typha*)
Cryptocephalus fulvus	a leaf beetle	possibly on sheep's-sorrel, but adults are found on a variety of flowers
Curculio glandium	a weevil	Oak trees - in developing acorns
Cyclosa conica	a spider	spring species of trees and bushes, preferring damp, dark woodland
Cymus melanocephalus	a plant bug	associated with *Juncus* wherever it grows
Eilema depressa	Buff Footman	lichens and algae on trees

Species	English name	Main ecological associations
Epitrix pubescens	a beetle	associated with Woody Nightshade
Euproctis chrysorrhoea	Brown-tail	rosaceous trees and shrubs - sometimes other trees and shrubs
Hypena rostralis	Buttoned Snout	hops - hibernating as adult in sheds, hollow trees, cellars etc
Hypsosinga pygmaea	a spider	grassland (especially calcareous) and low vegetation
Idaea rusticata	Least Carpet	withered leaves of ivy, *Clematis*, *Alyssum saxatile*, etc
Kalama tricornis	a lacebug	Dry ruderal habitats and sand dunes
Lamprotettix nitidulus	a plant hopper	arboreal species, mostly in the south
Mangora acalypha	a spider	Gorse and Heather in heathland and woodland in southern Britain
Metidiocerus rutilans	a plant hopper	on sallows, but found overwintering in pines
Neoscona adianta	a spider	rough grassland and heathland.
Notiophilus substriatus	a ground beetle	open, usually dry habitats especially if there is minimal vegetation
Oedemera lurida	a beetle	a common grassland species
Olibrus liquidus	a smut beetle	possibly associated with sap runs on trees
Oncotylus viridiflavus	a plant hopper	widespread in grassland habitats, usually on flowering heads of knapweed
Oxystoma craccae	a seed weevil	feeds in the developing seeds of vetches
Pipiza fenestrata	a hoverfly	Edge habitats
Pseudovadonia livida	a longhorn beetle	larvae feed in dead wood of deciduous and coniferous trees
Psylliodes chrysocephala	a leaf beetle	various Cruciferae
Rhamphus oxyacanthae	a weevil	larva mines in leaves of hawthorn
Rhopalus subrufus	a plant bug	St John's Wort (*Hypericum perforatum*)
Sphenella marginata	a picture-winged fly	on various ragwort species, in late summer and autumn
Stigmella aceris	a micro moth	caterpillar mines leaves of maple
Taeniapion urticarium	a weevil	nettles - larvae feed inside stem nodes
Tephritis formosa	a picture-winged fly	larvae gall the flowers of sow thistle
Tetrix subulata	Slender Ground-hopper	bare mud and sparse vegetation in marshy places, especially dune slacks
Tritomegas luctuosus	a plant bug	feeds on forget-me-nots (*Myosotis* species) in dry places
Tychius junceus	a weevil	*Medicago lupulina*

Species	English name	Main ecological associations
Xanthogramma pedisequum	a hoverfly	larvae feed in ants nests

'Research Only' UKBAP moths

11.272 The original list of UK BAP Priority Species of moths was divided into two sections. In the first, a total of 81 species are afforded the status of UK BAP Priority Species; none of these is recorded in the surveyed area nor is any likely to be present. However, the second section is a list of 69 species that have declined in population by a significant amount in the past 25 years. These were defined as "not yet rare" and were flagged as UK BAP species for the purposes of further research only. They may be seen as having equivalence with bird species listed on the UK amber list by virtue of recent population declines as opposed to genuine rarity.

11.273 Table 11-24 below provide the "Research Only" moth species recorded on the site.

Table 11-24:
"Research Only" Moth Species Recorded on the Site

Species	English name	Caterpillar food plant
Acronicta psi	Grey Dagger	deciduous trees and bushes
Agrochola litura	Brown-spot Pinion	deciduous trees and shrubs and herbaceous plants (requires both)
Agrochola lychnidis	Beaded Chestnut	deciduous trees and shrubs and herbaceous plants (requires both)
Allophyes oxyacanthae	Green Brindled Crescent	rosaceous trees and shrubs
Apamea remissa	Dusky Brocade	grasses
Aporophyla lutulenta	Deep-brown Dart	grasses, hawthorn, blackthorn
Atethmia centrago	Centre-barred Sallow	ash - buds then flowers
Callistege mi	Mother Shipton	coarse grasses, including reeds
Caradrina morpheus	Mottled Rustic	herbaceous plants
Chiasmia clathrata	Latticed Heath	*Medicago, Trifolium*
Diarsia rubi	Small Square-spot	herbaceous plants
Ecliptopera silaceata	Small Phoenix	willow herbs, enchanter's nightshade
Ennomos fuscantaria	Dusky Thorn	Ash
Hoplodrina blanda	Rustic	herbaceous plants
Scotopteryx chenopodiata	Shaded Broad-bar	vetches and clovers

Species	English name	Caterpillar food plant
Spilosoma lubricipeda	White Ermine	herbaceous plants
Spilosoma lutea	Buff Ermine	herbaceous plants and also trees and shrubs
Timandra comae	Blood-vein	Polygonaceae
Tyria jacobaeae	Cinnabar	Ragwort
Watsonalla binaria	Oak Hook-tip	oak - occasionally birch

2021

11.274 During the surveys conducted by SLR in 2021, anecdotal records of invertebrates were noted. Species recorded include blue-bordered carpet *Plemyria rubiginata* eggs on blackthorn adjacent to Home Covert Wood, peacock butterfly *Aglais io*, large white *Pieris brassicae*, orange-tip butterfly *Anthocharis cardamines* and a number of solitary bee species.

Evaluation

11.275 In order to provide a high level indication of site quality, useful for comparison with other sites with a broadly similar level of recording effort, a Species Quality Index can be calculated. This requires that recorded invertebrate species are scored according to their national status as follows:

- RDB species 100 points
- Notable - Na species 50 points
- Notable - Nb species 40 points
- Notable - N species 40 points
- Local species 20 points
- Common species no score

11.276 These scores are derived from Ball (1986)[63]. Adding together the scores in each category provides an 'Invertebrate Index' which is then calibrated for sampling effort through simple division of the total Invertebrate Index by the total number of species recorded.

11.277 On sites where it is evident that a significant number of the species recorded have exhibited dynamic positive or negative changes in national status that are not always reflected in the formal categorisations, it may be appropriate to revise scorings to better reflect current rarity. This is appropriate here where, amongst other things, three of the species found were considered 'extinct' in Britain prior to 1994 but have since either been re-found or have recolonised, and furthermore gone on to become widespread in south-east England. Revised scorings suggested for this site are indicated

[63] Ball, S. C. (1986) Terrestrial and freshwater invertebrates with Red Data Book, Notable or habitat indicator status. Invertebrate Site Register internal report number 66. NCC

in Table 11-25.

Table 11-25:
Revised allocation of invertebrate scores and calculation of Species Quality Index

Status category	Score in Ball (1986)	Revised score	Number of taxa on this site	Total Score for site	SQI
BAP(Research only)*	-	20	20	400	-
Extinct*	100	20	3	60	-
RDB 1	100	100	1	100	-
RDB 3	100	100	2	200	-
RDB K	100	100	2	200	-
NS(Na)	50	50	8	400	-
NS (Nb & N)	40	40	18	720	-
Local	20	20	25	500	-
Subtotal	-	-	**79**	2580	-
Common	0	0	727	0	-
Totals	-	-	**806**	**2580**	**3.20**

*specifically the species recorded in this present report only.

11.278 In the context that Species Quality Index outputs can be categorised as indicating a site of national importance where above 7, the total revised Species Quality Index value of 3.20 is fairly low and indicates a site of modest importance to invertebrate conservation. This is despite the inclusion of 'Research only' UKBAP moths, many of which remain very common, and despite no correction being made for certain other species that are undoubtedly abundant but retain a formal 'nationally scarce' status, such as Roesel's bush cricket. On the other hand, the high proportion of the invertebrate species total that relates to moths may skew the result because the vast majority of moths recorded in light traps are common species and for most sites moths are unlikely to have been recorded to an equivalent degree. As a consequence, the analysis of the full species dataset from the application site may not be directly comparable with other areas. This can be corrected for by removing the 248 moth species from the calculation and recalculating using only the remaining 558 non-moth invertebrates. This results in only a modest increase in SQI value, however: to 4.62.

11.279 An alternative means of evaluation commonly employed in modern invertebrate assemblage assessments is the Invertebrate Species-habitats Information System (ISIS). This is a tool introduced by Natural England and used by them to undertake common standards monitoring (i.e. to monitor the condition of invertebrate assemblages), score them based on the invertebrate assemblage types present (similar to how the NVC is used to assess plant communities) and evaluate their conservation value. It is thus a tool designed to measure invertebrate conservation value within the context of certain pre-existing parameters, and must be used on sites outside that context only with care.

11.280 The ISIS assemblage types are defined by lists of characteristic species that are generally found together in assemblages under natural or semi-natural. Broad assemblage types (BATs) are a comprehensive series of assemblages characterised by more widespread species. Specific assemblage types (SATs) are characterised by stenotopic (ecologically restricted) species, and therefore are more likely to be of intrinsic nature conservation value.

11.281 The software can therefore be used to approach the question of invertebrate habitat value assessment from the opposite direction i.e. predicting both the habitat types present, and their quality and value in invertebrate conservation terms, by looking at the full suite of species recorded and cross-checking their habitat requirements. Thus, if a large proportion of the total possible species with a particular specialised habitat requirement are present, the software indicates that the habitat must be both a) present and b) in good (favourable) condition.

11.282 Using the full dataset of 806 recorded invertebrate species, ISIS generates the following results for the application site:

Broad Assemblage Types

11.283 The top Broad Assemblage Types identified as present are presented in Table 11-26 below.

Table 11-26:
The Broad Assemblage Types from ISIS assessment of the invertebrates recorded on the application site

BAT	BAT name	Representation (1-100)	Rarity	Condition	BAT species richness
F2	grassland & scrub matrix	19	123		238
A1	arboreal canopy	9	125		117
F1	unshaded early successional mosaic	5	245	favourable	62
A2	wood decay	2	150		20
W2	mineral marsh & open water	1	111		18
F3	shaded field & ground layer	1	142		12
W3	permanent wet mire	1	100		11

11.284 Not surprisingly, the largest assemblage is associated with the grassland and scrub matrix. The arboreal canopy lies in second place and is undoubtedly so positioned because of the presence of a large number of moths on the list. The unshaded early successional mosaic assemblage of species is in favourable condition; the state of the habitat that supports this assemblage is, therefore, of high quality.

Specific Assemblage Types

11.285 The most important Specific Assemblage Types identified as present from ISIS analysis of the species inventory are presented in Table 11-27 below.

Table 11-27:
The Specific Assemblage Types from the ISIS assessment of the invertebrates recorded on the application site

SAT	SAT name	No.	Condition	Percentage of national species pool	Related BAT rarity score
A215	epiphyte fauna	3		15	150
F001	scrub edge	15	favourable	8	
F112	open short sward	12		6	245
F002	rich flower resource	6		2	
A212	bark & sapwood decay	12		2	150
F003	scrub-heath & moorland	7		2	
F111	bare sand & chalk	6		1	245
A211	heartwood decay	2		1	150

11.286 The results of analysis of the species inventory using ISIS therefore indicate that the site's value for invertebrates is primarily centred on the presence of unshaded early successional mosaic habitats and scrub edge. Thus the areas of the site recovering from past disturbance may hold a disproportionate amount of the invertebrate interest, although it is also clear that the large expanses of grassland in association with scrub also have value, despite the relative absence of 'flower-rich' representations of this habitat.

Other Fauna

Desk Study

11.287 The 2008 Cresswell Associates report stated that in 2001 the site supported up to six brown hares *Lepus europaeus*, with individuals also noted during visits in 2008. Only a single record of this species was made during the survey work carried out in 2014 and 2015, and this was outside the application site in the north-eastern part of the former airfield. It is possible that the increased presence of dogs in the more heavily trafficked areas of the site may be suppressing the site's potential value to this species. Other mammals noted during the course of the fieldwork in 2014 and 2015 included muntjac *Muntiacus reevesi*, grey squirrel *Sciurus carolinensis*, field vole *Microtus agrestis*, fox *Vulpes vulpes* and common shrew *Sorex araneus*.

11.288 The 2021 HERC data included the following of note (those considered historical not included):

- Fish species records; including for brook lamrey *Lampetra planeri* at an undisclosed location.

Field Results

2021

11.289 No additional incidental records were noted in 2021.

EVALUATION AND IDENTIFICATION OF KEY RECEPTORS

Evaluation Criteria

11.290 For the purposes of assessing likely significant effects, key ecological receptors are drawn out from the baseline information set out in the preceding section. The decision as to which ecological receptors are 'key' in this context is to a substantial extent a value judgement, informed by factors such as national and local conservation status and legal protection. The current guidance for Ecological Impact Assessment issued by the Chartered Institute for Ecology and Environmental Management (CIEEM)[64] recognises that professional judgement and a certain level of subjectivity is unavoidable when apportioning value to individual ecological receptors. However certain parameters and points of reference can be used to help ensure consistency – these are discussed below.

11.291 Sites already possessing statutory or non-statutory nature conservation designations would have been subjected to some form of evaluation process in the past, and their importance defined at a geographical scale (e.g. international, national, local). For these, evaluation would generally reaffirm their qualifying attributes, or in some cases may identify where designation may no longer be appropriate.

11.292 Factors such as extent, naturalness, rarity, fragility and diversity are all relevant to the determination of ecological value, and for the evaluation of sites and habitat features outside designated sites, these and other criteria as described by Ratcliffe[65], may be applied. Ratcliffe's criteria are well-established and underpin the procedure for selecting both Sites of Special Scientific Interest and many non-statutory designation systems in the UK, and therefore remain an accepted standard for site evaluation.

11.293 In applying these criteria, attention may be drawn to the relative scarcity or abundance of features within the survey area and in the wider geographical context. Some criteria are however absolute and not relative to scale. Ancient woodland, for example, is fragile irrespective of whether it is being considered in an international or local context. Similarly, the value of an otherwise poor habitat may be elevated if it is central to the survival of a rare species.

11.294 Where evaluation is important for the purposes of informing decisions related to land-use planning and development control, the above approach needs to be supplemented by consideration of whether individual species are subject to legal protection[66], or whether habitats or species are present which have been identified as 'priorities' for biodiversity conservation in the UK[67]. Planning authorities have

[64] CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, v1.1*. Chartered Institute of Ecology and Environmental Management, Winchester.

[65] Ratcliffe, D.A. (1977) A Nature Conservation Review, Cambridge University Press

[66] Principal legislation being the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations (as amended) which implements the EC Habitats Directive. Some animals are protected under separate legislation (e.g. the Protection of Badgers Act 1992).

[67] As published by the Secretary of State further to their duties under Section 41 of the Natural Environment and Rural Communities Act 2006

a statutory duty[68] to have regard to protected species and to further biodiversity objectives and the presence of such resources may therefore be material to the determination of development control decisions (ODPM Circular 06/2005). Species and habitats of importance locally may also have been identified in local biodiversity strategies, e.g. through the Hertfordshire Local Nature Partnership.

11.295 Finally, attention may be drawn to species not necessarily subject to legal protection or identified by Government as a priority for biodiversity conservation, but which nonetheless have an 'unfavourable' conservation status as defined by the Red Data Book system[69] or the Red and Amber lists for birds[70], or which are otherwise known to be rare or scarce in a local or regional context.

11.296 Scales of comparison varying from international to the context of the local area may be used to define the measure of importance (or value) attached to individual features. The definition of geographic terms can vary, but in this evaluation the following geographic frame of reference is used:

- International;
- UK;
- National (i.e. England/NI/Scotland/Wales);
- Regional (e.g. relevant Natural Area or area covered by a regional records' centre)
- County (or Metropolitan - e.g. in Hertfordshire);
- District (or Unitary Authority, City, or Borough);
- Local or Parish; and
- Within zone of influence only (which might be the project site or a larger area)

Evaluation and Identification of Key Receptors

11.297 The application site is not subject to any statutory or non-statutory nature conservation designation. The nearest such site is Home Covert, a Local Wildlife Site which adjoins the application site to the north-east. Being in sufficient proximity to fall within the zone of influence of certain potential impacts, this site is identified as a key receptor.

11.298 The application site itself is dominated by essentially dry unmanaged grasslands, with varying amounts of associated scrub, although there are also areas of grassland actively managed by livestock grazing or mowing. These grasslands range from species-poor examples reflecting past 'improvement' or other enrichment to those with a species composition variously indicative of the chemical properties of the underlying substrate. None of these grasslands are exceptional in terms of quality, most being examples of a widespread community commonly found elsewhere on road verges and other marginal land. Rather than their intrinsic interest, it is their unbroken expanse over large areas that is both unusual and worthy of note. Indeed it is this property, in combination with the relative lack of upstanding

[68] Section 40 of the Natural Environment and Rural Communities Act 2006.

[69] Following the British Red Data books published by the JNCC/RSNC and the Nationally Notable (Nationally Scarce) categorisations recognised by the JNCC

[70] Eaton, M.A., *et al*. (2009) *Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man*. British Birds 102, pp296–341.

features such as hedgerows and other field boundaries, that attracts certain of the more specialist taxa recorded. Prominent amongst these are open country birds, including large breeding populations of whitethroat, as well as breeding cuckoo, barn owl, kestrel, skylark and meadow pipit, and a wintering assemblage that includes good numbers of woodcock, as well as stonechat, snipe, barn owl and in past years short-eared owl. The site's invertebrate interest is also heavily centred on early successional, scrub edge and open grassland species, and amongst other things includes several nationally and locally rare species of Coleoptera.

11.299 Added to this grassland-focused backdrop are a number of small waterbodies that support great crested newts and other amphibians, and along with the few hedgerows and denser areas of scrub, these also act as feeding loci for local bat populations, which although dominated by one or two common species, also appear to include occasional use by uncommon and scarce species such as Nathusius' pipistrelle. The hedgerows and (mainly by virtue of the presence of great crested newts) four of the ponds also qualify as Habitats of Principal Importance further to section 41 of the Natural Environmental and Rural Communities Act 2006, with three of the hedgerows also meeting the criteria of 'Important Hedgerows' further to the Hedgerows Regulations 1997. Other protected species present include a sparse population of grass snake. Refer to the confidential appendix for badgers (**Appendix 11/5**).

11.300 Although the site has no Local Wildlife Site (LWS) designation, the areas surveyed by the Herts and Middlesex Wildlife Trust in 2013, including around half of the application site, were all assessed to qualify against the incumbent criteria for LWS designation, based largely on the presence of other neutral grassland and other lowland dry acid grassland supported by 29 qualifying indicator plant species. Within this, a core area of the richest habitats was identified that included the central-eastern part of the application site, as well as much of the former airfield land outside the application site to the east and north.

11.301 This suggested designation was never ratified and the LWS criteria for Hertfordshire have since been revised[71]; however, it is evident that the site would qualify for designation under the same, and indeed additional, grounds, under the new criteria. Furthermore, the northern part of the application site (which was not surveyed by the Wildlife Sites team in 2013), would probably also qualify for inclusion. This is to a large degree a function of the relatively inclusive nature of the LWS criteria. Based on intrinsic botanical interest alone, it is arguable at best whether the grassland is of sufficient quality to be worthy of designation; however, the unbroken extent of the habitat is unusual and provides carrying capacity for a range of species of fauna that are likely to have rather restricted habitat opportunities elsewhere across the county. For this reason, the unmanaged grassland component of the site, together with its associated scattered scrub, is identified as a key receptor of county importance.

11.302 Taking into account the baseline information amassed, and the overall evaluation above, the key receptors to consider in respect of the potential impacts affecting the application site are considered to be as set out in Table 11-28 below:

Table 11-28:
Key Receptors

[71] Hertfordshire Local Wildlife Sites Partnership (2014) Selection Criteria for Local Wildlife Sites in Hertfordshire (9th version).

Scale	Key Receptor
International	No receptors of international importance are assessed to be within range of any likely significant effects arising from the proposed development.
UK/National	No receptors of national importance are assessed to be within range of any likely significant effects arising from the proposed development.
Regional	No receptors of regional importance are assessed to be within range of any likely significant effects arising from the proposed development.
County	1. The Home Covert & Round Wood Local Wildlife Site abuts the site to the north. This site was designated due to the presence of ancient woodland indicator species; yet, is not ancient woodland. Due to the proximity of this designation, there is the potential for indirect hydrological, dust and noise impacts from the proposals. 2. The unmanaged grassland habitat on the site is collectively assessed to be of county importance due to its unusually large and unbroken extent and interconnectivity, and the carrying capacity this provides for associated fauna species, rather than due to its intrinsic botanical interest, which is limited, even though a very few notable (e.g. county-rare) species are present (green-winged orchid, whorled mint). Where scrub occurs as a loose matrix with this grassland resource, providing shelter and habitat edges, this is included as part of the county-valued mosaic.
District	1. Great crested newts: the population on the site is assessed as falling within the 'medium' size class (towards the lower end of this size class), but it forms part of a wider metapopulation likely to be of District importance. 2. Breeding birds: the site is likely to contain a significant proportion of the total breeding populations of whitethroat and barn owl in the relevant Districts, and in some years also that of other species such as grey partridge and grasshopper warbler. 3. Wintering birds: the site is one of very few in either of the relevant Districts that is likely to be able to accommodate high profile species such as short-eared owl and hen harrier, as well as significant numbers of wintering woodcock. 4. Passage birds: the background records and the site's geography and character suggest it is likely to be a local staging focus for migrating open-country birds and warblers passing between the conurbations of St Albans and Hatfield, especially in Spring. 5. Invertebrates: while county-significant species of Coleoptera have been recorded during the baseline studies, the effect of uneven recording coverage has to be taken into account, and the overall assemblage appears unlikely to exceed the District level of importance given the fairly cosmopolitan habitat preferences of the scarcer species found.

Scale	Key Receptor
Parish	1. Other grassland habitats, including livestock-grazed and mown areas: These are extensive, but include a more restricted range of species weakly indicative of semi-natural circumneutral grasslands, but no rarities, and their structure precludes significant value for the higher fauna associated with the rougher grasslands on the site. 2. Hedges, mature trees, ponds and denser scrub. These habitat components add to the site mosaic, and in the case of great crested newt, underpin the site population, however their intrinsic interest is relatively modest, by comparison with neighbouring and wider areas, with some being recent in origin and therefore of low fragility. Of the hedgerows on the site, three qualify as 'Important' under the Hedgerows Regulations 1997, and all that are still recognisable as hedgerows would qualify as habitats of principal importance, along with (by virtue of the presence of great crested newts) four of the ponds/waterbodies. 3. Bats. In the main, bat use of the site is modest and dominated by a small number of common species, with no roosts found or likely to be affected. However intermittent or localised use of peripheral areas and internal linear or wetland features by a greater range of species evidently occurs, including the nationally uncommon Nathusius' pipistrelle. There are no indications that the site receives any more than transient use by the more uncommon species recorded, and the site's open nature in comparison with surrounding land suggests that it is unlikely to be of elevated importance by comparison. 4. Brown hare. The application site is probably still used by this species of principal importance, although it was only recorded on adjoining airfield land in 2015 and not at the numbers cited in previous surveys.
Immediate local (within zone of influence only)	1. Badgers. Refer to the Confidential Badger Appendix 11/5. 2. Reptiles. One grass snake was found during the survey. The scope for metapopulation level impacts is assessed as negligible but effects on individual animals are possible, and the species is therefore retained as a key receptor. 3. The representations of other habitats within the application site are either small, of negligible value, or both, and are similarly assessed as of only immediate local (i.e. site) value. They are therefore scoped out as a key receptor.

11.303 The remaining sections of this chapter consider the potential for, and the magnitude and significance of, any impacts arising on the above key receptors from the project, along with any mitigation and/or compensation proposed, and its likely efficacy.

AVOIDANCE BY DESIGN AND DESCRIPTION OF PROPOSALS

Ecological Input to Design Process

11.304 Ecological input has been a significant driver in the design of the proposed restoration scheme, including in terms of seeking to reinstate the key habitat elements for which the site has current value, exploiting opportunities created by extraction in terms of the exposure of mineral substrates and their potential to develop semi-natural plant communities, exploiting opportunities created by changes to drainage patterns and responding to local and national initiatives in terms of appropriate habitat creation objectives, including taking account the views of the Hertfordshire and Middlesex Wildlife Trust, as canvassed at three meetings with their representatives (as part of the original application). This has allowed key objectives to be set towards the creation of semi-natural habitats appropriate to

the locality and the geology – in particular acid grassland, and to secure significant opportunities for certain fauna, including birds and invertebrates in particular, but also herpetofauna and other taxa.

Summary Description of The Proposals in the Context of Likely Ecological Effects

11.305 Initial establishment of the quarry would include creation of a new site access onto the A1057, involving removal of a section of hedgerow H6 and the linking of this access to a new processing plant site in the northern part of the application site by means of new haul roads. The road would be set back from the site boundary hedgerows, with an area of landscape screening created. Establishment of the new processing plant would follow the deposition of a layer of sand and gravel extracted from the recharge lagoons (see below) in order to raise levels.

11.306 In contrast to the original 2016 quarry design, the current application avoids the loss of Ponds P1, P2 and P3 in the initial phases of development (they would be removed in future phases of mineral extraction after approximately 10 years of operation). This delay in removal of the main breeding ponds, allows the great crested newt population to continue in existing ponds, and with access to neighbouring terrestrial habitat, whilst new mitigation ponds become established. The diversion of the existing ditch system carrying the Nast watercourse, would result in the removal of Pond P4. New freshwater and silt lagoons would also be constructed in this part of the site.

11.307 Recharge lagoons would be excavated at the eastern boundary of the application site. Once established, soil and overburden stripping and extraction of mineral is anticipated to take place in a sequence of seven phases, with the working 'cells' progressing east to west. Stripped materials would be stored in peripheral storage mounds and restoration of exhausted phases would progress in tandem with the working sequence, using both on-site materials and imported inert fill sourced from the construction and demolition waste sector and imported to the site under the terms of an Environmental Permit.

11.308 On completion of extraction, each worked out cell would be backfilled with inert material to achieve the required contours to ensure surface water flow is broadly re-established in a NW to SE alignment, towards an overflow connecting to an existing pipe which currently takes the ephemeral Nast flows along or under the A1057. The inert fill material would be covered by an engineered barrier / cap comprised of site-won interburden over which a 'restoration soil profile' of around 1.2m depth would be laid. Restoration soils would be carefully screened and selected to ensure they have suitable physical and chemical properties for the intended after-uses, including in particular lowland dry acid grassland, Lowland meadow and other neutral grassland. In the early phases of extraction, restoration materials may have to be stockpiled and stored, but in later phases, direct placement may be possible as part of progressive restoration. Micro-topographical diversity, including 'ridge and furrow' would be created in the final phases of restoration and in conjunction with preparation of soils and substrates for seeding, planting or natural regeneration as appropriate.

11.309 Restoration would comprise active planting interventions, potentially including use of harvested seed or 'green hay' from suitable donor sites in the locality, with hedgerow and tree planting sourced from nurseries able to guarantee native provenance. The recharge lagoons would be retained but remodelled to create a permanent waterbody, with other smaller and more ephemeral waterbodies also created, e.g. through placement and compaction of low permeability materials in shallow depressions. Following an appropriate establishment and aftercare period, the site would be managed in accordance with an approved management plan, likely to major on livestock grazing to maintain

grassland diversity and controlled visitor management to ensure some areas are subject to reduced levels of disturbance as compared with the existing situation.

11.310 The proposed hedgerow planting and ditch creation would follow the historic field pattern associated with Popefield Farm, re-creating the networks of habitats that would have been present prior to the use of the site as an aerodrome.

IMPACT ASSESSMENT

Methodology

Terms of Reference

11.311 The assessment of likely significant ecological effects arising from the project follows the guidelines produced for EcIA by the Chartered Institute for Ecology and Environmental Management (CIEEM)[72]. The approach taken is set out below:

Determining the Sensitivity of Key Receptors

11.312 In order to determine whether a specific effect on the key ecological receptors listed in Table 11-28 above is 'significant', the sensitivity of the affected habitat, site or species must be considered. The sensitivity of an individual receptor is a product of various factors including:

- Habitat extent or population size (at a given geographical level)
- Habitat or population fragility (including ability to recover)
- The rarity of a species or habitat; and
- Susceptibility to environmental change (e.g. from disturbance or pollution).

11.313 Applying the above criteria, the sensitivity of individual receptors can be put into 'High', 'Moderate' or 'Low' categories as follows:

[72] CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, v1.1*. Chartered Institute of Ecology and Environmental Management, Winchester.

Table 11-29: Sensitivity

Sensitivity	Habitat Example	Species Example
High	Habitat is highly susceptible to nutrient enrichment or invasion from competitive species Habitat has highly specialised hydrological or soil/geology requirements (e.g. eutrophic standing waters and standing open waters with associated grassland habitats) Habitat is present as small and isolated fragments vulnerable to edge effects Habitat takes an extended period to develop full suite of components (e.g. ancient woodland)	Species is highly intolerant of disturbance or pollution Species is present in a small and isolated population and/or has low dispersal rates Species has low recruitment rates and population recovery is likely to be very slow
Moderate	Habitat can tolerate some elevated levels of pollution or would recover within a short-medium term (e.g. <20 years) Habitat has hydrological or soil/geology requirements that can be recreated or are fairly widely met Habitat may be isolated, but is present at an extent that provides resistance to edge effects and is better able to accommodate damage Habitat develops over a moderate timescale given the right conditions (e.g. acid grassland)	Species is able to tolerate some levels of disturbance or pollution (e.g. sub-lethal effects). Species population is restricted, but large enough to accommodate some temporary reduction without long term consequences for viability. Species has moderate recruitment rates
Low	Habitat is highly resistant to nutrient enrichment or other forms of pollution and physical disturbance (e.g. modified grassland) Habitat has non-specific requirements that are readily met elsewhere Habitat is extensive and well able to accommodate localised or more extensive damage Habitat is easily recreated over a short timescale (e.g. arable)	Species is highly resistant to disturbance and pollution (e.g. most urban wildlife) Species' population is widespread and recolonisation in the wake of any localised range reduction likely to occur readily Species has high recruitment rates likely to lead to rapid recovery of population levels

11.314 As with the identification of key receptors, a certain amount of subjectivity and the application of professional judgment is unavoidable when determining sensitivity, however in addition to first-hand experience of the species/habitat and locality in question, a wealth of scientific literature and/or local conservation status information can often be drawn upon to inform such judgements.

Identification of Impacts and their Magnitude

11.315 Impacts arising from the proposals that have the potential to be significant are identified from review

of the scheme details, and tandem assessments for other environmental disciplines based on them, including in this instance the following in particular;

- Environmental Statement Chapter 3 (Development Description) and accompanying drawings showing initial preparation works and extraction phases.
- Proposed final restoration scheme drawing (drawings HQ 3/15).
- Environmental Statement Chapter 6 – Water
- Environmental Statement Chapter 9 – Air Quality
- Environmental Statement Chapter 10 - Noise

11.316 The following terms are used to quantify the 'magnitude' of identified impacts in this assessment:

Table 11-30:
Impact Magnitude

Impact Magnitude	Definition
Very High	An example of a very high magnitude impact would be direct mortality or displacement of a significant proportion of a species' population or loss of habitat at a level likely to remove its continued representation at the given geographical level being considered.
High	An example of a high magnitude impact would be direct mortality, indirect displacement or habitat loss that would be likely to substantially reduce the population level or degree of representation at the given geographical level being considered.
Moderate	Moderate impacts include those likely to result in a net reduction of population or habitat representation (at least in the absence of effective mitigation or compensation) at the given geographical level being considered
Minor	Minor impacts include those that may result in loss of a few individuals from a species' population or minor reduction in habitat extent at the given geographical level being considered.
Negligible	Negligible impacts are those that are not likely to give rise to measurable effects on population level or habitat representation at the given geographical scale.

Significance of Effects

11.317 Whether a potential effect is 'significant' or not at the given geographical level that the receptor is valued at, is determined by quantifying the magnitude of effect on each of the receptors identified. Thus for receptors of national or international value and high sensitivity, negative effects measured at high or very high magnitude are likely to represent a significant impact at that geographical scale. In development control terms, such impacts are very likely to conflict with planning policy. At the other end of the scale, minor magnitude effects on receptors of low sensitivity and only immediate local value are likely to be below significance thresholds, and to merit relatively low weight in planning decisions. Substantial effects on high value receptors that are of low sensitivity may fall either side of the significance threshold - in such cases further avoidance or mitigation may be able to be employed to ameliorate effects. A key consideration is whether the 'integrity' of a site or ecosystem (e.g. the

coherence of its structure and function) and/or the 'conservation status' of a species or habitat (e.g. the ability of a population/habitat to maintain itself at pre-development levels/quality) would be compromised.

Impact Prediction Confidence

11.318 For the impacts identified, confidence levels in the assessments made may be attributed and/or discussed where there is a significant degree of uncertainty.

Assessment

Potential Effects

11.319 Identification of potential effects and their zone of influence has included review of the development description and working scheme (ES Chapter 3) and the results of tandem assessments on water resources (ES Chapter 6), landscape (ES Chapter 8), air quality (ES Chapter 9) and noise and vibration (ES Chapter 10).

11.320 Taking the above into account, the project is considered to have the potential to give rise to a range of potentially significant direct and indirect effects on ecological receptors, including *inter alia*:

- Implementation Phase - direct effects:
  - Direct and permanent loss of existing grassland, hedgerow and disturbed ground habitats to phased top-soil/overburden stripping, materials storage and the establishment of haul routes, highway access and the processing plant site;
  - Loss of waterbodies or waterbody complexes, one of which (P4) is known to support breeding great crested newts would be lost in the establishment phase and another (P1) lost during operation of the quarry;
  - Risk or direct mortality of select protected/notable fauna; including breeding/wintering birds, badger, bats, reptiles and great crested newt (in the absence of any mitigation);
  - Loss of an established, main, badger sett;
  - Loss of habitat for nesting and wintering birds, including loss of current barn owl nesting locations in artificial boxes;
  - Loss of habitat and used by reptiles, invertebrates and localised scarce plants; and
  - Risk of spread of invasive flora leading to reduction in biodiversity, in the absence of management or mitigation measures.
- Implementation phase - indirect effects:
  - Potential effects on retained peripheral and adjoining habitat features (including Home Covert LWS and retained ponds that support great crested newts) from lighting, noise, dust and groundwater drawdown;
  - Displacement and/or disturbance of fauna using application site due to habitat loss and/or operational activities; and

- Development and progressive expansion of temporary early-succession habitats in operational and ancillary areas, with potential colonisation by associated fauna.

- Completed scheme - direct effects:
  - Reinstatement of expansive grassland habitats, with localised scrub and hedgerow and an expanded wetland component.
- Completed scheme - indirect effects:
  - Likely changes in use of the site by fauna already associated with the site; and
  - Likely changes involving other species (e.g. colonisation by species not currently present).

Assessment of Effects in the Absence of Mitigation

11.321 Table 11-31 overleaf sets out the likely significant effects on the key ecological receptors identified prior to the application of any additional mitigation measures for both the implementation phase of the project and the post-completion phase. It thus takes into account the avoidance, mitigation and compensation measures taken as part of the design process, as previously set out in this chapter.

Table 11-31
Predicted Effects on Key Receptors in the Absence of Additional Avoidance or Mitigation

Receptor	Value							Potential Effects	Magnitude	Significance	Additional Avoidance or Mitigation Measures Proposed?
	I	N	R	C	B/D	P	ZoI				
Home Covert and Round Wood Local Wildlife Site (LWS)				*				1) Indirect effects – disturbance to light-sensitive fauna, or disruption of behaviour through introduction of new sources of artificial light.	1) Lighting proposed for plant site only during the winter months (ES Chapter 3). Taking account of design mitigation (directional designs and adherence to industry standards for good design practice), potential for minor magnitude residual impacts of a temporary (medium-long term) nature on western side of LWS concentrated on woodland edge, although unlikely to penetrate far into designated area.	1) Not significant in relation to the integrity of the LWS designation. See also 'bats' below.	1) No
								2) Indirect effects – disturbance to noise- sensitive fauna, or disruption of behaviour through introduction of new sources of significant noise.	2) Taking account of design mitigation (e.g. cladding of processing plant) and the noise-attenuation effect of peripheral storage bunds (where present) residual potential for minor magnitude impacts of a temporary (medium-long term) nature on western side of LWS concentrated on woodland edge, but unlikely to penetrate far into designated area.	2) Not significant in relation to the integrity of the LWS designation. See also 'breeding birds' below.	2) No
								3) Indirect effects – physical impacts on plant communities affected by windborne dust and potentially on contained surface water systems affected by significant deposition.	3) Potential for negligible to minor magnitude impacts of a temporary (medium- long term) nature on western side of LWS and concentrated on immediate woodland edge.	3) Not significant in relation to the integrity of the LWS designation.	3) No
								4) Indirect effects – groundwater derogation with potential related effects on available soil water for LWS vegetation and habitat features.	4) Essentially free-draining nature of soils in south-western part of LWS, re-charge of retained adjoining section of Nast surface water system via diverted ditch, and design mitigation measures (including re-charge during de-watering of Upper Mineral Horizon and subsequent installation of clay bunds – see Chapter 6 - renders the scope for any effects negligible.	4) No likely significant effect on the LWS.	4) None proposed or required.
Unmanaged Other neutral Grassland				*				1) Progressive direct loss of c.90% of existing resource on application site.	1) Impact magnitude ameliorated by phased sequence of extraction and restoration such that development of similar vegetation on land released from current grazing or mowing management, and/or reinstated following progressive completion of restoration, is likely to reduce magnitude of loss to perhaps no more than 50% of the existing resource at any given point in time.	1) Significant unavoidable impact on resource arguably qualifying for LWS status (County importance) but the relatively species-poor nature of the existing resource, in part due to its recent origin, means that replication of value in incidentally developing or post-restoration areas likely to be close to 100%, even in worst case.	1) None practical, achievable or proportionate over and above the adoption of phased removal and compensation (through restoration) as already proposed.

Receptor	Value							Potential Effects	Magnitude	Significance	Additional Avoidance or Mitigation Measures Proposed?
	I	N	R	C	B/D	P	ZoI				
Great Crested Newt					*			1) Loss of 2no breeding ponds through the duration of the quarry operation and de-facto loss of up to 70% of terrestrial habitat within 500m of these, through exclusion and/or operational activities.	1) Major in terms of the on-site population but this is evidently part of a larger metapopulation with a range extending significantly north and east, so metapopulation-level effects no higher than moderate.	1) Potentially significant in terms of maintenance of favourable conservation status at District level. In any event, impact on even one animal would have legal implications and therefore further consideration of avoidance and mitigation techniques is required.	1) Yes. Avoidance of loss of main breeding pond and terrestrial habitats in early years of operation and creation of replacement breeding ponds would be undertaken as part of initial operations. Translocation, including clearance of GCN from aquatic and terrestrial habitat within application site, and exclusion for duration of operations, would be carried out under licence. District Level Licensing (DLL) is not operational in the county. Measures may change if DLL becomes operational or other approaches to mitigation become established.
								2) Potential for groundwater derogation effects on ponds used by the species (P1, P2, P3, P5 and P6) and to be retained in the medium and longer term close to extraction area.	2) Minor. Scope for significant dewatering of P5 and P1 limited by ground-water re-charge through retained (diverted) Nast system and re-charge lagoons. Risk of dewatering P5 and P6 reduced by design mitigation measures (including re-charge during de-watering of Upper Mineral Horizon and subsequent installation of clay bunds – see Chapter 6). P2 and P3 are ephemeral pools currently and unlikely to be important to GCN population currently.	2) Worst case predictions of impact magnitude are for short-term temporary drawdown impacts during earliest phases of operation (e.g. excavation of recharge lagoons). These are unlikely to give rise to significant meta-population level effects but any impact on egg or larval life-stages would have legal implications and therefore further consideration of avoidance and mitigation techniques is required.	2) Yes. Monitoring of water levels in these waterbodies is proposed in order to identify any need for intervention. If critical operations (e.g. excavation of re-charge lagoons) occur outside the period when GCN may breed in these ponds, the scope for impact may be avoided entirely. Measures may change (if DLL becomes operational).
								3) Loss of 30-40% of terrestrial habitat within 500m of off-site breeding pond P6 through exclusion and/or operational activities, although reinstated in medium-long term.	3) Minor. Much of the terrestrial habitat in question is of reduced suitability for terrestrial phase GCN due to grazing and/or likely to be exploited to a lesser degree than other unaffected habitats (e.g. Home Covert).	3) Assessed as likely to fall below significance thresholds in terms of conservation status at District level. However, impact on even one animal would have legal implications and therefore further consideration of avoidance and mitigation techniques is required.	3) Yes. A detailed mitigation programme, following current NE guidance and policies relating to phased development would be developed. Mitigation would include the clearance and/or rescue of GCN from terrestrial & aquatic habitat within application site, and retention an enhancement and creation of new habitats sufficient to maintain the population in favourable condition for duration of operations, Mitigation measures may change (if DLL becomes operational).
								4) Scope for direct mortality or and disturbance to individuals (incl. disturbance from lighting/ noise).	4) Major in terms of the on-site population but this is evidently part of a larger metapopulation with a range extending significantly north and east, so metapopulation-level effects no higher than moderate.	4) Potentially significant in terms of maintenance of favourable conservation status at District level. In any event, impact on even one animal would have legal implications and therefore further consideration of avoidance and mitigation techniques is required.	4) Yes. A detailed mitigation programme would be designed. Measures may change (if DLL becomes operational).

Receptor	Value							Potential Effects	Magnitude	Significance	Additional Avoidance or Mitigation Measures Proposed?
	I	N	R	C	B/D	P	ZoI				
Breeding Birds					*			1) Direct impacts on bird nests, eggs or young through site stripping or other operational activities (direct mortality, displacement/disturbance).	1) Phased nature of workings reduces scope for any more than a minor magnitude impact, even at the site level.	1) Not significant at District level for most species, although potentially approaching or exceeding such levels if restricted site population of certain scarcer species (e.g. barn owl, cuckoo) was impacted.	1) Yes. Impact on any active nest would have legal implications and therefore further consideration of avoidance and mitigation techniques is required.
								2) Progressive direct loss of 90-100% of existing breeding bird habitats on the site compromising breeding success or leading to wholesale displacement.	2) Minor to moderate in the context of the geographical scale indicated. Scope for higher magnitude effects restricted significantly by phased working sequence which would leave extensive areas under rough grassland initially, and by later phases restoration is likely to have generated suitable replacement breeding conditions for a significant proportion of affected species (e.g. skylark, whitethroat).	2) Not significant at District level for most species due to amelioration effect of phasing, although potentially approaching or exceeding such levels if site population of certain species (e.g. barn owl, cuckoo) was impacted in any given operational phase.	2) None, over and above the measures employed to ensure legal compliance as per (1) above and the incorporated design mitigation.
								3) Changes in breeding bird assemblage using the site in response to temporary exclusion of public, and development of ephemeral and subsequent long-term replacement habitats through progressive restoration.	3) Neutral to minor (positive or negative) depending on uptake of ephemeral habitats by species of conservation importance (e.g. sand martin, little ringed plover), and the success of the restoration scheme long-term in reinstating the current level of ecological interest.	3) If minor magnitude positive or negative effects are manifested these would be significant at District level due to the site's relative importance at that geographical scale.	3) No.
Wintering Birds					*			1) Direct impacts on wintering birds through site stripping or other operational activities (dependant on timescales of soil strip) via potential direct mortality, displacement/disturbance.	1) Phased nature of workings reduces scope for any more than a minor magnitude impact, even at the site level.	1) Not significant at District level for most species due to amelioration effect of phasing, although potentially approaching or exceeding such levels if wintering population of certain species (e.g. barn owl) was impacted in any given operational phase.	1) None, over and above incorporated design mitigation.
								2) Progressive direct loss of 90-100% of existing wintering bird habitats on the site compromising site's attractiveness to such species or leading to wholesale displacement.	2) Minor to moderate in the context of the geographical scale indicated. Scope for higher magnitude effects restricted significantly by phased working sequence which would leave extensive areas under rough grassland initially, and by later phases restoration is likely to have generated suitable replacement conditions for a significant proportion of affected species. Given the above, exclusion of public (albeit temporarily) may even temporarily enhance conditions for sensitive species such as short-eared owl.	2) Not significant at District level for most species due to amelioration effect of phasing, although potentially approaching or exceeding such levels if wintering population of certain species (e.g. barn owl) was impacted in any given operational phase.	2) None, over and above incorporated design mitigation.
								3) Changes in wintering bird assemblage using the site in response to temporary exclusion of public, and development of ephemeral and subsequent long-term replacement habitats through progressive restoration.	3) Neutral to minor (positive or negative) depending on uptake of ephemeral habitats by species of conservation importance (e.g. green sandpiper), and the success of the restoration scheme long-term in reinstating the current level of ecological interest, and subsequent management in maintaining that interest.	3) If minor magnitude positive or negative effects are manifested these would be significant at District level due to the site's relative importance at that geographical scale.	3) No.

Receptor	Value							Potential Effects	Magnitude	Significance	Additional Avoidance or Mitigation Measures Proposed?
	I	N	R	C	B/D	P	ZoI				
Passage Birds					*			1) Progressive direct loss of 90-100% of existing bird habitats on the site compromising site's attractiveness to such species or leading to wholesale displacement.	1) Minor. The nature of passage bird use is that the types of habitat change that would occur during the operational phase and progressive restoration are not likely to significantly affect the openness of the site and its existing attractiveness to passage species.	1) Not significant due to the low magnitude of change and the nature of passage bird use.	1) None, over and above incorporated design mitigation.
								2) Changes in passage bird assemblage using the site in response to temporary exclusion of public, and development of ephemeral and subsequent long-term replacement habitats through progressive restoration.	2) Minor to moderate positive given that the development of ephemeral habitats associated with active extraction is likely to create an additional attractant for species not currently associated with the site. Following restoration, some of this positive change might be retained depending on management and levels of public access.	2) If minor to moderate temporary or longer-term positive effects are manifested these would be significant at District level due to the site's relative importance at that geographical scale.	2) No.
Invertebrates					*			1) Direct impacts on individuals or populations through site stripping or other operational activities.	1) Phased nature of workings and large expanse of macro-habitats reduces scope for any more than a minor magnitude impact, even at the site level.	1) Unlikely to be significant at the assemblage/metapopulation level for any species.	1) No.
								2) Progressive direct loss of 90-100% of existing invertebrate habitats on the site.	2) Minor in the context of the geographical scale indicated, and the likely site-wide and local distribution of the species of higher conservation importance. Scope for higher magnitude effects restricted significantly by phased working sequence which would leave extensive areas under rough grassland initially, and by later phases restoration is likely to have generated suitable replacement conditions for a significant proportion of affected species, with some expansion of currently more restricted habitat opportunities (e.g. wetland, acid grassland).	2) Unlikely to be significant at the assemblage/metapopulation level for any species.	2) None, over and above incorporated design mitigation.
								3) Changes in invertebrate assemblage using the site in response to development of ephemeral and subsequent long-term replacement habitats through progressive restoration.	3) Neutral to minor (positive or negative) depending on uptake of ephemeral habitats by species of conservation importance (e.g. solitary bees and wasps), and the success of the restoration scheme long-term in reinstating the current level of invertebrate interest.	3) Positive impacts up to District level of significance are possible.	3) None, over and above incorporated design mitigation.
Other Grasslands						*		1) Progressive direct loss of c.100% of existing resource on application site.	1) Impact magnitude ameliorated by phased sequence of extraction and restoration such that development of similar vegetation through progressive restoration is likely to reduce magnitude of loss to perhaps no more than 25% of the existing resource at any given point in time, with equivalent or expanded resource recreated.	1) Taking into account design mitigation, impacts not significant above the immediate site context, and potentially net positive for this receptor.	1) None, over and above incorporated design mitigation.

Receptor	Value							Potential Effects	Magnitude	Significance	Additional Avoidance or Mitigation Measures Proposed?
	I	N	R	C	B/D	P	ZoI				
Hedges, Disturbed Ground Habitats, Mature Trees, Ponds and Denser Scrub						*		1) Progressive direct loss of up to c.30-40% of existing resource on application site.	1) Minor (ponds, scrub) or negligible (hedges, mature trees) in comparison with Parish resource, with advanced compensatory provision proposed in relation to ponds.	1) Not significant above the immediate site level.	1) None, over and above incorporated design mitigation.
Bats						*		1) Potential indirect habitat fragmentation effects on local bat populations from permanent losses or breaches of hedgerows. 2) Temporary loss of foraging area due to removal of vegetation in active extraction areas 3) Increased habitat diversity delivered by progressive restoration through operational phase delivering compensatory or new representations of semi-natural grassland, wetland and scrub. 4) Potential for killing or injury to individual animals roosting in bat boxes, trees or other features that are within footprint of operational areas.	1) Minor (see also under hedges and mature trees above) in terms of the integrity of commuting and foraging routes in the short-medium term and compensated in the long-term by enhanced conditions for the species recorded, as delivered through the restoration scheme. 2) Minor to negligible. The phased working sequence would limit the extent of land devoid of vegetation at any one time and losses are likely to be compensated or outweighed by benefits as the restoration sequence progresses. 3) Negligible through to minor positive as restoration progresses in tandem with working. 4) Minor to negligible. Risk of bats roosting on site is low/negligible based on current baseline data. Highly unlikely that any roosts would be of a size or support a species of high conservation significance.	1) Effects predicted to remain well below significance thresholds in terms of local population integrity for any bat species. 2) Effects predicted to remain well below significance thresholds in terms of local population integrity for any individual bat species. 3) Negative effects predicted to remain well below significance thresholds. Significant positive effects progressing from immediate local to Parish level by the completion of the restoration due to enhanced wetland foraging opportunities. 4) Effects predicted to remain well below significance thresholds in terms of local population integrity for any individual bat species.	1) Yes – any affected mature trees would be re-surveyed prior to initial operations and prior to each stripping phase to ensure no roosts are established or to inform appropriate mitigation if required in the future. 2) None required. 3) None required. 4) Conduct regular reviews of the risks of roosting bats occurring within the operational or future phases of development and ensure sufficient mitigation or avoidance measures are in place prior to disturbance of any identified potential roosting features.
Brown Hare						*		1) Loss of cover and foraging area due to removal of vegetation in active extraction areas	1) Minor to negligible. The phased working sequence would limit the extent of land devoid of vegetation at any one time and losses are likely to be compensated or outweighed by benefits as the restoration sequence progresses, including temporary benefits from reduced disturbance.	1) Negative effects predicted to remain well below significance thresholds in terms of local population integrity. Significant positive effects at the Parish population level are possible, although these may be rendered temporary depending on the future management of public access.	1) None, over and above incorporated design mitigation.
Badger							*	Refer to Confidential Badger Appendix 11/5	Refer to Confidential Badger Appendix 11/5	Refer to Confidential Badger Appendix 11/5	Refer to Confidential Badger Appendix 11/5

Receptor	Value							Potential Effects	Magnitude	Significance	Additional Avoidance or Mitigation Measures Proposed?
	I	N	R	C	B/D	P	ZoI				
Reptiles							*	1) Small-scale scope for impacts on individuals (direct mortality/disturbance) from sparse local population of grass snake (incl. disturbance from lighting).	1) Minor. Only very low numbers likely to be at risk.	1) Effects not predicted to be significant in terms of local populations. Effects likely to be reduced by recovery in the short-term.	1) Yes – habitat manipulation would be employed out of season to discourage grass snakes (and any other reptiles colonising/re-colonising in the future) from areas affected by works and/or phased translocation would be employed.
								2) Loss of breeding and foraging habitats in ponds and grassland.	2) Negligible through to minor negative effects as restoration progresses in tandem with working. In the longer term, increased habitat diversity for reptile species delivered by progressive restoration through operational phase delivering new representations of semi-natural grassland, wetland and scrub.	2) Not significant.	2) None, over and above incorporated design mitigation.
								3) Fragmentation of commuting routes to move through this wider landscape.	3) Negligible through to minor negative effects as restoration progresses in tandem with phased working. In the longer term, increased habitat diversity for reptile species delivered by progressive restoration through operational phase delivering new representations of semi-natural grassland, wetland and scrub.	3) Not significant.	3) None, over and above incorporated design mitigation.
Invasive Flora							*	1) Potential for invasive, non-native species on site to be spread on and off-site via operation and vehicular activity.	1) Minor to moderate dependant on transmission of invasive species (e.g. New Zealand pigmyweed, Japanese knotweed and snowberry) around site and/or off-site (e.g. via watercourses, roadways, wind-blown plant material mobilised by works etc) and the extent of the future colonisation/degradation of other habitats.	1) If minor to moderate temporary or long-term effects are manifested these would be significant at the District (potentially catchment) level. Has the potential to increase in significance should infestations not be contained, controlled and managed.	2) Yes. Measures are required to identify all potential invasive species and follow avoidance, containment and control mitigation measures to prevent/minimise spread.

FURTHER AVOIDANCE, MITIGATION, COMPENSATION AND ENHANCEMENT

Specially Protected Species

Great Crested Newt

11.322 Further mitigation is required in respect of this European Protected Species (EPS) due to the confirmed loss of breeding ponds and damage to/loss of large areas of terrestrial habitat during the operational phase. A draft EPS licence was prepared for the original 2016 scheme and subject of pre-submission screening advice from Natural England. This mitigation scheme would be revised in the light of comments from Natural England and other consultees and submitted to Natural England for approval. An outline of the proposed mitigation approach for great crested newts is set out below.

11.323 The proposed mitigation approach uses DEFRA Licensing Policy 3, and this is considered to be the best option for GCN, as opposed to the traditional mitigation route. This policy is designed to allow GCN access to temporary habitats, e.g. within the quarry footprint and on soil mounds surrounding the quarry, that they would have otherwise been prevented from accessing. This gives access to a much larger site and reduces the risk of fragmentation of the GCN population compared to the traditional mitigation route. It is considered that allowing GCN on a working site would not be detrimental to the conservation status of the species. In order to do this, a robust population would be first be established/maintained in retained ponds in the receptor/refuge site (P5, P9 and proposed 8 new mitigation ponds) and through enhancement of P1 and terrestrial habitat it surrounding for the early phases of quarry development.

11.324 The mitigation approach has followed the mitigation hierarchy, through the avoidance of direct impacts to P5 and P9; avoidance of impacts to P1, P2 and P3 in the early phases of the quarry; mitigation to reduce risk of killing/injury to GCN during key stages of the project and enhancement to retained and newly created habitats. The mitigation solution for the current application is to establish a core receptor/refuge area on the eastern boundary of the site. This protects on-site ponds that support GCN (P5) and previously supported GCN in 2015 (P9). It also protects core terrestrial habitat for the medium population associated with P6 and maintains the best possible links with off-site populations, including those in P10 and further afield to the north, e.g. at Cemex Cutfield. The receptor site is on the east side of the site, adjacent to Home Covert Woodland and would be enhanced to ensure it is suitable to support the increased numbers of GCN in the long-term (30+ years).

11.325 Existing ponds within the receptor site would be enhanced and 8 new ponds would be created in this receptor/refuge area. New ponds have been designed to maximise the benefits of local groundwater re-charge and surface water runoff, so they are likely to hold water for longer and be more dependable breeding habitats than the ponds currently within the site. Terrestrial habitats in the receptor/refuge area would also be undertaken, i.e.. log piles, hibernacula, 0.5ha of scrub planting and grassland management/enhancement. As the on-site population is relatively small and closely associated with P1, a buffer of 50m around P1 is established in the initial phases of establishment earthworks.

11.326 Systematic GCN capture and clearance (i.e. standard mitigation fencing & pitfall trapping) would be undertaken on a risk-basis, with mitigation designed to capture a high proportion of animals present in

areas that would be lost to early phases of development and to ensure a robust population of GCN is maintained. Before removal of P4, this would be subject to draindown (if required, dependant on water levels) and netting and hand searching to rescue GCN and translocate them to suitable local breeding ponds, e.g. Pond 1. There is no double-handling risk as Pond 1 and surrounding habitat would be protected from development activities for at least 10 years.

11.327 Before earthworks to clear vegetation from P1 and its core terrestrial habitat, which is current proposed at the end of Phase B/Start Phase C in approximately 10 years it is proposed to undertake systematic GCN capture and clearance around core habitats associated with the pond on a risk-basis. The final capture period and extent would be determined by GCN population surveys in advance of clearance. Any newts found would be relocated to the receptor/refuge area to the east of the site. Once the capture period is completed around P1, P2 and P3 all TAF would be removed and all remaining areas would be destructively searched in advance of earthworks commencing. No habitat fragmentation between meta populations is predicted as there would be no long-term TAF retained within the development and internal haul routes would be relatively narrow, unsealed and only in use during daylight working hours.

11.328 The GCN population within the site would have access to large areas of un-developed land to the south of the quarry for the approximately 10 years whilst the quarry is established and earlier phases extracted. Temporary habitat enhancements and management improvement, e.g. creation of scrub and log piles, reduction of public visitor pressure (informal public access around the ponds (P1,P2 P3) and associated terrestrial habitat areas would be reduced whilst quarry is operational by erection of a post and wire fence to restrict access) and a reduction in grassland management intensity, which would allow an increase in over-winter vegetation heights, would temporarily improve habitat quality for GCN in the later phases of proposed development. Water levels in P1 would be monitored during operation and levels would be topped up using ground water if they drop during summer months, increasing chances of successful breeding. There is no risk of double handling as there is at least 10 years before newts associated with P1 would be moved. Immediately prior to final quarry restoration, the potential for soil bunds to support GCN would be considered and selected fencing and pitfall trapping (using standard methods) would be implemented on bunds where they are within 100m of breeding ponds. The final design/layout of newt fencing and capture area would be informed by up to date population data.

11.329 There are not predicted to be any long-term effects resulting from groundwater drawdown. GCN ponds would be subject to regular monitoring and would be topped up with groundwater if water levels drop.

11.330 For the purposes of planning determination, it is necessary to set out how the mitigation approach described above can and would meet the three tests of the Habitats Directive in order for derogation to be given in the form of a licence.

11.331 The case that there is overriding public interest in the development proceeding and that there is no satisfactory alternative to the development relates to the site's allocation for minerals extraction in the adopted Minerals Local Plan and the significant contribution it makes to local supply of sand and gravel and the importance of that supply to the local and regional economy. This is as set out in the planning statement submitted with the application.

11.332 The favourable conservation status of great crested newts, here measured in terms of the site and local metapopulation, would be secured through the mitigation measures described above.

11.333 Full detail of the methodology for the above would be prescribed fully within an EPS licence, which would be sought in advance of ground-breaking works that may lead to licensable activities within the site.

11.334 It should be noted that the District Level Licensing (DLL) scheme is not currently operational in the county. Should this come into effect then proposed mitigation measures may be subject to change.

Bats

11.335 As set out in Table 11-31, no significant effects on bat roosts are predicted due to the absence of evidence of any roosts in the limited number of mature trees and the single structure on the site, as confirmed by specific survey. This assessment is likely to remain current with respect to most vegetation removed during set up operations, but further checks of mature trees that would be removed during this phase (e.g. in and around the plant site) and of the building in the south-eastern edge of the application site, would be made immediately prior to their felling or demolition respectively.

11.336 In relation to the remainder of the site, while current roosting opportunities are absent or highly limited, the elapse of time over the operational phase renders it possible, albeit unlikely, that the baseline situation could change. To address this, a repeat appraisal of the possibility of roosts being present would be made prior to the commencement of site preparation works on each future phase, and if potential roosts sites are identified these would be subject to full surveys (emergence/re-entry or climbing inspections) to ascertain that no bat constraint has developed. If bat roosts are found, appropriate mitigation under licence would be enacted prior to the commencement of preparatory works for that phase. If required, measures would be detailed in a method statement and work schedule to support a licence application.

11.337 As an ancillary and unrelated enhancement for bats, the opportunity would be taken to install bat boxes on a number of retained mature trees at the site margins, including the part of the applicant's lease-holding that extends partly within the edge of Home Covert. This would represent an enhancement in terms of the current poor level of bat roosting opportunities on the site.

11.338 Full detail of the methodology for the above would be prescribed fully within a Species Protection Plan in advance of works proceeding on site.

Badger

11.339 Refer to the Confidential Badger Report (**Appendix 11/5**).

Barn Owl

11.340 To ensure an unbroken continuity of nest and winter roost site opportunities for this Schedule 1 protected species, the existing barn owl boxes on the site would be relocated in the post-breeding / pre-winter period (i.e. once certain any chicks have fledged) prior to their location being affected by any individual working phase. Consideration would be given to the erection of additional permanent pole or tree mounted boxes as part of the final restoration.

11.341 This would be undertaken immediately following inspection by a licensed Ecologist who would be

tasked with monitoring barn owl activity on site. The methodology for this would be prescribed within a Species Protection Plan.

Nesting Birds

11.342 Site clearance and works within the breeding bird season (March to August inclusive) has the potential to incur damage to or disturbance of nesting birds and their nests/young.

11.343 It is intended that vegetation removal, overburden stripping and related groundworks for the preparatory phases (including conveyor construction) and for each working phase, would be precede the main works.

11.344 Site clearance in late winter/early spring (i.e. late February/early March) or mid-Autumn (i.e. September) is most preferable to avoid impacts to nesting birds (and potential hibernating reptiles). No particularly early nesting species are anticipated on this site and so this approach is likely to successfully avoid any impact from this source.

11.345 Immediately in advance of each phase, a suitably qualitied and experienced Ecological Clerk of Works (ECoW) would inspect all vegetation for signs of nesting bird activity. Should any activity be noted within and nearby the works area then the ECoW would advise a buffer area/no works zone to prevent disturbance of or direct mortality to the nest, adult birds and chicks. The ECoW would monitor site conditions until such time that all chicks are confirmed to have fledged the nest(s). Thereafter works can continue for the next 48 hours. Should the site area not be cleared within that time and suitable nesting bird habitat remains then a follow up inspection would be required. The ECoW would advise on areas that are free from constraint and can be subject to habitat manipulation to remove nesting bird habitat for areas that would be subject to works.

11.346 The buffer areas/no works zones would be dependent on the species of bird (5m minimum and can be extensive for species that are highly sensitive to disturbance). This can be a significant factor for programming of works on site so should be factored in to avoid unexpected delays.

11.347 Full detail of the methodology for the above would be prescribed fully within a Species Protection Plan in advance of works proceeding on site.

Reptiles

11.348 In advance of groundworks on any individual phase, suitably timed habitat manipulation (strimming and/or mowing) would be employed to displace and discourage reptile species from habitat with the potential to support them.

11.349 Low density populations are present on the site. Compensatory habitat would develop in short order on peripheral or already restored land as the working sequence progresses. For these reasons, habitat manipulation is considered an appropriate, proportionate and adequate means to negate or minimise the scope for inadvertent killing or injuring of any individual animals from the sparse local population of grass snake on the site, and indeed any residual population of slow worm.

11.350 A full methodology for habitat manipulation would be prescribed within a Species Protection Plan. This would take account of the potential presence of nesting birds on site and shall be programmed

accordingly (as outlined for nesting birds in Section above).

Invasive Flora

New Zealand Pigmyweed and Japanese Knotweed

11.351 A specialist invasive species contractor would be instructed, at the earliest opportunity, to advise on the most effective options for containment, control and management of Japanese knotweed, New Zealand pygmyweed and snowberry on site.

11.352 An Invasive Species Management Plan would prescribe options available to minimise the risk of the Schedule 9 invasive species from being spread around site or on adjacent land/watercourses.

11.353 The specialist can advise on the legal ramifications of containment and treatment options; including, the need for permitting/licensing for transfer of Hazardous Waste should the material be legally transported off-site.

11.354 The most environmentally sensitive option would be sought in the confines of the works programme.

RESIDUAL EFFECTS

11.355 The residual effects anticipated to arise as an overall consequence of the project (i.e. taking into account both the design mitigation set out above, and the further avoidance, mitigation and compensation measures) are summarised for each of the key receptors in Table 11-31 below.

Table 11-32:
Residential Effects

Receptor	Residual Effect
Home Covert and Round Wood LWS	With the adoption of best practice and industry guidance in respect of minimising the indirect effects on the LWS habitats from lighting, noise and dust, no significant residual impacts are predicted in terms of the integrity of this designated site.
Unmanaged Grasslands	The phased nature of extraction, the likely development of ephemeral unmanaged grassland habitats of not dissimilar nature and conservation significance, and the active creation and future management of such habitats following the completion of restoration ensures that any negative impacts would be of minor to moderate magnitude, temporary and fully compensated in the long term. Residual effects after restoration assessed as not significant and may be positive subject to restoration success and future management.
Great Crested Newts	A comprehensive mitigation scheme for this species would be implemented. The scheme would require derogation from the provisions of European and UK legislation in the form of a licence from Natural England. The three tests upon which the grant of a licence is contingent are capable of being met. Residual impacts on the species are assessed to be below significance thresholds on the successful completion of mitigation, with scope for significant positive effects in the long-term due to the enhanced wetland habitat provision forming part of the restoration scheme.

Receptor	Residual Effect
Breeding Birds	The phased nature of extraction and progressive restoration, in conjunction with the incidental development of ephemeral habitats in operational areas and the exclusion of public access from operational areas during the active working or restoration phase, is likely to ensure operational phase impacts on this receptor remain below significance thresholds. Post-restoration, there is scope for significant positive impacts at the District level to be secured, subject to future management.
Wintering Birds	Similarly to the above, the phased nature of extraction and progressive restoration, in conjunction with the incidental development of ephemeral habitats in operational areas and the exclusion of public access from operational areas during the active working or restoration phase, is likely to ensure operational phase impacts remain below significance thresholds. Post-restoration, there is scope for significant positive impacts at the District level to be secured, subject to future management.
Passage Birds	The scope for significant negative effects is assessed as remote due to the transient nature of site use by this group of receptors and the phased nature of extraction and progressive restoration, in conjunction with the incidental development of ephemeral habitats in operational areas and the exclusion of public access from operational areas during the active working or restoration phase. Positive effects significant up to the District level are possible post-restoration, subject to an appropriate management regime being delivered.
Invertebrates	Scope for significant negative effects restricted by phased working sequence which would leave extensive areas under rough grassland/scattered scrub initially, and by later phases restoration is likely to have generated suitable replacement conditions for a significant proportion of affected species, with some expansion of currently more restricted habitat opportunities (e.g. wetland, acid grassland) potentially delivering significant positive effects long-term.
Other Grassland Habitats	Losses anticipated to be below significance thresholds at the relevant (Parish) geographical level, due to progressive nature of site working and restoration and the compensatory (or expanded) provision built in to the restoration scheme.
Hedges, Mature Trees, Ponds and Denser Scrub	Losses anticipated to be below significance thresholds at the relevant (Parish) geographical level, in large part due to progressive nature of site working and restoration and the compensatory (or expanded) provision built in to the restoration scheme in respect of ponds, hedges and scrub.
Bats	Short term effects likely to be neutral or net positive (although sub- significant in relation to conservation status of resident local populations) due to very minor habitat loss or fragmentation effects being outweighed by delivery of improved habitat diversity through extraction and progressive restoration. In medium term, mitigation proposed to militate against and/or address future effects further obviates scope for significant effects. Post completion (long term), effects are likely to be significant positive (Parish level) due to expansion and improvement of habitat resources, including provision of new wetland habitat foraging and roosting opportunities in particular.
Brown Hare	Negative effects predicted to remain well below significance thresholds in terms of local population integrity. Significant positive effects at the Parish population level are possible during the operational phase, due to exclusion of public (and dog) access although these may be rendered temporary depending on the future management regime.
Badger	Refer to Confidential Badger Appendix 11/5.

Receptor	Residual Effect
Reptiles	With precautionary mitigation, no significant effects anticipated due to phased habitat loss being compensated by delivery of improved habitat by progressive restoration. In medium to long term, effects are likely to be significant positive (Parish level) due to expansion and improvement of habitat resources.
Invasive Flora	With early intervention, on the advice of a commissioned Invasive Flora Management Specialist, short significant positive effects at the District/catchment geographical level are possible during the construction and operation phase. The maximum biodiversity benefits would be realised and the greatest opportunity to select the most environmentally sound option would be enabled with prompt action to contain, control and manage invasive flora on site. This would reduce risk of spread of invasive species in the locality. Ongoing monitoring and management would be essential to success. Post completion (long term) effects are likely to be significant positive (Parish level) due to expansion and improvement of habitat resources, upon provision of native habitats.

CONCLUSIONS

11.356 As can be seen from Table 11-31, the net residual effect of the proposals in terms of the key ecological receptors is anticipated to be at worst neutral and at best a positive effect measurable at least at the District level of significance. The difference relates to a degree of residual and unavoidable uncertainty over the success of the restoration scheme and subsequent long-term management in securing similar or enhanced habitats to the baseline position and, in particular, the extent of visitor pressure and its management over the long-term.

11.357 The project would give rise to minor temporary negative effects on certain key faunal receptors (in particular great crested newts) during various stages of the working sequence, but none of these receptors are predicted to be subject to negative effects of high magnitude (e.g. significant in terms of wider local populations), subject to mitigation measures which, in respect of great crested newts, are required under statute in any event. There is no impediment to mitigation proposals being delivered that are in accordance with standard best practice, and in that context there is no cause to believe that the requisite licenses would not be forthcoming in due course. There is also a high certainty that all temporary negative effects on key faunal receptors related to habitat loss would be at least fully compensated in the long-term through the restoration scheme.

11.358 Refer to the Confidential Badger Report (**Appendix 11/5**) for an assessment relating to this species.

11.359 The proposals for restoration focus on replication of the higher-value elements of the site in its baseline condition, including in particular the large expanses of rough circumneutral grassland, but also seek to exploit opportunities to secure expanded representations of other semi-natural vegetation, in particular acid grassland and wetland habitats, providing replacement and expanded opportunities for species of conservation importance, including declining open-country birds, scarce plants and insects, great crested newts and others. Depending on the success of restoration delivery, and the future management of the site, the project has the potential to ultimately deliver significant positive effects at District level or above, and to qualify the restored site for non-statutory designation within a relatively short time frame.

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INTRODUCTION

12.1 This chapter of the ES, prepared by Andrew Josephs Associates, presents the findings of a cultural heritage desk-based assessment and field evaluation in connection with a planning application for a mineral development on the former Hatfield Aerodrome (hereafter the application site). The location and extent of the application site is shown on **Figure 12.1**.

12.2 The detailed description of the proposals is set out in Chapter 3 of this Volume. The proposed working scheme is shown on **Figure 12.2**. For the purposes of the impact assessment it is assumed that disturbance could occur anywhere within the red line application boundary.

SCOPE OF CULTURAL HERITAGE AND METHODOLOGY

12.3 Cultural heritage is represented by a wide range of features that result from past human use of the landscape. These include historic structures, many still in use, above ground and buried archaeological monuments and remains of all periods, and artefacts of anthropological origin. In its broadest form cultural heritage is represented by the landscape and townscape itself.

12.4 This chapter considers both direct (physical) and indirect effects upon cultural heritage. Indirect effects can occur as a result of significant changes to the setting of an historic landscape or feature, whether permanent or temporary. This is particularly relevant to designated assets of national importance, such as Scheduled Monuments, Listed Buildings, Conservation Areas, and Historic Parks and Gardens.

12.5 A search was made of the National Monuments Record and the Hertfordshire Historic Environment Record (HHER) for a study area of up to 1km from the application site. This was considered an appropriate area of search, based upon topography, vegetation and built development that encloses the application site and restricts long-distance views from designated assets.

Consultations

12.6 Consultations were held with Alison Tinniswood and Andy Instone of the Natural, Historic & Built Environment Advisory Team, Hertfordshire Council, to agree the scope of the field evaluation stages.

Planning Policy

12.7 The importance of cultural heritage is clearly recognised at both national and local levels. Certain features that are deemed to be of particular importance are given legal protection through the Ancient Monuments and Archaeological Areas Act 1979 (Scheduled Monuments), the Town and Country Planning Act 1990 (Listed Buildings and Conservation Areas) and the Hedgerows Regulations 1997 (Hedgerows of Historic Importance).

12.8 The following policy and guidance is of particular relevance to this application:

- National Planning Policy Framework 2012. Department for Communities and Local Government.
- Planning Practice Guidance: Conserving and Enhancing the Historic Environment http://planningguidance.planningportal.gov.uk
- English Heritage 2008. Conservation Principles: Policies and Guidance for the Sustainable Management of the Historic Environment. London.
- English Heritage 2011. Seeing The History In The View: A Method For Assessing Heritage Significance Within Views.
- Historic England 2015 Good Practice Advice 3 – The Setting of Heritage Assets
- English Heritage 2008. Archaeology and Mineral Extraction. London.
- English Heritage 2008. Mineral Extraction and the Historic Environment. London.
- Minerals and Historic Environment Forum 2008. Mineral Extraction and Archaeology: A Practice Guide.
- English Heritage 2009. Planning Mitigation and Archaeological Conservation – Resource Assessment.

BASELINE CONDITIONS

Previous Cultural Heritage Studies

12.9 No cultural heritage studies or investigations have taken place within the application site prior to the work associated with this planning application.

Designated Heritage Assets

12.10 No designated assets of cultural heritage importance lie within the application site.

Scheduled Monuments

12.11 No scheduled monuments lie within 1km of the boundary of the application site. The nearest is the Colney Chapel moated site in London Colney parish (list entry number 1010718), about 1.8km south west of the application site. There is no visual connection with the application site.

Listed Buildings

12.12 The nearest listed buildings are Popefield Farm (with two attendant listed farm buildings) and the Three Horseshoes Public House. A Grade II milestone lies 70m to the east of the Three Horseshoes. These are described in Table 12-1.

Table 12-1
Listed Structures in proximity to the application site

NHLE entry number	Name	Description	Date
1103025	Popefield Farmhouse	Farmhouse. Timber frame. Painted brick ground floor. Plastered upper floors. Plain tile roofs. 2 storeys and attics.	Mid C17 origins, restored circa 1980.
1172843	Barn NW of Popefield Farmhouse	Two barns in long range, linked to farmhouse by single storey extension at right angles. Timber frame. Weatherboarded. Plain tile roof.	Late C17, altered and extended in C18.
1347189	Granary and shed	Granary and attached open shed. Granary is timber frame with C19 brick infill. Plain tile gable end roof. 2 storeys and attics.	The granary is late C17, the shed early C19.
1347182	Milepost ENE of the Three Horseshoes Public House	Cast iron, triangular open back	c1820
1172839	Three Horseshoes Public House	Timber framed with plastered brick casing. Steep pitched plain tile roof.	Early C18 with C19-20 additions.

12.13 A further twenty five listed structures lie between 250m and within 1km of the application site boundary. These are listed in Table 12-2. Of these the flight test hanger, offices, fire station and control tower of the former Hatfield Aerodrome are Grade II*, as is Torilla a house of 1930s construction, the remainder being Grade II.

12.14 The locations of listed buildings are shown on **Figure 12.3**.

12.15 Two buildings are assigned a sixteenth century date: they comprise the Grade II listed Sleapshyde Farmhouse (1347209) and the Old Forge Cottage (1348162). The others range from the seventeenth century to the twentieth although some may have unidentified earlier work within their cores.

Table 12-2
Listed Structures within 1km of the application site

NHLE entry number	Name	Description	Date
1100903	Milepost to west of Comet roundabout	Cast iron, triangular, open backed.	c1820
1101036	The Comet public house	Red brick two storey Hotel with Clipsham stone dressings	1933
1101043	Astwick Manor	Manor house now college headquarters	Late C17 or early C18 extended in C19 and C20
1102875	Oak Farmhouse	Timber frame farmhouse	Mid-late C17 with possibly earlier core. C19-20 casing
1102984	Rose Cottage and	Pair of house in a single long range.	Late C17 C19/20

NHLE entry number	Name	Description	Date
	Little Rose Cottage	Timber frame with weatherboarding	extensions and alterations
1102985	Two barns and stable at Sleapshyde Farmhouse	Pair of barns and attached stable forming L-shaped plan	Barns C17, Stable C19
1102986	Farm Cottage, Sleapshyde Lane	Timber framed house, plastered walling steeply pitched red tile roof	Late C17 with C19-20 casing
1102987	The Plough Inn, Sleaphyde Lane	Public House. Timber framed painted brick ground floor plastered upper floor, thatched roof.	Late C17 extended mid C19
1103006	Barn south of Oak Farm House	Timber framed barn weather boarded with corrugated iron roof	Probably late C17, four bay C19 extension
1103018	Smallford Cottage	Farmhouse now house. Timber framed with later C20 weatherboarding	Mid C17, C18-19 extension
1102988	Sunnyside	House. Timber frame	C17-C19
1347211	Forge Cottage	House, formerly a forge. Timber frame	C17-C20
1101006	Barns at Nast Hyde Farm	Barns and stable range in L plan, Weatherboarded.	C17-C19
1173779	Nast Hyde Farmhouse	Farmhouse. Timber framed rear part with red brick. Plain tile roof. 2 storeys	C17-C19
1101005	Cottage at Great Nast Hyde	Cottage. Timber frame and painted brick	C17-C20
1173761	Great Nast Hyde	Manor house, now British Aerospace residence. Red brick, stone dressings, plain tile roof.	C17-C20
1348145	Torilla	House by F R S Yorke. Modern style, showing influence of Le Corbusier	1934-5
1173109	Farmhouse and small barn at Suttons Farm	Farmhouse and barn with C18 brick front but probably earlier core. Slate roof with C17 red brick chimney	C17-18
1175602	Barn south of Oak Farmhouse	Barn with four timber frame bays. Open on SE gable, weatherboarding. Corrugated iron roof	Late C17
1245067	Smallford station	Station now office building. Timber framed and weather boarded Welsh slate roof.	1866
1347208	Ye Olde House	House divided into three properties. Timber framed with red brick ground floor weather boarded upper. Plain tile roof	Mid-late C17
1347209	Sleapshyde Farmhouse	Farmhouse. Timber framed. Cement-rendered with combed pargetting. Half hipped plain tile roof with massive C17 red brick chimney.	Early C16 altered and floored in later C17
1347210	Granary SE of Sleapshyde Farmhouse	Granary now dog kennel. Timber framed with brick infill, cemented brick piers. Corrugated iron roof.	Late C17 or early C18
1348162	Old Forge Cottage	House formerly forge. Three timber framed bays, painted brick exterior.	Late C16, extended C17, brick exterior

NHLE entry number	Name	Description	Date
			C18-C19
1376561	The flight test hanger, offices, fire station and control tower	Main hanger built of aluminium covered with insulated aluminium. Some steel framing in the brick clad offices. The six storey control tower noted for its use of non-reflective glass	1952-3 hanger, offices and tower 1954

Conservation Area

12.16 Towards the southern edge of the 1km radius study area lies Sleapshyde Conservation Area. There is no visual or contextual connection between the Conservation Area and the application site.

Other designated assets

12.17 There are no World Heritage Sites, Historic Parks and Gardens or Registered Battlefields within 1km of the application site.

Site visit to designated assets

12.18 A site visit to designated assets in the vicinity of the application site was carried out in June 2015.

12.19 The application site is well screened from all but the nearest listed buildings at Popefield Farm by vegetation and built development. Peripheral hedging along the A1057 and the narrow country lanes to the south would ensure that there could be no impacts of magnitude upon listed buildings in Wilkins Green and Sleapshyde (**Photograph 12.1**).

12.20 The view from the Three Horseshoes Public House (**Photograph 12.2**) illustrates well the screening effect of the application site's hedged boundaries (**Photograph 12.3**).

12.21 Popefield Farm lies on private land and it was not visited. The Farm complex comprises three listed buildings, as described above (Table 12-1). **Photographs 12.4**-**12.6** show the Farmhouse and farmbuildings recorded for the Images of England database. The house is orientated to its courtyard setting, that is to the south-west.

12.22 The view from the public road looking towards the Farmhouse and the application site is shown on **Photograph 12.7**.

Historic Environment Record

12.23 Details of investigations, sites and finds lying within 1km of the boundary of the application site were provided by the Hertfordshire HER. These are tabulated below, Table 12-3, (listed buildings have been omitted from the table) and the locations of sites discussed shown on **Figure 12.4**.

Table 12-3
HHER entries within 1km of the application site

HER NO.	DESCRIPTION
125	LATE IRON AGE OCCUPATION, HATFIELD AERODROME
465	DENE HOLES, CHANTRY WOOD, CHANTRY LANE, HATFIELD
2617	CROPMARKS OF A DITCHED FEATURE, HATFIELD
2666	LATE IRON AGE AND ROMANO-BRITISH ENCLOSURE, OAKLANDS COLLEGE, COLNEY HEATH
2935	PALAEOLITHIC HANDAXE, SE OF SLEAPSHYDE FARM, COLNEY HEATH
5301	VICTORIAN LETTER BOX, OPPOSITE THE PLOUGH PH, SLEAPSHYDE, COLNEY HEATH
5371	SITE OF MALTINGS, WATERS GARAGE, HATFIELD
5517	SITE OF HALT, NAST HYDE, HATFIELD
6839	ROAD BRIDGE, STATION ROAD, SMALLFORD
6881	POST-MEDIEVAL CHALK PIT, COLLEGE LANE, HATFIELD
9628	HATFIELD-ST ALBANS BRANCH OF THE GREAT NORTHERN RAILWAY
9760	CROPMARKS OF FIELD SYSTEM AND TRACKWAYS, JERSEY FARM, SANDRIDGE
9925	MEDIEVAL DITCHES AND PITS, SUTTONS FARM, HATFIELD QUARRY
9926	BRONZE AGE PITS & ROMANO-BRITISH DITCH SYSTEM, SUTTONS FARM, HATFIELD QUARRY
9927	LATE IRON AGE FEATURES, SUTTONS FARM, HATFIELD QUARRY
11536	SITE OF HARPSFIELD HALL, HATFIELD
11540	BOUNDARY DITCHES, HATFIELD AERODROME
11541	BOUNDARY DITCHES, HATFIELD AERODROME
11544	UNDATED CREMATION, HATFIELD AERODROME
11546	LATE BRONZE/EARLY IRON AGE OCCUPATION, HATFIELD AERODROME
11547	LATE IRON AGE CREMATION URN, HATFIELD AERODROME
11549	LATE IRON AGE/ROMANO-BRITISH DITCHES AND POTTERY, HATFIELD AERODROME
11550	LATE BRONZE AGE/EARLY IRON AGE DITCH, HATFIELD AERODROME
11551	LATE BRONZE/EARLY IRON AGE FEATURES, HATFIELD AERODROME
11556	POSSIBLE FLINT ARROWHEAD, SUTTONS FARM, HATFIELD
11559	MIDDLE BRONZE AGE POTTERY, HATFIELD AERODROME
11560	SAXON POTTERY, HATFIELD AERODROME
11561	PALAEOLITHIC HANDAXE, HATFIELD AERODROME
11562	LATE IRON AGE/ROMANO-BRITISH PITS AND POTTERY, HATFIELD AERODROME
11649	POSSIBLE GREEN, E OF SLEAPSHYDE FARM, COLNEY HEATH
11830	SITE OF ROEGREEN FARM NORTH, COLLEGE ROAD, ROE GREEN, HATFIELD
11831	SITE OF ROEGREEN FARM SOUTH, COLLEGE ROAD, ROE GREEN, HATFIELD
11832	ROEHYDE FARM, HATFIELD
11886	DE HAVILLAND AERONAUTICAL SCHOOL ACCOMMODATION BLOCK, COOPERS GREEN LANE, HATFIELD

HER NO.	DESCRIPTION
11887	DE HAVILLAND AERONAUTICAL SCHOOL TRAINING HANGAR, COOPERS GREEN LANE, HATFIELD
11907	POST-MEDIEVAL FIELD BOUNDARIES, HATFIELD AERODROME, HATFIELD
11908	MESOLITHIC TRANCHET AXE OR THAMES PICK, HATFIELD AERODROME, HATFIELD
11909	HAMMER-STRUCK FLAKE, HATFIELD AERODROME, HATFIELD
12235	SITE OF BUTTERWICK FARM, SMALLFORD
13076	SITE OF TOLL GATE, OAKLANDS LANE, SMALLFORD
13600	UNDATED PIT, OAKLANDS COLLEGE, SMALLFORD, COLNEY HEATH
13616	OAKLANDS, HATFIELD ROAD, COLNEY HEATH
13687	DE HAVILLAND CANTEEN & ADMINSTRATION BLOCKS, COMET WAY, HATFIELD
13721	BRONZE AGE FLINT FLAKES, HATFIELD BUSINESS PARK, HATFIELD
15396	NAST HYDE FARM, WILKINS GREEN LANE, ELLENBROOK, HATFIELD
15397	GREAT NAST HYDE, WILKIN'S GREEN LANE, ELLENBROOK, HATFIELD
15400	SUTTONS FARM, COOPER'S GREEN LANE, HATFIELD
15569	UNDATED PIT, HOWE DELL PRIMARY SCHOOL, HATFIELD
16446	SITE OF HOLLYBUSH HALL, COLNEY HEATH LANE, SMALLFORD
17354	SITE OF MISSION ROOM AND ROE GREEN COTTAGES, COLLEGE LANE, ROE GREEN, HATFIELD
17599	SITE OF 'CHALK SHAFTS', COLLEGE LANE, HATFIELD
17661	SITE OF MISSION ROOM, COOPER'S GREEN LANE, HATFIELD
18084	CROPMARKS OF POSSIBLE DITCHES AND PITS, SANDPIT LANE, JERSEY FARM, ST ALBANS
18091	CROPMARKS OF PITS, BOUNDARIES AND PROBABLE TRACK, SMALLFORD LANE, SLEAPSHYDE
18472	SUNNYSIDE, WILKINS GREEN LANE, WILKINS GREEN, COLNEY HEATH
18473	WILKINSGREEN FARM, WILKINS GREEN LANE, COLNEY HEATH
18475	SITE OF TOLL GATE, HATFIELD ROAD, SMALLFORD
18476	METHODIST CHURCH, SLEAPSHYDE, COLNEY HEATH
30774	POST-MEDIEVAL POTTERY AND OTHER DEBRIS, EAST OF OAKLANDS LANE, COLNEY HEATH
30775	POST-MEDIEVAL POTTERY AND OTHER DEBRIS, NORTH OF SLEAPSHYDE, COLNEY HEATH

Discussion

Early Prehistoric

12.24 The HER records two instances of Palaeolithic finds within the study area (2935, 11561), both of which were isolated hand axes, and a single Mesolithic find, a tranchet axe or Thames pick found on the aerodrome (11908).

Later Prehistoric

12.25 A number of finds of flint attest to a later Prehistoric presence in the study area. Finds such as an arrowhead (11556), a hammer struck flake (11909) and scatter of Bronze Age flakes (13721) suggest a background of activity further reflected by the identification of Bronze Age pits (9926) and from the aerodrome a find of middle Bronze Age pottery (11559).

12.26 Further late Bronze Age to Iron Age evidence is also recorded in the form of 'occupation' (11546) and a ditch and other features (11550, 11551) all within the aerodrome. A single late Iron Age cremation in an urn is also recorded from the aerodrome and a group of Iron Age features (9927) from quarrying at Suttons Farm.

Roman

12.27 The Roman period is surprisingly sparsely represented in the study area. Only two sites, each of which also have late Iron Age activity are recorded as producing Roman material. They comprise some ditches (11549) and pits 11562), both within the former aerodrome.

Saxon

12.28 Some Saxon pottery (nine small and abraded sherds) was recovered from archaeological work in the aerodrome but there is no indication whether they came from a feature.

Medieval

12.29 The medieval period is represented by a group of ditches excavated at Suttons Farm ahead of quarrying in 2000. They produced pottery of C12-C13 date and were interpreted as part of a wider system.

Post Medieval

12.30 The remaining material is either of post-medieval date or undated. Many of the entries relate to the site of farms or structures that appear on earlier maps but are no longer extant in the landscape.

Historic Landscape Assessment

Introduction

12.31 The application site was until recently partially occupied by elements of the Hatfield Aerodrome including a runway, taxiway and ancillary structures, the removal of which has produced an uneven landscape. Significant land disturbance also took place associated with the filming of Saving Private Ryan and Band of Brothers.

Historic Landscape of the application site and immediate surroundings

12.32 Examination of the historic maps of the application site and its immediate surroundings reflect an agricultural landscape (before the aerodrome) of rectilinear fields that presumably date to the enclosure of the area. The form of the fields is unchanged from the 1883 1:10,560 (**Figure 12.5**) through to the 1925 1:10,560 mapping with the exception of the amalgamation of some of the smaller parcels with other larger fields.

12.33 Popefield Farm itself is depicted on each of these maps with the same building layouts, suggesting it too was unchanged. There is variation in the landuse of some of the adjoining land parcels which in the 1883 mapping are clearly shown as orchard but by 1899 (**Figure 12.6**) only one parcel fronting onto the Hatfield Road is shown thus.

12.34 On the 1899 mapping a gravel pit is depicted some distance to the north of the farm. This area is also shown unannotated on the 1925 map (**Figure 12.7**) when the field boundary to the north has gone. It is possible there was more extensive quarrying which removed the boundary that has not been mapped. This is perhaps more likely since on the 1938 1:10,560 (**Figure 12.8**) the field with the marked gravel pit is shown with two pits, possibly ponds, and it is subdivided by a new north-south aligned field boundary.

12.35 The area to the west of Popefield Farm is shown on the 1938 map with a racetrack. This was Smallford track and operated as a speedway venue from 1936-1939.

12.36 Subsequent mapping (**Figures 12.9-12.11**) show the farm and to its north and east elements of the runway associated with the de Haviland works. At the same time many of the field boundaries appear to have been removed or replaced. The 1975-78 1:10,000 mapping shows the former gravel pit/pond area as wooded.

Field Based Evaluation

12.37 Geophysical survey and trial-trenching was carried out in November and December 2015.[1]

Geophysical Survey

Aims and Methodology

12.38 Approximately 11.5 hectares was surveyed across the application site by Archaeophysica in areas where the ground was not overgrown or uneven, a result of earthmoving activities.

[1] Reports have been submitted to Hertfordshire County Council

12.39 The survey was carried out using Magnetometry in a continual recording mode taking readings at 1.0m between lines, and 0.3m mean along line interval. This is usually referred to as 'detailed' geophysics.

12.40 All work was carried out by experienced geophysical surveyors.

Results

12.41 The surveyed areas were predominantly around the southwest end of the former runway. The results (**Figure 12.12**) showed a general background of evidence for the degradation of the natural [1][2] and also extensive spreading of ferrous material across the site [2] as might be anticipated from the clearance of the site. A linear spread of anomalies [3] running approximately parallel to the northern boundary of the surveyed area and more extensive areas [4 & 5] to the south. The origin of these anomalies is unclear but it is likely to be the product of the demolition of structures and dumping of material.

12.42 Part of the origin of the area [6] may be the crash of a Lightning jet in 1962 and the subsequent 'clean up' (www.eyemead.com/noise-1.htm), **Photographs 12.8-12.9**).

12.43 In addition to identifying field boundaries that were in existence until the post war extension of the runway, only a single possibly archaeological linear feature [7] was identified. It is a short length of possible ditch on an orientation that is different to the recent field system and it may therefore relate to an earlier land division.

Trial-Trenching

Aims and Methodology

12.44 Trial-trenching of part of the application site was carried out by TVAS in November and December 2015. Some of the application site could not be explored at that time owing to the need to secure appropriate licences to allow working within 250m of ponds known to contain Great Crested Newts.

12.45 The general purpose of the evaluation was to determine the presence/absence, extent, condition, character, quality and date of any archaeological deposits within the area of development. Its specific research aims were to:

- determine if archaeologically relevant levels have survived on the application site;
- determine if archaeological deposits of any period are present;
- identify areas that may have been destroyed or disturbed while the area formed part of a film set and, if so, provide information on the extent of this disturbance;

[2] Numbers in [*n*] refer to **Figure**

- provide information in order to draw up an appropriate mitigation strategy if required.

12.46 This phase of evaluation was to comprise the digging of 204 trenches each 2m wide and 25m long. The trench locations were laid out using hand held GPS in a largely random but evenly spread pattern. Owing to on-site constraints, including a small plantation, it was not possible to open all of the trenches and a total of 165 were opened in this phase. The layout is shown on **Figure 12.13**.

12.47 The trenches were dug under archaeological direction by a 360°-type machine fitted with a ditching bucket. The spoil heaps were monitored for finds and all potential archaeological deposits were hand-cleaned and excavated.

Results

Introduction

12.48 The results of the trenching have revealed no positively identified ancient archaeological levels or features. In general the site stratigraphy was a topsoil or former agricultural soil of between 0.1 and 0.3m thick which overlay a silty clay subsoil of between 0.1-0.3m thick. This in turn generally overlay the 'natural' that ranged from a reddish clay to a gravel across the site. These naturals were clear and would allow the easy identification of any features cutting into them. The poor drainage these naturals provided is reflected by the presence of several different field drain systems across the application site. Most were ceramic pipes in narrow trenches infilled with loose gravel, although some were concrete pipes that may relate to drainage works associated with the application site's use as an airfield.

12.49 Although most trenches were blank, and had the simple stratigraphic sequence described above, some specific and destructive activities could be identified.

Plough scars

12.50 The first and slightest impact was from deep ploughing, with groups of parallel plough scars identified in a number of areas of the site, for example in trenches 7 and 13-15. These plough scars were however not present across the entire site as would have been expected if they were the product of normal agricultural ploughing. Instead they seemed to only be present in areas of tree planting, perhaps reflecting the deliberate breaking of the soils prior to the planting of presumably bare rooted cuttings.

Remains associated with the airfield

12.51 One part of the area evaluated produced evidence for extensive make up, in places in excess of 1m, of imported clean clays and sands along with deposits of brick bats and other material. The localised occurrence of this material in trenches 92, 100-106, 110-111, 114 and 117-18, coincided with

part of the concrete runway and the land to its immediate south which is indicated as a slight valley by the contours on the pre-airfield Ordnance Survey.

12.52 The original grass airstrip and wartime airfield did not extend into this area but in the immediate post- war years there was a need to extend the runway and replace the grass surface with concrete to accommodate the larger and heavier aircraft. Hatfield was one of the first examples of this new construction in the country. The work saw the runway cutting through a slight rise and running across a slight valley which was infilled, sealing its topsoil. Work commenced in June 1945 and was completed by December 1947. The dumped material noted in some of the trenches was presumably from the cutting through the slight ridge and the limited nature of the slight valley is reflected by the fact that in trenches 109, 111 and 115 there was a the suggestion of a tapering edge to the dumped material.

12.53 The valley contained the Ellenbrook, which had already been culverted in a pipe by the time of the construction of the new runway, but a new bigger culvert was inserted to carry its course. Whilst neither culvert was identified in the evaluation the black, slightly organic nature of the buried topsoil present in this group of trenches was characteristically typical of a waterlogged soil and may denote the proximity of the brook.

12.54 In addition to the dumping to provide a more level base for the runway, a possible post-runway pit was identified in trench 114 which extended in excess of 2.5m below the present ground level. This feature contained large amounts of wood, metal, salt-glazed sewer pipes and a rubber wellington boot. It is unclear why the pit was excavated but it represents modern dumping.

Ground disturbed as part of a film set

12.55 In addition to the areas of deliberate dumping to create the level base for the construction of the runway, several other areas of disturbed ground were identified where there was evidence to suggest the overburden had been previously stripped to, if not into, the underlying natural. This evidence was predominantly to the west and south west of the runway (for example in trenches 75, 76, 81, 82 and 127-134) and much of the area coincided with a large rectilinear but slight surface hollow.

12.56 The origin of this disturbance was almost certainly associated with the filming of The Band of Brothers mini-series. The series was shot over 8 to 10 months and the various sets included replicas of European towns. This part of the application site had previously been used to shoot the film Saving Private Ryan in 1997 and whilst aerial images have not been located, a still from the film (**Photograph 12.10**) shows significant construction, including a canal (still identifiable on site) and a raised railway.

12.57 A Google earth image of 2000 (**Photograph 12.11**) shows the extent of disturbance associated with filming during restoration and **Photograph 12.12** is a still of the Band of Brothers film set. Backfilling contained quantities of both brick rubble and cabling, in particular co-axial cable. Trenching

produced evidence for a toothed machine bucket having created striae in the upper surface of the natural and in other places bricks and other modern material had been compacted into the surface of the natural.

Tree root bowls

12.58 Discrete features were identified in several of the trenches. Some of the features were identified as tree root bowls (trenches 80 & 87), one of which in trench 80 produced modern material.

Linear features

12.59 The most frequently occurring feature type was that of a linear ditch or gully, of which 18 examples were identified over 12 trenches. The majority of these features could be identified as forming part of a field boundary or trackway depicted on the nineteenth century Ordnance Survey mapping of the area. The examples present in trenches 27 (ditches 5 & 6) formed part of a field boundary. That there are two ditches may denote either the replacement of one by the other or the suggestion that this line was also the parish boundary and was therefore marked on both sides. The individual cuts were both less than 1m wide and between 0.3-0.15m deep so clearly not of a size on their own and without a hedge, for example, to form a stock boundary.

12.60 It is significant that in other trenches that should have crossed field boundaries in this area (trenches 11, 17 & 23) no linear boundaries were identified perhaps suggesting that some boundaries were only defined by a hedge with no ditch.

12.61 In trench 6 a ditch on the same orientation as a field boundary on the 1896 mapping was present. It was 0.95m wide and up to 0.22m deep and from its infill a single piece of abraded clay building material (CBM) was recovered, along with a clay pipe stem fragment of mid to late eighteenth century date.

12.62 The construction of the airfield extension saw the removal of most of the previous field boundaries. A ditch in trench 104 (ditch 1) was almost certainly one of the approximately north-south aligned ditches shown on the mapping and its identification at a depth of about 1.8m below the present surface gives an indication of the scale of earthmoving that accompanied the construction of the extended runway.

12.63 The ditches identified in trenches 40 and 42 may be part of the complex that formed the track running north from Popefield Farm, with ditch 7 in trench 40 being equated to ditch 15 in trench 42. Only a single cut was evident in trench 40, but four ditches in two groups of two (ditches 13 & 15 and 11 & 12) were seen in trench 42 perhaps reflecting both sides of the track and its periodic redefinition.

12.64 Trenches 88 and 92 each held a single ditch that do not conform to the position of any of the mapped boundaries and neither contained any dateable artefacts. In trench 92, the ditch (23) lay approximately northeast to southwest across the trench and was 0.65m wide and 0.21m deep, whilst in

trench 88 the ditch (22) was almost east-west and measured 2m wide and 0.3m deep.

12.65 The two remaining ditches occurred in trench 130 (ditch 19) and trench 55 (ditch 26). Ditch 19 could not be equated to any of the identified mapped field boundaries but ditch 26 was almost certainly part of the south side of a small land parcel that lay toward the northern part of the application site.

12.66 Overall most of the identified ditches in the trenches could be reconciled as being boundaries shown on the nineteenth century Ordnance Survey mapping and where dating was recovered from them it was invariably of post medieval or recent date.

Fence line

12.67 A further recent boundary was defined in trench 46 where a line of 5 equal-sized post holes (8-10 & 16 & 17), at least one of which (17) was seen in section cutting from the base of the topsoil. This line was not structural and may have been the remains of a recent fence defining the plantation to the southwest. Posthole 9 contained a fragment of post medieval CBM.

Conclusion

12.68 This phase of evaluation has successfully identified a range of post-medieval features that can almost entirely be predicted from mapping of the site. No ancient artefacts were recovered, even from the spoil heaps. The oldest find was the sherd of salt glazed Bartmannkrug jug. The absence of any features of earlier date may reflect the marginal location of this part of the landscape, perhaps made too wet by the presence of the Ellenbrook.

SUMMARY OF DEVELOPMENT

12.69 The planning application is for the establishment of a new quarry on land at the former Hatfield Aerodrome, being part of an allocated site referred to in the extant Minerals Local Plan (”Preferred Area 1”). The proposals would involve the winning and working, together with processing for sale, of some 8Mt of sand and gravel over a period of around 30 years (based on an annual output of around 250,000tpa). In parallel with the extraction of minerals would be the importation of low permeability inert material to infill the mineral workings to facilitate the restoration of the site to a beneficial after use, combining recreation and nature consideration. The imported material would typically comprise excavation wastes from construction and engineering projects (soils, overburden, clays etc.) within the region.

12.70 The quarry would be worked on a phased basis to allow for progressive restoration. Excavated material would be processed at the quarry using a combination of screening and washing plant to produce a range of graded aggregates and sands. Processed aggregates would either be dispatched from the site in HGVs or used in ancillary ‘downstream’ plant (a ‘concrete batching plant’) located within the plant site for the production of concrete. Processed aggregates and concrete (together with the import of cement)

would be exported via a new access constructed onto the A1057 (Hatfield Road) on the southern side of the quarry.

12.71 Other ancillary development would include a weighbridge, office accommodation, electrical transformer, electrical switch-room, and small stores and maintenance building, fresh water and silt lagoons.

ASSESSMENT OF EFFECTS

Introduction

12.72 The nature of mineral extraction results in the total loss of the archaeological resource wherever extraction takes place, and the potential loss or damage in other areas associated with infrastructure and landscaping. These are direct effects.

12.73 Indirect effects are those that do not physically affect a cultural heritage asset, townscape or landscape, but that alter the context or setting.

Direct Effects

12.74 Although the HHER would indicate that the application site lies within an area of some archaeological potential, there is clear evidence of significant disturbance through the construction and demolition of the airfield, and subsequent use as a film set. Even where the ground is undisturbed, geophysical survey and Phase 1 trenching found scant archaeological remains and none that would appear to pre-date the post-medieval period. No artefacts of earlier date were found.

Indirect Effects

12.75 A site visit indicated that only the complex of three listed buildings at Popefield Farm could experience an adverse effect of any magnitude.

12.76 In order to quantify the scale of that effect an assessment has been carried out based upon criteria set out in Seeing the History in the View: A Method For Assessing Heritage Significance Within Views (Historic England 2011) and advice within Good Practice Advice 3 – The Setting of Heritage Assets (Historic England 2015). The use of views was chosen as the most appropriate way of assessing change to the setting, given that it is proposed to restore the land nearest the properties at close to existing levels, such that the long-term context would not adversely change. In the short-term, during preparatory works, extraction and infilling, the context would alter, but, as the property is occupied, it is the views of the development that are most sensitive to change.

12.77 As the property is on private land, the assessment has been made using evidence from Google Earth and by standing at the boundary of the property nearest the application site.

Operational Phase

12.78 Each phase of extraction would be worked in a similar fashion. Stripped soils and overburden would be placed into storage mounds (3m – 5m in height) located on the periphery of the working area. The greatest adverse effect would be during the creation of these bunds, estimated to take about 3 weeks. During extraction, the bunds would restrict views of the development. Phases A, D and F are the closest to Popefield Farm, at a distance of between 75m and 100m.

12.79 Seeing the History in the View states that "*the value of the view as a whole may be determined through its designated status, the overall heritage significance in the view, and the extent to which the view exhibits additional significance as a result of a number of heritage assets being seen in combination with each other*."

12.80 Views from the house towards the application site in Phase A would be partly screened by trees. In Phases D and F, views north from the house would be largely blocked by the barn to the north west. Views of the most southern limit of Phase F are likely to be largely unobstructed.

12.81 The viewing point of most significance, using Historic England guidance, is on the approach to the house where the house and two associated listed buildings can be viewed in the same envelope (**Figure 12.14**). This is an interpolated viewing point, as the viewing point lies on private land.

12.82 Based upon guidance contained in the policy document, the view is ascribed a "moderate" value/importance, defined as:

12.83 "*The view* is *likely to be of importance at the county, borough or district level …and contain heritage assets such as grade II listed buildings, grade II historic parks or gardens, conservation areas, locally listed buildings or other locally identified heritage resources whose heritage significance is well represented in the view and which benefit from being seen in combination with each other."*

12.84 Assessment of the magnitude of impact should "*as far as possible be objective, reasoned and quantifiable. The assessor should consider the extent to which heritage significance within a view may be changed or affected by the proposed development by reason of the latter's location or design*."

12.85 We have therefore assessed the magnitude of this change as 'low adverse', which is defined by Historic England in Seeing The History In The View, page 22 as:

12.86 "*The* development *erodes to a minor extent the heritage values of the heritage assets in the view, or the view as a whole, or the ability to appreciate those values*".

12.87 The rationale for this is that the listed buildings form a courtyard that prevent views to the north and east. Views to the north-west and west would be

largely unobstructed, although mitigated to some extent by the peripheral bund. The main impact is therefore during the estimated 3 weeks of bund construction.

12.88 Using the Historic England matrix, below, the effects upon the view is therefore calculated to be "minor adverse".

	WITH HIGH VALUE	WITH MEDIUM VALUE	WITH LOW VALUE
With high magnitude of impact	Major effect	Major effect	Moderate effect
With medium magnitude of impact	Major effect	Moderate effect	Minor effect
With low magnitude of impact	Moderate effect	Minor effect	Negligible effect
Negligible/ neutral impact	Negligible effect	Negligible effect	Negligible effect

12.89 A second view has been considered; that from the house looking north-east towards Phase A (**Figure 12.3**). This view is from the rear of the house and would therefore be of low value, described as "*a locally valued view [from] heritage assets such as grade II listed buildings, grade II historic parks or gardens, conservation areas, locally listed buildings or other locally identified heritage resources whose heritage significance is clearly readable, but not best represented, in this particular view*".

12.90 We have assessed the magnitude of the change to the view as medium adverse. This is defined by Historic England as "*the development erodes to a clearly discernible extent the heritage values of the heritage assets in the view, or the view as a whole, or the ability to appreciate those values*."

12.91 The rationale for this is that even with some filtering of views by trees, there would be clear views to the application site, especially from upstairs windows. The clearer views would however be oblique.

12.92 Using the Historic England matrix, below, the effects upon the view is therefore calculated to be "minor adverse".

	WITH HIGH VALUE	WITH MEDIUM VALUE	WITH LOW VALUE
With high magnitude of impact	Major effect	Major effect	Moderate effect
With medium magnitude of impact	Major effect	Moderate effect	Minor effect
With low magnitude of impact	Moderate effect	Minor effect	Negligible effect
Negligible/ neutral impact	Negligible effect	Negligible effect	Negligible effect

Post-restoration

12.93 It is proposed to restore the application site to a beneficial after-use, which is very similar in character and appearance to the existing Ellenbrook Fields, reinstates the current accessibility of the greenspace to members of the local public, whilst fulfilling all engineering requirements, in terms of managing water (surface and groundwater).

12.94 The landcover would consist of a broad area of gently sloping conservation grassland, divided by hedgerows and with some complimentary wetland and pond features.

12.95 The proposed hedge planting and alignment of open ditches/swales uses the 1888 historic field pattern which existed on the application site prior to the aerodrome and other interventions, with the aim of reinstating the broader landscape setting of the Popefield Farm listed building complex. Some of this remnant field pattern is still present on site, whilst some has been lost.

12.96 This would also create potential linkages with the existing hedgerows, woodland and tree belts around the perimeter of the application site.

12.97 The viewing point is the same as assessed in para 12.81 which is of "moderate" value/importance.

12.98 The magnitude of change is as 'low beneficial', which is defined as "*the development enhances to a minor extent the heritage values of the heritage assets in the view, or the view as a whole, or the ability to appreciate those values.*"

12.99 Using the Historic England matrix, below, the effects upon the view is therefore calculated to be "minor beneficial".

	WITH HIGH VALUE	WITH MEDIUM VALUE	WITH LOW VALUE
With high magnitude of impact	Major effect	Major effect	Moderate effect
With medium magnitude of impact	Major effect	Moderate effect	Minor effect
With low magnitude of impact	Moderate effect	Minor effect	Negligible effect
Negligible/ neutral impact	Negligible effect	Negligible effect	Negligible effect

Criteria used in the Evaluation of Predicted Effects

12.100 In accordance with the EIA Regulations the significance of an effect should be identified. This is achieved using a combination of published guidance and professional judgement, including the assessment criteria published by Historic England, above.

12.101 The EIA Regulations require that 'significant' effects are identified, whereas NPPF uses the terms 'substantial' and 'less than substantial'. As this application is being determined under the EIA Regulations, the terms 'significant' and 'not significant' are therefore used below.

12.102 Four criteria have been considered in evaluating the significance of the predicted effects of the proposed development. This draws on the results of the assessment of impact upon listed buildings (paras 12.75-12.99, above) and the results of the desk-based and field-based evaluation.

Type of effect

12.103 Effects may be positive, negative, neutral (i.e. no discernible effect) or none. They may be permanent or temporary, direct or indirect. They may also be cumulative with other effects occurring in the vicinity.

Probability of the effect occurring

12.104 An assessment is made as to the likelihood of the identified effect occurring. Probability is considered as certain, likely, unlikely or not known.

Sensitivity

12.105 Three categories of sensitivity are identified: high, medium and low. These are expanded upon in Table 12-4, below.

Table 12.4
Definitions of sensitivity

Sensitivity	Definition
High	Sites and settings of *national importance*. Scheduled Monuments. Registered Battlefields. Grade I and Grade II* Listed Buildings and Grade I Registered Historic Parks and Gardens. Sites may also be discovered as a result of new research that are also of national importance and are candidates for scheduling.
Medium	Sites and settings of *regional importance*. Archaeological sites and features that are not considered sufficiently important or well-preserved to be protected as Scheduled Monuments. Grade II Listed Buildings and Grade II Registered Historic Parks and Gardens. Conservation Areas.
Low	Archaeological sites and structures, and other components of the historic environment that contribute to the local landscape. Locally designated assets.

Magnitude

12.106 The magnitude of change to a cultural heritage asset or landscape is considered in terms of its vulnerability, its current condition and the nature of the impact upon it. With respect to sub-surface archaeology, there may be a degree of uncertainty of the magnitude of change, and where this is the case it is noted. Magnitude is assessed as high, medium, low or negligible/none and the criteria used in this report are set out in Table 12-5, below.

Table 12-5
Criteria for Assessing Magnitude of Change

Magnitude of Change	Description of Change
High	Complete destruction of a well-preserved archaeological site, structure or element of the cultural heritage landscape Change to the setting of a cultural heritage feature such that our ability to understand the resource and its historical context is permanently and substantially changed
Medium	Partial destruction of a well-preserved archaeological site, structure or element of the cultural heritage landscape Change to the setting of a cultural heritage feature such that our ability to understand the resource and its historical context is permanently changed, but not to the extent of removing its whole context
Low	Destruction of an archaeological site or other cultural heritage feature already in degraded condition Change to the setting of a cultural heritage feature such that our ability to understand the resource and its historical context is slightly or temporarily changed
Negligible/None	No physical effect upon an archaeological site or other feature of the cultural heritage landscape No discernible effect upon the setting of a cultural heritage feature, or our ability to understand the resource and its historical context

ASSESSING SIGNIFICANCE

12.107 The four criteria are considered together to reach a conclusion upon the significance of an effect. This does not take into account any measures that are proposed to mitigate the effect, as set out in paras 12.110-12.117. In

accordance with the EIA Regulations these are quantified as significant, not significant or neutral (i.e. no change to the existing situation). In some cases it may not be possible to quantify the significance of an effect, for example due to a gap in information, and this is noted.

12.108 Table 12-6 presents a matrix of the inter-relationship of sensitivity with magnitude.

Table 12-6
Inter-relationship of sensitivity with magnitude

Sensitivity	Magnitude → High	Medium	Low	Negligible/None
High	**Significant**	Not significant	Not significant	Neutral
Medium	**Significant**	Not significant	Not significant	Neutral
Low	Not significant	Not significant	Not significant	Neutral

EVALUATION OF THE SIGNIFICANCE OF PREDICTED EFFECTS

12.109 The results of the assessment are drawn together in **Table 12-7**, below, to reach an overall assessment of significance.

Table 12-7
Effects and Evaluation of Significance

	Type of Effect	Probability of Effect Occurring	Sensitivity	Magnitude of Effect	Significance	Rationale
Direct effects upon statutorily designated assets of the historic environment	Neutral	Certain	High	None	Neutral	There are designated heritage assets within the application site
Effects upon buried archaeology within PEA	Negative Permanent	Certain	Low	Low	Not significant	Although the HHER would indicate that the application site lies within an area of some archaeological potential, there is clear evidence of significant disturbance through the construction and demolition of the airfield, and subsequent use as a film set. Even where the ground is undisturbed, the geophysical survey and Phase 1 trenching found scant archaeological remains and none that would appear to pre-date the post-medieval period. No artefacts of earlier were found. A scheme of precautionary mitigation involving monitoring by archaeologists, followed if necessary by excavation, recording, analysis and publication, would be implemented (see para 12.11 -12.17*).
Indirect effects upon Popefield Farm: Operational Phase	Negative	Certain	Medium	Medium	Not significant	Using Historic England guidance, an assessment has concluded that the effect upon the setting of Popefield Farm would be 'minor adverse' during the operational phase due to visibility of, in particular, the construction of peripheral bunding. The most sensitive view, looking to the front of the house, would not be affected, but there would be clear views from the rear elevation, although these would mainly be oblique.
Indirect effects upon Popefield Farm: Post-restoration	Positive	Certain	Medium	Medium	Not significant	It is proposed to restore the application site to a beneficial after-use that includes reinstating the 1888 historic field pattern, which existed on the application site prior to the aerodrome and other interventions, to enhance the broader landscape setting of the Popefield Farm listed building complex. Using Historic England guidance, an assessment has concluded that the effect upon the setting of Popefield Farm after restoration would be 'minor beneficial'.
Indirect effects upon other designated assets	Neutral	Certain	High Medium	Negligible	Neutral	A combination of distance, topography and intervening vegetation would prevent effects of any magnitude upon other Listed Buildings or designated assets within 1km of the application site.

MITIGATION

Designated Heritage Assets

12.110 No additional mitigation is considered necessary in connection with the effects upon offsite designated heritage assets.

Archaeology

12.111 Although to date there is no evidence of archaeology pre-dating the post-medieval period on the application site, it is recognised that there remains a potential for it to be present, in particular in areas not disturbed by the airfield and film making.

12.112 A tiered watching brief during soil stripping would be appropriate mitigation, with the frequency and intensity adjusted to reflect ongoing results. This could be as set out in **Table 12-8**.

Table 12-8
Scope of Tiered Watching Brief

Tier 1	**Low-level monitoring** would involve one archaeologist observing soil stripping within designated areas of the application site. These would be areas that retain potential through lack of modern disturbance. This would be an appropriate approach where isolated archaeological sites are being occasionally exposed. If archaeology is apparent s/he can intervene, and request a change of machining methodology to avoid archaeology until it can be dealt with or adopt a Tier 2 approach, below. If no archaeology is showing up and with the agreement of Herts CC, the watching brief would become more intermittent.
Tier 2	**Continuous monitoring** would involve two archaeologists per machine - one watching, one cleaning and marking. This would be an appropriate approach where archaeological features are being regularly exposed. When/if there is more archaeology than two archaeologists can deal with, a team would be brought in to excavate (Tier 3, below).
Tier 3	**Set piece archaeological excavation** of areas containing a density of features using a team of archaeologists.

Outline of Watching Brief and Excavation Procedure

12.113 An archaeological contractor would be appointed to carry out the fieldwork with an experienced and appropriately qualified supervisor in charge of day-to-day site-based work.

12.114 Where required within areas of potential archaeological interest, soils would be stripped using a backacting 360° machine to a level agreed with the monitoring archaeologist. No tracking or movement of plant may take place on the exposed surface until it has been signed-off by the County Archaeologist, or a delegated archaeologist. Machinery may need to be halted or diverted to allow archaeologists safe access to examine the stripped surface.

12.115 Any archaeological finds within the topsoil would be collected and bagged by area; all finds from the exposed surface would be individually bagged and located to their findspot. Exposed surfaces would then be cleaned by hand tools as necessary in order to clarify located features and deposits.

12.116 Excavation and recording of archaeological features and deposits would then take place either within the remit of the watching brief if not extensive or as part of a formal archaeological excavation. Established excavation and recording methodology would be used.

12.117 Details of methodologies would be formalised in a Written Scheme of Investigation, agreed with Herts CC, prior to development commencing.

RESIDUAL IMPACTS

12.118 With the implementation of the proposed mitigation strategy in respect of archaeology and the historic landscape-led restoration scheme, there would be no adverse residual impacts.

CUMULATIVE EFFECTS

12.119 Cumulative assessment is required under the EU Directive on EIA. Its purpose is to identify impacts that are the result of introducing the development into the setting of cultural heritage assets in combination with other existing and proposed developments. It may also include the combined effects upon the archaeological resource. The combined impact may not simply be the sum of the impacts of individual developments; it may be more, or less.

12.120 There are considered to be no cumulative effects of the proposed scheme upon cultural heritage.

CONCLUSIONS

Direct Effects and Mitigation

Archaeological potential and effects

12.121 Although the Hertfordshire Historic Environment Record would indicate that the application site lies within an area of some archaeological potential, there is clear evidence of significant disturbance through the construction and demolition of Hatfield Aerodrome, and subsequent use as a film set for Saving Private Ryan and Band of Brothers.

12.122 Even where the ground is undisturbed, geophysical survey and Phase 1 trenching found scant archaeological remains and none that would appear to pre-date the post-medieval period. No artefacts of earlier date were found.

12.123 The nature of mineral extraction however results in the total loss of the archaeological resource wherever extraction takes place, and the potential loss or damage in other areas associated with infrastructure and landscaping.

Designated Heritage Assets

12.124 There would be no adverse direct effects upon designated assets such as listed buildings or scheduled monuments.

12.125 The direct effects upon designated heritage assets is therefore neutral.

Mitigation

12.126 In accordance with planning policy, a precautionary approach should be taken to the potential loss of the archaeological resource. A tiered watching brief within areas undisturbed by modern activities, accompanied by excavation and recording, is proposed. Such mitigation could be carried out in line with the quarry phasing.

12.127 Should archaeological features be identified these would be recorded and excavated, appropriate to their significance, with subsequent analysis and publication of the results. This would ensure recovery of archaeological information within the application site.

12.128 The scope of work would be submitted to Hertfordshire County Council before development commences in the form of a Written Scheme of Investigation and would be subject to a planning condition requiring its implementation.

12.129 The effects upon archaeology would be negative. However, taking into account the proposed mitigation measures and lack of archaeological evidence to date, it is considered that the effect is not significant.

Indirect Effects and Mitigation

Designated assets in the vicinity of the application site

12.130 Examination of a study area of 1km from the application site was undertaken to assess the potential effects of the proposed development upon the setting of designated heritage assets.

12.131 Thirty listed structures lie within 1km of the application site boundary, but due to intervening vegetation and development only the listed building complex at Popefield Farm could experience an adverse effect of any magnitude.

12.132 An assessment of the predicted effects upon Popefield Farm both during operation and after restoration was carried out using Historic England guidance.

12.133 This concluded that there would be a minor adverse effect upon views of and from Popefield Farm during the operational phase. After restoration, that would include hedge planting to recreate the 1888 historic field pattern with the aim of reinstating the broader landscape setting of Popefield Farm, there would a minor beneficial effect.

12.134 Taking into account the proposed mitigation measures, it is considered that the effect upon Popefield Farm is not significant and upon other offsite designated heritage assets the effect is neutral.

Mitigation of indirect effects

12.135 No additional mitigation is considered necessary in connection with the effects upon offsite designated heritage assets.

Residual Impacts

12.136 With the implementation of the proposed mitigation strategy, in respect of archaeology and the historic landscape-led restoration scheme, there would be no adverse residual impacts.

Cumulative Effects

12.137 There are considered to be no cumulative effects of the proposed scheme upon cultural heritage.

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INTRODUCTION

13.1 Proposals for the extraction of minerals, along with associated operations (such as processing and transportation) of minerals have the potential to impact upon the health and well-being of local communities. Through good design and suitable mitigation, the impacts can be ameliorated such that any effects on health or well-being are within acceptable limits.

13.2 Particular issues that can affect health and wellbeing include *inter alia* noise, emissions to air (such as dust or fine particulate matter); emissions to water; and changes to the landscape. Such matters have been considered in other chapters of this ES.

13.3 This chapter of the ES therefore provides an assessment of the potential health impacts arising through the proposed development. It is supported by a Health Impact Assessment (HIA), which is provided in **Appendix 13/1**.

LEGAL BACKGROUND

13.4 The NPPF supports the role of planning in creating healthy, inclusive communities by supporting local strategies to improve health, social and cultural wellbeing for all. Section 8 relates to the promotion of healthy and safe communities. Paragraphs 92 and 93 refer to planning decisions, as follows:

91 "*Planning policies and decisions should aim to achieve healthy, inclusive and safe places*" which, amongst other things, "*enable and support healthy lifestyles, especially where this would address identified local health and well-being needs*" – for example "*through the provision of safe and accessible green infrastructure, sports facilities, local shops, access to healthier food, allotments and layouts that encourage walking and cycling*".

13.5 Paragraph 92 states that "*To provide the social, recreational and cultural facilities and services the community needs, planning policies and decisions should…*

take into account and support the delivery of local strategies to improve health, social and cultural well-being for all sections of the community".

EIA Regulations

13.6 It is a requirement of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) that the EIA process must (amongst other matters) "*identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on the following factors—*

(a) population and human health".

13.7 Human health, along with other matters such as effects on biodiversity, land, soil, water, air and climate, material assets, cultural heritage and the landscape, is therefore at the heart of Environmental Impact Assessment.

13.8 The process of EIA requires the consideration of effects across a wide range of potential impacts. Health effects on the population are assessed with regard to all relevant potential impacts, including air quality, noise, traffic and as such have been considered within other chapters of this ES.

13.9 The aim of EIA is to protect the environment, including the population, by ensuring that a local planning authority when deciding whether to grant planning permission for a project does so in the full knowledge of the likely significant effects, and takes this into account in the decision-making process. It is therefore the primary mechanism for supporting the decision-making process for development proposals that are likely to result in significant environmental effects. Consequently, this chapter, and the appended Health Impact Assessment, draws on the findings of the EIA and seeks to avoid duplication of assessment, instead providing signposting, where appropriate, to detailed assessment of health effects reported in the Environmental Statement.

Planning Practice Guidance (PPG)

13.10 Planning Practice Guidance is a web-based resource and that is updated as necessary. It advises that a health impact assessment may be a useful tool to use where there are expected to be significant impacts.

13.11 The range of issues to be considered in decision-making in respect of health and health infrastructure include:

- "*opportunities for healthy lifestyles have been considered (e.g., planning for an environment that supports people of all ages in making healthy choices, helps to promote active travel and physical activity, and promotes access to healthier food, high quality open spaces, green infrastructure and opportunities for play, sport and recreation);*
- *potential pollution and other environmental hazards, which might lead to an adverse impact on human health, are accounted for in the consideration of new development proposals; and*
- *access to the whole community by all sections of the community, whether able-bodied or disabled, has been promoted*".

Definition of Health

13.12 The World Health Organisation (WHO) defines health as not only the absence of disease or infirmity, but also as 'a state of complete physical, mental and social wellbeing.' It emphasises that all people have right to the highest attainable standard of health and wellbeing, stating that health is 'one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition.' It is now accepted that an individual or community's health is determined not only by the availability and quality of healthcare services, but that a range of economic, social, psychological and environmental influences play an equally important role.

METHODOLOGY

Scope of HIA

13.13 The consultation exercise described above helped define the scope of the potential environmental impacts including impacts on human health that would be addressed within the EIA, and the outcome of these assessments are reported in the ES accompanying the planning application.

13.14 In scoping the HIA, given the extent of matters addressed in the EIA, it is therefore deemed appropriate that this HIA report should signpost detailed reports provided within the ES and other planning application documents rather than duplicate this work. However, this HIA provides a comprehensive overview of health and wellbeing impacts associated with the proposed development that draws together the available information into one place, thereby supporting better understanding of the health and wellbeing effects of the proposed development (both beneficial and adverse). The HIA also seeks to identify whether the health and wellbeing of any particular population groups might be disproportionately disadvantaged or benefitted by the proposed development.

Methodology

13.15 Whilst there is no statutory regional or national guidance for undertaking HIA, Hertfordshire County Council's Position Statement (see section 3.2.6 of the HIA) advises that the guidance provided by the Welsh Health Impacts Assessment Support Unit (WHIASU) should be used to inform HIA.

13.16 The WHIASU approach is further supplemented by the Applicant's and SLR's experience of other similar projects throughout the UK.

WHIASU Toolkit

13.17 Produced by WHIASU, this toolkit provides the definitions and frameworks for producing an HIA and is the Hertfordshire County Council's recommended format for screening and scoping HIA. The Toolkit sets out three types of HIAs available:

- *"Prospective HIA – at the start of the development of a project, proposal or plan.*
- *Concurrent HIA – runs alongside the implementation of the project (or policy)*
- *Retrospective HIA – assesses the effect of an existing project or policy and can be used as an evaluation tool. Retrospective assessments can also be made of unexpected events, as a way of learning lessons for future similar events".*

13.18 Within these three types, HIAs can be further narrowed down to three sub-categories:

- *"A Desktop HIA exercise can take hours or a day and can encompass a small number of participants around a table using existing knowledge and evidence to assess a proposal, policy or plan.*
- *A Rapid HIA can take days or weeks and usually includes the establishment of a small steering group and often uses the approach of a participatory stakeholder workshop – it typically involves a brief investigation of health impacts, including a short literature review of*

quantitative and qualitative evidence and the gathering of knowledge and further evidence from a number of local stakeholders.

- *Comprehensive HIAs are more in-depth and can take months to complete. They may be time intensive, financially costly, require extensive literature searches and the collection of primary data. This type of HIA is more suited to more complex proposals"*.

13.19 WHIASU acknowledge that some HIAs will cover one or more of these subcategories. It further details the five main steps to be undertaken when conducting an HIA:

- *"Screening*
- *Scoping*
- *Appraisal of Evidence/Assessment*
- *Reporting and Recommendations*
- *Monitoring and Evaluation"*

13.20 Finally, the Toolkit offers a Health and Wellbeing Checklist and a Vulnerable/Disadvantaged Groups Checklist – these act as references for the potential impacts on health and wellbeing that a development may pose and the potential group receptors that the Toolkit highlights as being vulnerable e.g., children, religious groups, unemployed.

BASELINE CONDITIONS

13.21 Section 5 in the HIA sets out the baseline conditions for the area within which the application site is located. It provides information on the current conditions in relation to health and wellbeing for people who live within the local area, including age, health issues, and qualifications. It also provides information on the community, through data on transport, access to recreation facilities and open space, induces of deprivation, and crime. It is necessary to understand the baseline conditions in order to assess how the proposed development would impact on health and wellbeing of the local community, including people working at the proposed quarry in the future.

13.22 As the proposed development spans across two Local Authority jurisdictions, the geographical scope of the baseline review is based primarily on these local authority areas, Welwyn Hatfield Borough Council and St Albans City and District Council. This area is identified as the Local Area of Influence (LAI), within which most effects on the local community would be experienced, although adjustment is made where necessary depending on the type of impacts and receptors.

13.23 For comparative purposes, data is also provided for Hertfordshire as a whole and nationally (Great Britain and England), where available.

ASSESSMENT OF HEALTH IMPACTS

13.24 Based on the scoping exercise summarised in Section 4.0 of the HIA, and the baseline review undertaken in Section 5.0 of the HIA, an assessment and summary of the relevant potential health and wellbeing effects is included in Table 6-1 in Section 6 of the HIA. Much of the information is based on the findings of the comprehensive ES which accompanies the planning application. The table therefore provides a summary of the assessment for each health and wellbeing determinant

and a cross reference is provided where appropriate to the relevant ES chapter, technical appendices and other planning application documents. Table 6-1 is based on the Health and Well-being Determinants Checklist set out in Appendix 1 of the WHIASU Toolkit.

13.25 Where applicable, the assessment identifies if there is a disproportionate effect on vulnerable or disadvantaged groups in the local communities, thereby impacting health inequalities. A guide to vulnerable or disadvantaged groups is provided in Appendix 2 to the WHIASU Toolkit, and comprises the following:

Age related groups
- Children and young people
- Older people

Income related groups
- People on low income
- Economically inactive
- Unemployed/workless
- People who are unable to work due to ill health

Groups who suffer discrimination or other social disadvantage
- People with physical or learning disabilities/difficulties
- Refugee groups
- People seeking asylum
- Travellers
- Single parent families
- Lesbian and gay and transgender people
- Black and minority ethnic groups
- Religious groups

Geographical groups
- People living in areas known to exhibit poor economic and/or health indicators
- People living in isolated/over-populated areas
- People unable to access services and facilities.

MONITORING AND EVALUATION

13.26 The assessment of health impacts undertaken in section 6.0 has confirmed that no significant adverse effects are expected as a result of the proposed development once appropriate mitigation has been applied.

13.27 There is potential for beneficial effects that are also not significant at the level of the population as a whole, although specific population groups may be disproportionately benefitted, especially if the recommended measures regarding support for local workers including skills training and support for active and sustainable travel are put in place.

13.28 The ES proposes the implementation of continued monitoring and reporting with regard to the following matters:

- Air Quality – regular occupational exposure monitoring will be undertaken and any exceedances reported to senior management and a remediation plan put in place.
- Water Quality – A Ground Water Management Plan as detailed in Chapter 6 of the ES will be agreed with the EA and implemented throughout the operational life of the proposed development.

13.29 In addition to the environmental monitoring measures proposed in the ES, it is recommended that the Applicant should prepare an Employment and Skills Plan to promote the following:

- Employment - measures to support employment of local people, including support for people without access to a private transport
- Equality – positive support for potential employees and existing employees with regard to access within the site and flexibility of working arrangements
- Procurement - measures to encourage local firms to supply goods and services
- Training – induction and continuous career training to enhance skills with regard to safety, health and environment
- Monitoring and Evaluation – annual report to senior management and commitment for areas of low performance to be reviewed and positive actions put in place.

CONCLUSIONS

13.30 A Health Impact Assessment (HIA) has been undertaken following the standard Hertfordshire County Council preferred format based on the WHIASU Toolkit. The HIA draws heavily on the extensive assessment work undertaken for the Environmental Impact Assessment which is reported in the Environmental Statement (ES) accompanies the planning application, and signposting to other reports is provided where appropriate.

13.31 The socio-economic and health profile for the surrounding area has been summarised. This generally shows that whilst Hertfordshire in general is relatively buoyant, there are certain geographical areas in the vicinity of the site that are less prosperous than the county as a whole.

13.32 An assessment of health effects is set out in section 6.0 of the HIA and cross-references are provided where appropriate to the detailed studies reported in the ES. Where relevant, the assessment identifies any population groups that may be expected to be disproportionately affected by the proposed development, whether negatively or positively.

13.33 During consultation with stakeholders and the local community, concerns have been raised regarding two environmental issues that have the potential for serious health consequences:

- air quality, including the potential effects of silica from air-borne particulate matter. SLR has undertaken detailed emissions modelling of such matters which is reported in full in the ES. The results show that emissions of particulate matter from the operational phases of the quarry would not give rise to significant adverse effects at surrounding receptors. The assessment (based on the worst case assumption that all PM10 particulate emissions are silica) assessed emissions against the US standard of 3ug/m3 as an annual mean to provide a suitable Air Quality Assessment Level (AQAL) as there is no standard for silica in the UK. The results showed that no sensitive receptor including nearby residential properties exceeded 10% of the AQAL.

- water quality, including the potential for historical bromate pollution to be drawn into the quarry when it is being worked sub-watertable. As there will be no pumping of groundwater from the Lower Mineral Horizon (LMH) the potential for drawing impacted groundwater into the site is considered to be low. However, wet digging of mineral from beneath the LMH could create short lived local changes in groundwater head which could conceivably induce a local gradient towards the site and suitable mitigation measures are proposed including the development of a groundwater and water management plan to be agreed with the Environment Agency and Affinity Water prior to works commencing.

13.34 As a result of the proposed mitigation, no significant effects are predicted.

13.35 The assessment concludes that the proposed development is not predicted to give rise to any significant adverse health-related impacts, and that there will be some benefits particularly to the economy during the site operation and to biodiversity and public access in the longer term. The potential benefits are likely to benefit certain groups within local communities through the provision of skills training and career development. An Employment and Skills Plan is recommended to help reduce potential inequalities in access to work and to ensure that local people, particularly those that may be disadvantaged in terms of employment opportunities, gain maximum benefit from the proposed development.

13.36 In summary, the proposed development is not expected to have a significant adverse impact on health for those living near the site, working on the site or using nearby areas for recreational purposes. Where required, the proposed development provides for appropriate mitigation measures to minimise adverse effects and enhance beneficial effects.

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INTRODUCTION

14.1 Chapters 6 to 13 of this ES have set out the findings of the EIA for a range of environmental topics, and in particular, ascertain the potential significance of identified impacts. The topics considered as part of the EIA are set out in Appendix 1/1 to Chapter 1 of this Volume. It is possible for a number of the environmental topics to impact upon nearby receptors; whilst individually, the impacts may be within accepted limits, collectively the impacts may be more significant. These are referred to as "*inter-relationships between impacts*". At the same time, potential impacts associated with the proposed development may be acceptable in isolation, but when considered in the context of other developments in the immediate vicinity, may become more significant. These are referred to as "*Cumulative Impacts*".

14.2 This chapter of the ES therefore provides an assessment of the potential cumulative impacts arising through the proposed development. It also summarises the main interactions between the environmental topics that form part of the EIA.

LEGAL BACKGROUND

EIA Regulations

14.3 been set out. Paragraph 5(e) to Schedule 4 of the EIA Regulations provides that an ES may contain a description of the likely significant effects of the development on the environment resulting from "*the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources*".

14.4 This is not a mandatory requirement of an ES (being the items listed in Regulation 5(a) to (e)), but one which is required where "*relevant to the specific characteristics of the development and to the environmental features likely to be affected*".

Planning Practice Guidance

14.5 Paragraph 017 (Reference ID: 27-017-20140306) to the web based PPG comments that:

> *"Some parts of a mineral planning authority area may have been subjected to successive mineral development (such as aggregate extraction or surface coal mining) over a number of years. Mineral planning authorities should include appropriate policies in their minerals local plan, where appropriate, to ensure that the cumulative impact of a proposed mineral development on the community and the environment will be acceptable. The cumulative impact of mineral development is also capable of being a material consideration when determining individual planning applications."*

CUMULATIVE IMPACTS

14.6 There is a broad range of opinion on the definition of cumulative impacts[1]. The widely accepted definition is that provided by the United States Council on Environmental Quality in 1978:

> *'the impacts on the environment which result from incremental impacts of the action when added to other past, present and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time".*

14.7 IEMA goes on to comment that cumulative impacts may occur:

Physical-chemical transport	A physical or chemical emission is transported away from a proposed project where it then interacts with another pollutant (e.g., air emissions, waste water effluent, sediment). Several entirely separate developments can therefore have a cumulative impact at a location some distance away from the project location
Nibbling loss	Occurring as a result of the gradual disturbance and loss of land and habitat (e.g., clearing of land for new housing and roads.)
Spatial and temporal crowding	Cumulative effects can occur when too much is happening within too small an area and in too brief a period of time. Spatial crowding results in an overlap of effects (e.g., noise from a road adjacent to an industrial site, confluence of stack emission plumes). Temporal crowding may occur if effects from different actions overlap or occur before the receptor has had time to recover.
Growth-inducing potential	A project can induce further projects to occur. (e.g., bypass for a town creating new development opportunities)
Combined effects	These occur when different types of effects all affect the same receptor. Assessed individually they may be considered to be insignificant, but when combined result in a significant effect on the receptor (e.g. perceived change in the quality of life of a household or community)

14.8 Cumulative impacts have also been described[2] as being those impacts caused by the sum of the projects impacts on the environment component, and/or the projects impacts when added to those of other past, present or future projects. Cumulative impacts can be:

- additive, aggregative or "*nibbling*", namely the simple sum of all of the impacts;

[1] Page 11/4. Guidelines for Environmental Impact Assessment. IEMA
[2] Methods of Environmental Impact Assessment. P Morris and R Therivel. UCL Press 2000

- synergistic, where impacts interact to produce an impact greater than the sum of the individual impact; and
- neutralising or antagonistic impact, where the impacts counteract each other, reducing the overall impact.

14.9 Cumulative impacts may therefore result from a number of situations:

- the interaction or proximity of two or more current quarries (not necessarily for the same type of mineral) or developments of a similar nature;
- the continuation of a particular working over time through successive extensions;
- the interaction or accumulation of different impacts at one site, affecting a range of sensitive receptors; and
- a combination of the above scenarios.

LAND USE

Other Mineral Sites

14.10 Hatfield Quarry, operated by CEMEX, lies to the north of the application site. The processing plant is located off Oaklands Lane, approximately 200m to the west of the application site, whilst the extraction area (based on Google Earth) is located adjacent to Symondshyde Great Wood, around 1000m to the north of the application site. There are no other mineral operations in the immediate vicinity of the application site.

14.11 Permission for Hatfield Quarry was due to expire in October 2020, however, planning permissions have been granted for an extension which allows operations up to c. 2023. In addition, a planning application is being considered for 3.5Mt; this would increase the life of Hatfield Quarry by around 8 years. Considering the potential lead in time should planning permission be granted for Hatfield Aerodrome, the potential overlap would be around 6 years.

14.12 Notwithstanding this, consideration has been given throughout the EIA to the potential for cumulative impacts to arise and no significant effects would arise.

Other Developments with Similar Characteristics

14.13 Other types of development that would potentially have similar characteristics to the quarrying operations would be the construction phase of large housing developments, retail of industrial parks, especially in the context of noise, air quality (dust), movement of plant and machinery and disturbance of the ground (removal of vegetation and soils for example). Planning permission has been submitted for a mixed use (mainly housing) development on the remainder of the Hatfield Aerodrome site. Given the separation distances between mineral operations and the mixed use development, the likelihood for cumulative impacts are low, with the likelihood diminishing as the workings progress away from the first two phases. With the employment of suitable mitigation, cumulative impacts could be suitably ameliorated to acceptable limits.

ENVIRONMENTAL QUALITY

Water

14.14 Chapter 6 of this volume presents the findings of the assessment on the water environment, examining aspects such as the quantity and quality of surface and groundwater resources. Through the design of the site, and following recognised best practices, no significant adverse effect is predicted. Whilst groundwater would be pumped from the workings in the Upper Mineral Horizon, it would be recharged to the aquifer. Allied to this, clay would be used to 'seal' the edges of the workings in the Upper Mineral Horizon.

14.15 Consideration of the potential cumulative effects with the adjacent CEMEX operations has been considered as part of the Groundwater Management Plan, and also noted in Appendix 6/11 (addressing questions posed by Affinity Water in the Scoping Opinion). Suitable mitigation has been designed into the scheme to ameliorate any significant adverse effects.

14.16 Accordingly, as no significant adverse effect is predicted, no significant cumulative impacts are predicted with other developments.

Transport

14.17 Consideration has been given to the predicted increase in traffic as a result of the development. The assessment has used data from traffic counts undertaken in 2015 along with published data for 2019; this baseline data will include HGV traffic from Hatfield Quarry, and thus the assessment is cumulative. Whilst other developments, mainly housing, are being promoted into emerging Development Plans the precise details are not currently known and thus it is not possible to assess any likely cumulative impacts. Notwithstanding this, traffic associated with the quarry would be reasonably evenly distributed throughout the day; whereas housing developments tend to have peaks consistent with morning and afternoon 'rush hours'. Allied to this, traffic using visiting the quarry would use the primary road network, such as the A1057.

14.18 Arlington Business Parks GP Limited submitted an Outline Planning Application (6/2018/2768/OUTLINE) to Welwyn Hatfield Borough Council for a "*…large-scale mixed use development including 1,100 new homes and supporting infrastructure including a primary school, local centre and open space with all matters reserved*". At the time of writing Hertfordshire County Councils' planning portal records the status of the application as 'Under Consideration'.

14.19 The assessment work by Vectos concluded that the significance of the effects of the completed development on the relevant factors - i.e. Severance, Pedestrian Delay, Pedestrian Amenity, Driver Delay, Accidents & Safety, and Public Transport – would be 'Negligible' in all cases save for Severance and Pedestrian Amenity, both of which were expected to suffer only 'Minor Adverse' effects.

14.20 Accordingly, as no significant adverse effect is predicted, no significant cumulative impacts are predicted with other developments.

Landscape and Visual Impact

14.21 Chapter 8 of this volume has considered both cumulative landscape and visual effects. the assessment focuses on the cumulative landscape effects of the proposed development in conjunction with the operational Hatfield Quarry to the north and proposed major Hatfield Garden Village housing development to the north east; all three of these sites lie within "Area 31 De Havilland Plain".

14.22 Application reference 5/1240-14 describes how "*Hatfield Quarry (the Quarry) has been an active sand and gravel and waste site since the 1940/50's based on planning records held by the mineral planning authority, the Quarry having been used as a disposal point for household waste at various times and locations…The current sand and gravel workings take place approximately one to two kilometres north west of Cut Field with aggregates processing, storage and distribution taking place approximately one kilometre to the south west*".

14.23 An application has been submitted (October 2018) for the working a new extension to Hatfield Quarry. The application area is 117ha of predominately agricultural land adjoining Coopers Green Lane, on the periphery of the Hatfield Garden Village development on the north west of Hatfield Town Centre. The site would be linked to the existing CEMEX Hatfield Quarry by a conveyor link approximately 4km in length, utilising part of the existing conveyor link that passes to the north of the proposed development.

14.24 The proposed housing development (67.5 ha) is an extensive site along the western edge of Hatfield and effectively links the proposed CEMEX extraction area with the proposed development area resulting in major change along a large proportion of the western edge of Hatfield. These three developments together therefore have the potential to greatly affect the perception of the western edge of Hatfield and nature of the town's boundary.

14.25 The cumulative effect on "Area 31 De Havilland Plain" also has the potential to be great. However, the De Havilland Plain is identified as being in poor condition, with a moderate strength of character and a management objective of 'improve and restore'. There is thus a degree of acceptance to change as opposed to trying to conserve, strengthen or reinforce existing character.

14.26 Because of the conveyor link the two proposed mineral extractions would be perceived as separate areas and not together, although each may be perceived in conjunction with the housing development. Mitigation of the potential level of change is present in the form of the extensive amount of open space included with the housing development (53% of the housing development area). This would create a more permeable landscape with green links from the existing urban edge out to the green belt further west. In a similar way the phased working and restoration of the two mineral developments would reduce the level of disturbance present at any one stage. Ultimately both mineral developments would be fully restored and creating an extended area of habitat and recreational benefits to the north and south of the housing development and enhancing the remaining green belt.

14.27 The presence of "*existing and restored mineral workings*" is already one of the key characteristics of "Area 31 De Havilland Plain". Therefore, the addition of the proposed development, to the ongoing operations at Hatfield Quarry would not give rise to changes in landscape character of such an extent as to have major effects on its key characteristics or transform it into a different character type; it is not considered that the development "*tips the balance*" through its additional effects.

14.28 Consideration has also been given in Chapter 8 to the potential cumulative visual effects of the proposed development with the proposed development at Hatfield Quarry and the major housing development, Hatfield OPA (aka Hatfield Garden Village).

14.29 No occurrence of simultaneous visibility of the two mineral excavations is predicted due to their physical separation and intervening presence of the town of Hatfield. However, the retained plant site and conveyor link at Hatfield Quarry would lead to some limited simultaneous visibility with the proposed development at the following locations:

- users of the public right of way to the north of the application site, near to the Hatfield Quarry conveyor (Viewpoint 1); and
- users of public right of way to the west of the application site, parallel to Oaklands Lane, near to the Hatfield Quarry processing plant site area and perimeter soil storage bund (Viewpoint 8).

14.30 However, in each case the proposed development would be in a different direction to the elements and features of Hatfield Quarry, meaning that walkers along the route would be looking around to experience any potential coalescence.

14.31 Visual interaction with the proposed housing development would also be limited due to the screening vegetation around the edge of the proposed development site. Viewpoint 6 looks north east across the proposed development site and would see the phased extraction and restoration process set against the urban elements of Hatfield Business Park and Hertfordshire University. The proposed housing development would infill between these two existing urban features increasing the extent of the overall urban component of the view. Similar effects would occur in views in the opposite direction from the housing development, intervening vegetation, mounds, and hedgerow planting would reduce visibility at ground level, but upstairs windows are likely to have more extensive views. Such views may include the CEMEX processing plant, thus creating a cumulative effect in conjunction with the proposed development plant site, although such effects would be limited due to the screening provided by Home Covert.

14.32 The other potential cumulative visual effects are of a sequential nature, for example users of the road network or recreational visitors moving along the rights of way. However, this is also considered to be limited and mitigated by the existing urban fringe character of area and roadside vegetation screening.

14.33 Overall, there are no significant cumulative visual effects anticipated because of the proposed development.

Air Quality

14.34 Cumulative consideration has been given to pollutant contributions associated with both road traffic and fugitive dust releases at human receptor locations, where relevant. Effects were found to be not significant.

14.35 Cumulative dust-led impacts from other quarries have the potential to arise where processes overlap at a receptor location. For human health (ambient PM concentrations), a 1km distance threshold is prescribed by IAQM guidance, consistent with national planning policy. Whereas for dust deposition effects (human and ecological), dust impacts from sand and gravel sites are uncommon beyond 250m from the nearest dust generating activities. As established above, no

statutory ecological receptor exists within 250m of the site, therefore no cumulative impacts can arise.

14.36 It is acknowledged that a planning application for an extension of a sand and gravel quarry at Hatfield Quarry off Oaklands Lane (land adjoining Coopers Green Lane) is under consideration – located north east of the application site. A review of the health impact assessment submitted for that application was undertaken.

14.37 Dispersion modelling of proposed fugitive dust sources was undertaken in support the assessment, limited to three extraction sites (located approximately 2km north east from the application site) and supporting (new) infrastructure (e.g. conveyors). The full extent of new sources considered are located 1.3km from the application site. As such, cumulative effects associated with dust disamenity arising from the proposed extraction sites and supporting infrastructure can therefore be scoped out given the separation distances between proposed sources (>500m i.e. 250m + 250m process contribution overlap from sand and gravel sites) and limited likelihood of effects arising.

14.38 The Hatfield Quarry off Oaklands Lane sand and gravel quarry will be served by existing infrastructure (CEMEX Hatfield processing plant and supporting conveyor lines) located north and west of the application site. These sources were not considered as part of the Hatfield Quarry off Oaklands Lane dispersion modelling assessment on the assumption that throughput is to remain unchanged and are sufficiently distant from any new source for cumulative effects to arise. The processing plant is located approximately 200m from the application site. However, despite this all receptors considered are not found to be located within 250m from both sources. As such, cumulative effects associated with existing and proposed operations relative to the CEMEX Hatfield processing plant and supporting conveyor lines can be scoped out.

14.39 As discussed above, the maximum modelled PM_{10} and $PM_{2.5}$ concentrations reported within the accompanying health impact assessment (relating to proposed operations) for all receptors and phases considered has been added to the future year modelled concentrations to address potential cumulative impacts (i.e. 2023 DM and DS). This approach is believed to be conservative on reflection, as assumes the maximum modelled concentration at all receptors for those sources considered is constant across the modelled area, not accounting for dispersion and dilution with distance - contrary to established guidance (IAQM). Furthermore, this approach is considered to be suitably conservative in the absence of PM_{10} and $PM_{2.5}$ modelled contributions from existing sources (CEMEX Hatfield processing plant). Despite this, existing sources (such as the processing plant) are believed to be suitably covered through inclusion within the relevant background concentrations given that throughput is not expected to change.

14.40 In relation to road traffic emissions, traffic flows used for the air quality assessment includes vehicle movements associated with committed developments in the assessment area.

14.41 The air quality assessment, and the results presented are therefore inherently cumulative, where relevant.

14.42 Furthermore, all modelled concentrations/deposition rates are considered to be well-below the respective environmental benchmarks despite the conservative assessment methodology adopted (i.e. use of dust emission factors derived from arid conditions, 2019 road traffic emission factors and background concentrations). Therefore, the likelihood of a cumulative effect or exceedence arising outside of the operational envelope assessed is low.

Noise

14.43 Like transport considered above, the assessment (Chapter 10 of this Volume) uses measured data, which will include the operation of Hatfield Quarry. As such the assessment is cumulative. The assessment found that the potential increase in ambient levels due to worst-case operational noise would be slight at worst at two receptors but generally not significant at the remainder of the nearby noise-sensitive receptors.

14.44 It should be noted that, at Radio Nursery and the proposed new development to the west of the site, the existing measured noise levels were measured away from the working nursery and therefore are considered to be conservative.

Cultural Heritage

14.45 As set out in Chapter 12 of this volume there are considered to be no cumulative effects of the proposed scheme upon cultural heritage.

Ecology

14.46 Whilst the development would result in the loss of habitat, through suitable mitigation, including the restoration of the workings, no cumulative impacts are predicted with other developments.

INTER-RELATIONSHIPS BETWEEN IMPACTS

14.47 As set out above, elements of a development can give rise to inter-related impacts. The approach taken in the EIA has been to assess how a particular type of effect (*e.g*. movement of HGVs) may become a source of impact that results in an effect to a completely different category of receptor. Like cumulative impacts, these inter-relationships have been considered within each of the technical assessments for the environmental topics.

14.48 Examples of inter-relationships are:

- the movement of HGVs within the site can impact upon the noise climate around the site. This is addressed in Chapter 10 of this Volume;
- the movement of HGVs around the site and on the public highway can impact upon air quality. This is addressed in Chapter 9 of this Volume;
- the construction of screening mounds, whilst ameliorating noise impacts, can affect the visual appearance of the site. The potential visual impacts of the development are considered in Chapter 8.

14.49 Finally, interactions between more than one type of impact may be experienced at a particular receptor. As a hypothetical example, a receptor may experience increased levels of noise and deposition, or noise and visual impacts; such impacts may occur simultaneously, sporadically or on separate occasions. There is, however, no physical mutuality between the impacts, other than that both could cause annoyance, whether experienced separately or simultaneously.

14.50 For the proposed quarry, no significant impacts have been identified for any of the environmental topics considered as part of the EIA. Thus, no receptors are likely to experience any significant accumulated impacts from two or more sources.

SAINT ALBAN'S DISTRICT COUNCIL

HATFIELD DISTRICT COUNCIL

LEGEND

APPLICATION SITE BOUNDARY

DISTRICT BOUNDARY

N

0 800m 2000

Metres 1:25,000

built on relationships

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

SITE LOCATION PLAN

HQ 2/1

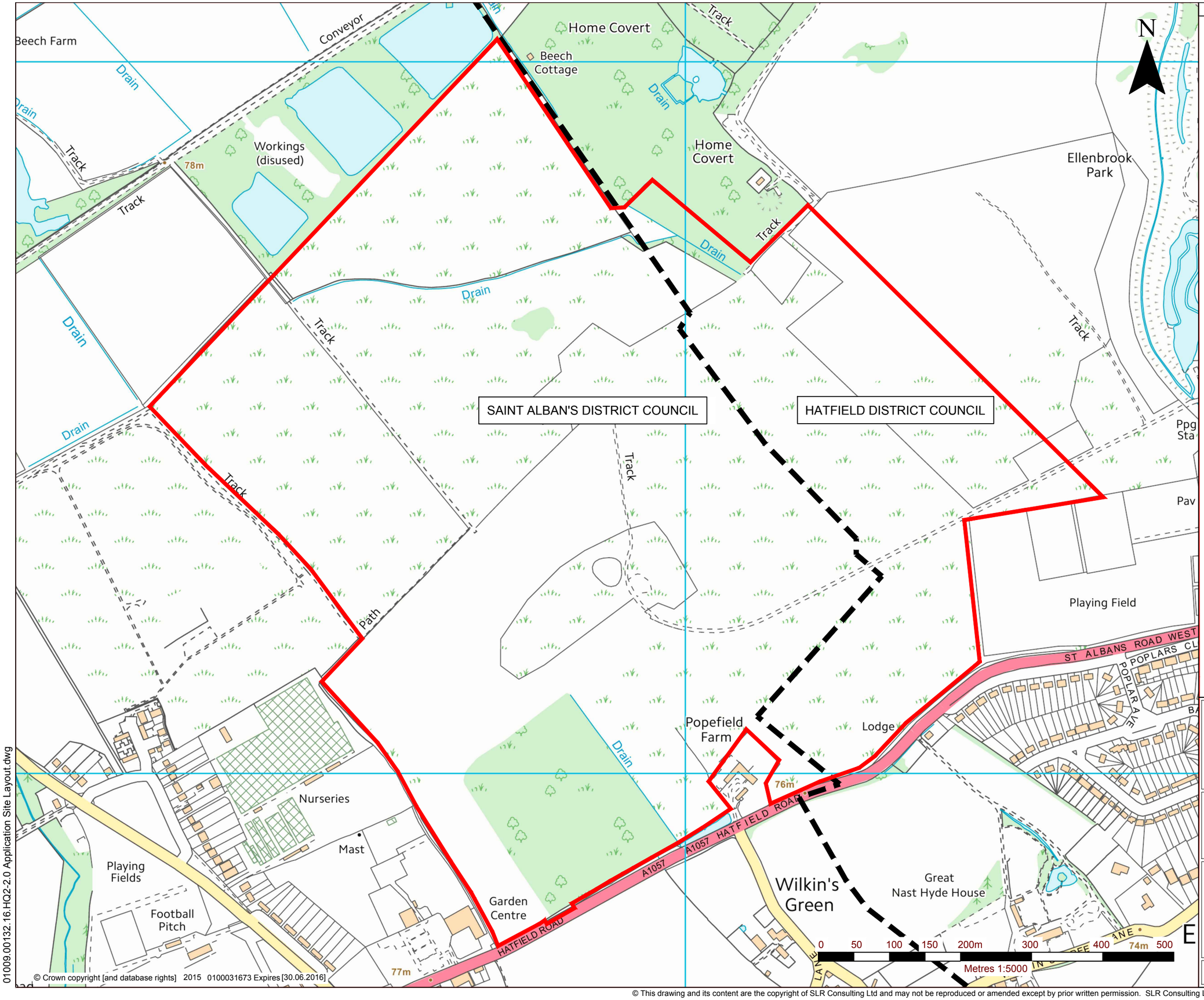
Scale 1:25 000 @ A3

Date NOVEMBER 2015

01009.00132.06.HQ2-1.0 Site Location Plan.dwg

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LEGEND

- APPLICATION SITE BOUNDARY
- DISTRICT BOUNDARY

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01009.00132.16.HQ2-2.0 Application Site Layout.dwg

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

APPLICATION SITE LAYOUT

HQ 2/2

Scale 1:5 000 @ A3

Date NOVEMBER 2015

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N

NOTES

1. DRAWING IS BASED ON BRETT TOPOGRAPHICAL SURVEY RECIEVED NOVEMBER 2014.

LEGEND

APPLICATION SITE BOUNDARY

PHASE BOUNDARY

77.0 TOPOGRAPHIC CONTOURS (mAOD)

0 50 100 150 200m 300 400 500

Metres 1:5000

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

TOPOGRAPHIC SURVEY

HQ 2/3

Scale 1:5 000 @ A3

Date NOVEMBER 2015

01009.00132.16.HQ2-3.0 Topographic Survey.dwg

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NOTES

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LEGEND

- SITE BOUNDARY
- LONDON CLAY FORMATION
- LAMBETH GROUP
- LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

SOLID GEOLOGY

HQ 6/1

Scale: 1:25,000 @ A3

Date: JUNE 2021

01009.00132.18.HQ.6.1.0 Solid Geology

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NOTES

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LEGEND

SITE BOUNDARY

DRIFT GEOLOGY

ALLUVIUM

RIVER TERRACE DEPOSITS

CLAY WITH FLINTS FORMATION

KESGRAVE CATCHMENT SUBGROUP

LOWESTOFT FORMATION

SAND AND GRAVEL OF UNCERTAIN AGE

BEDROCK AT OR NEAR SURFACE

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

DRIFT GEOLOGY

HQ 6/2

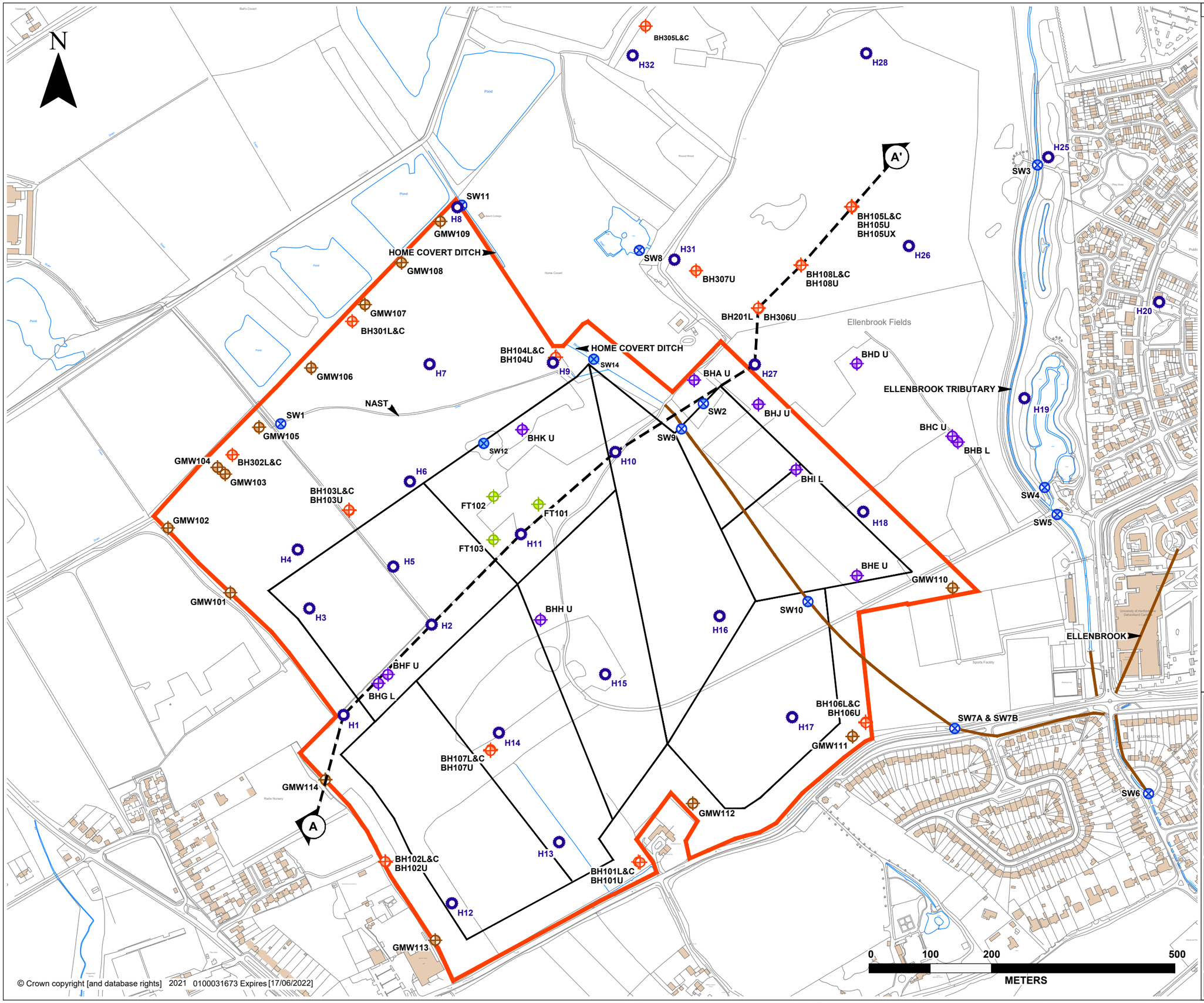
Scale 1:25,000 @ A3

Date JUNE 2021

01009.00132.18.HQ.6.2.0 Drift Geology

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LEGEND

- SITE BOUNDARY
- PHASE BOUNDARY
- CULVERT
- A — CROSS SECTION LOCATION
- BHD — OLD WELLS (NON SLR) U = UPPER, L = LOWER
- H26 — LMR BOREHOLES (1994)

SLR BOREHOLES

- BH105L&C — DUAL MONITORING WELLS (LOWER MINERAL HORIZON AND CHALK)
- BH105U — SHALLOW MONITORING WELL (UPPER MINERAL HORIZON)
- FT101 — FIRE TRAINING AREA MONITORING WELL
- SW2 — SURFACE WATER MONITORING POINT
- GMW112 — GAS AND UPPER MINERAL AQUIFER MONITORING WELLS

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

SITE BOREHOLE LOCATION PLAN AND LINE OF CROSS SECTION

HQ 6/3

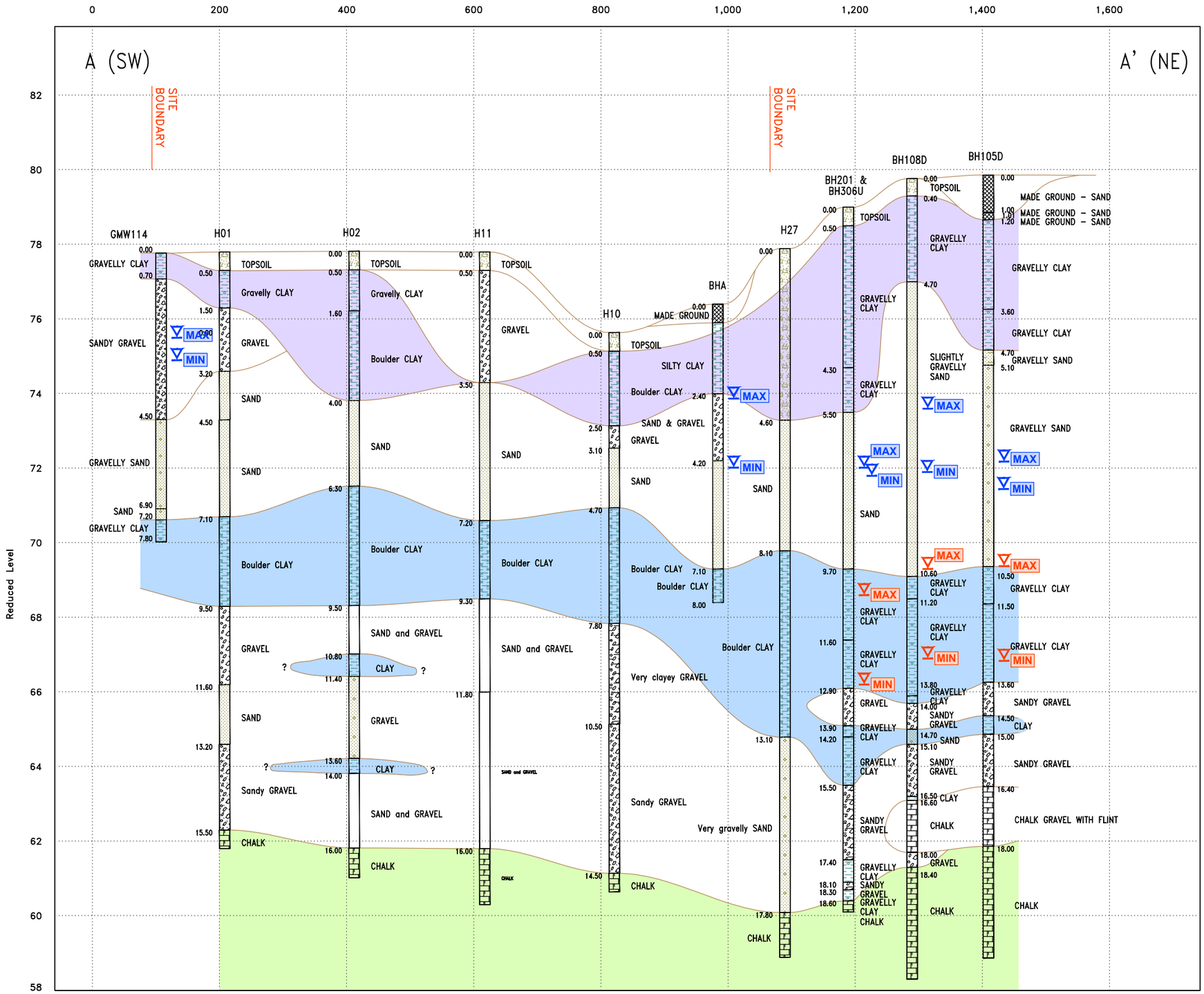
Scale: NTS (A3)

Date: AUGUST 2021

09885.00024.18.HQ6-3.0a_SITE_BH_LOC&X_SEC_LOC.dwg

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NOTES

MAX UPPER MINERAL HORIZON - MAX. GROUNDWATER ELEVATION

MIN UPPER MINERAL HORIZON - MIN. GROUNDWATER ELEVATION

MAX LOWER MINERAL HORIZON / CHALK - MAX. GROUNDWATER ELEVATION

MIN LOWER MINERAL HORIZON / CHALK - MIN. GROUNDWATER ELEVATION

LEGEND

OVERBURDEN

INTERBURDEN

CHALK

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

CROSS SECTION OF SITE GEOLOGY

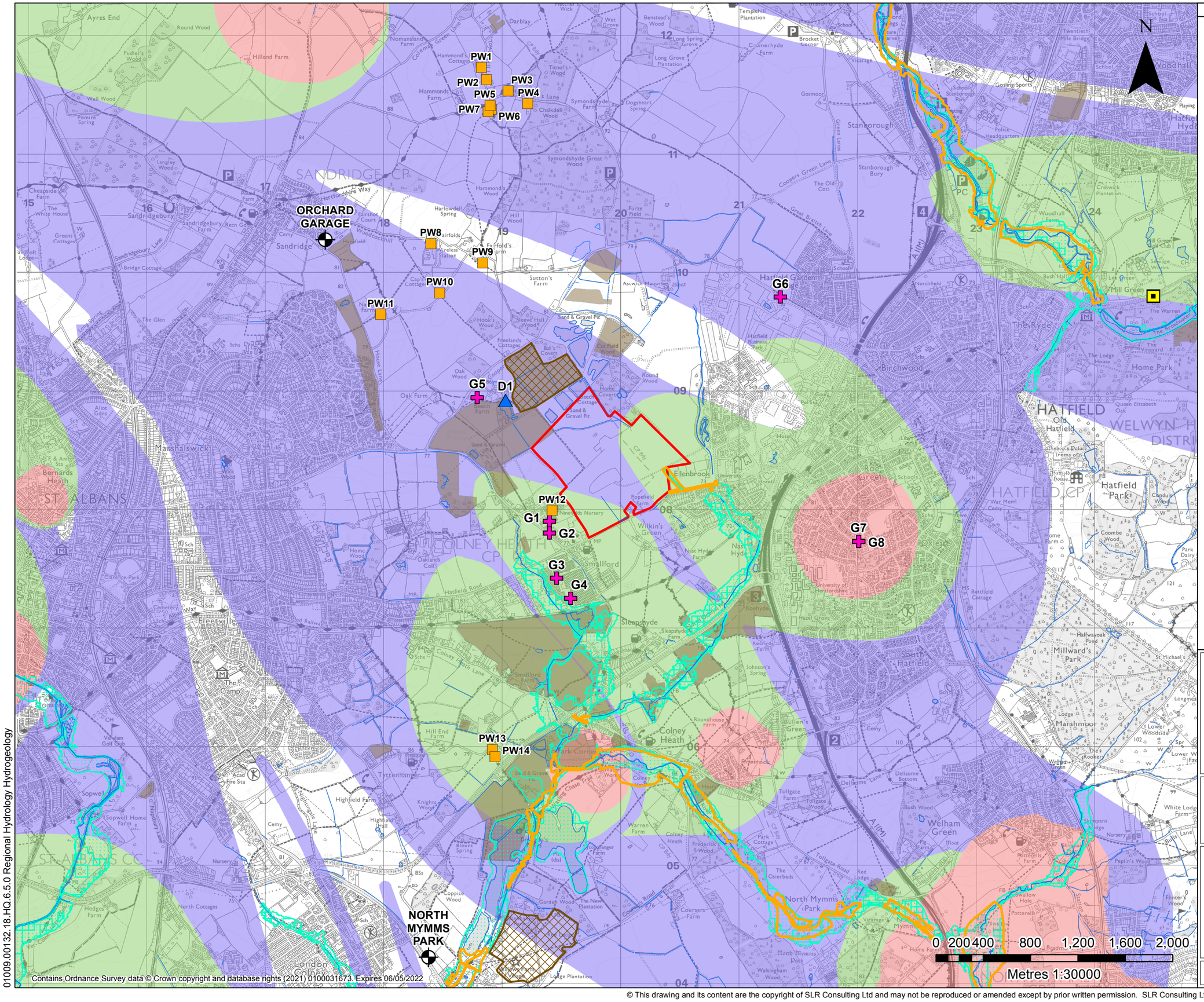
HQ 6/4

Scale: NTS (A3)

Date: JUNE 2021

09885.00024.18.HQ6-4.0_X_SECTION_SITE_GEOLOGY.dwg

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LEGEND

- SITE BOUNDARY
- HISTORIC FLOOD EXTENT
- FLOOD ZONE 2
- LANDFILL SITE
- HISTORIC LANDFILL SITE
- ENVIRONMENT AGENCY MONITORED BOREHOLES
- LICENSED ABSTRACTION WITHIN 2KM RADIUS
- LICENSED DISCHARGE WITHIN 2KM RADIUS
- ENVIRONMENT AGENCY RAINFALL MONITOR
- PRIVATE WATER SUPPLY
- WATERCOURSE

GROUNDWATER SOURCE PROTECTION ZONES

- INNER ZONE (ZONE 1)
- OUTER ZONE (ZONE 2)
- TOTAL CATCHMENT (ZONE 3)

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ENVIRONMENTAL STATEMENT

REGIONAL HYDROLOGY/ HYDROGEOLOGY

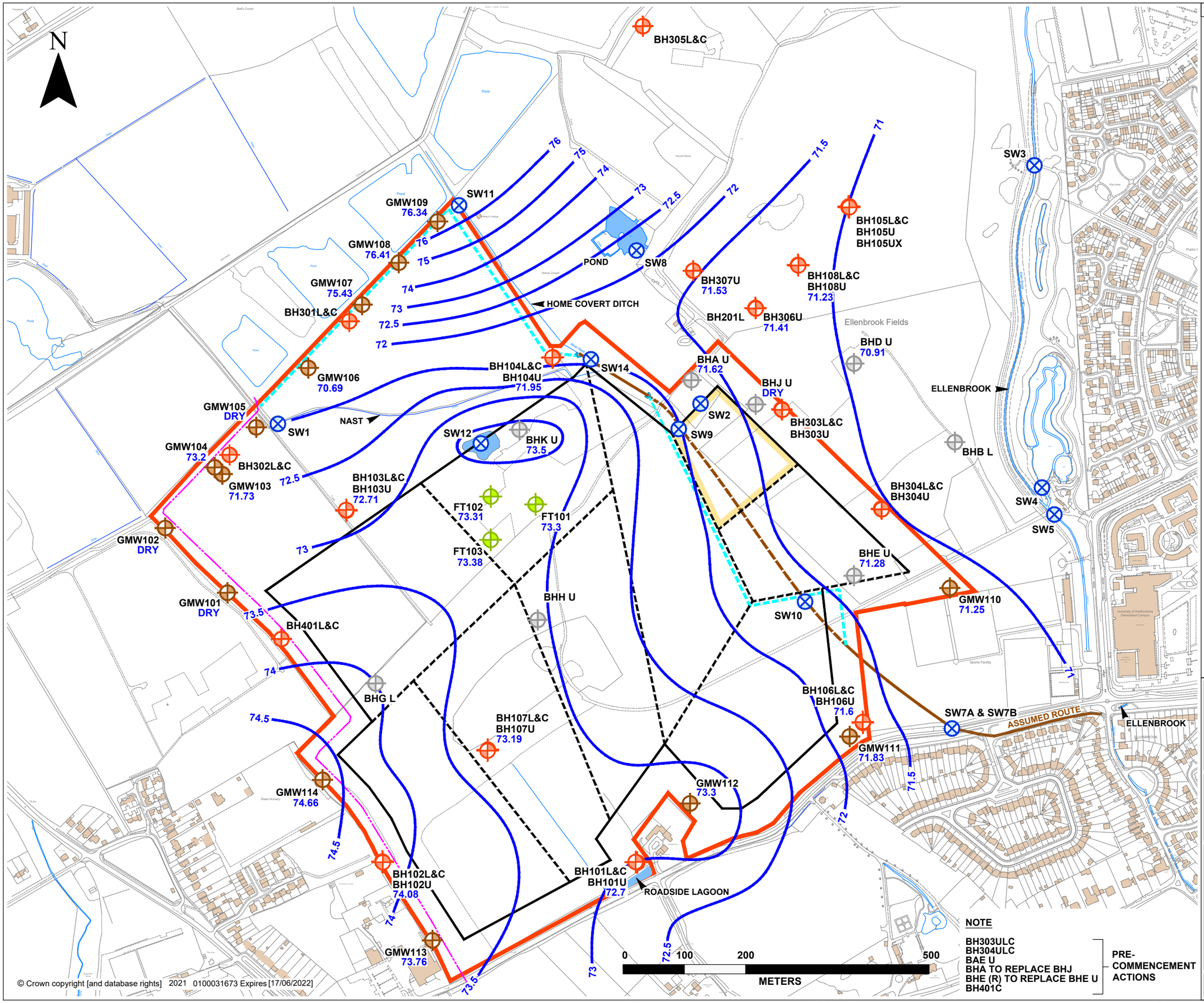
HQ 6/5

Scale 1:30,000 @ A3

Date JUN 2021

01009.00132.18.HQ.6.5.0 Regional Hydrology Hydrogeology

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LEGEND

- SITE BOUNDARY
- EXISTING RIVER NAST CULVERT (TO BE RETAINED)
- EXISTING RIVER NAST CULVERT (TO BE ABANDONED)
- RIVER NAST CULVERT (PROPOSED ROUTE)
- NATIONAL GRID GAS PIPELINE (SURVEYED LOCATION)
- PROPOSED MINERAL DEVELOPMENT SITE
- PHASE BOUNDARY
- PROPOSED UPPER MINERAL LAGOON
- BHK U — PRE BRETT MONITORING WELLS

SLR BOREHOLES

- BH104L&C — DUAL MONITORING WELLS (LOWER MINERAL HORIZON AND CHALK)
- BH104U — SHALLOW MONITORING WELL (UPPER MINERAL HORIZON)
- SW2 — SURFACE WATER MONITORING POINT
- FT101 — FIRE TRAINING AREA MONITORING WELL
- GMW106 — GAS AND UPPER MINERAL AQUIFER MONITORING WELLS

PIEZOMETRIC SURFACE

- 65 — PIEZOMETRIC SURFACE ELEVATION (mAOD) - SLR (AUGUST 2019)

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ENVIRONMENTAL STATEMENT

UPPER MINERAL HORIZON GROUNDWATER CONTOURS (AUGUST 2019)

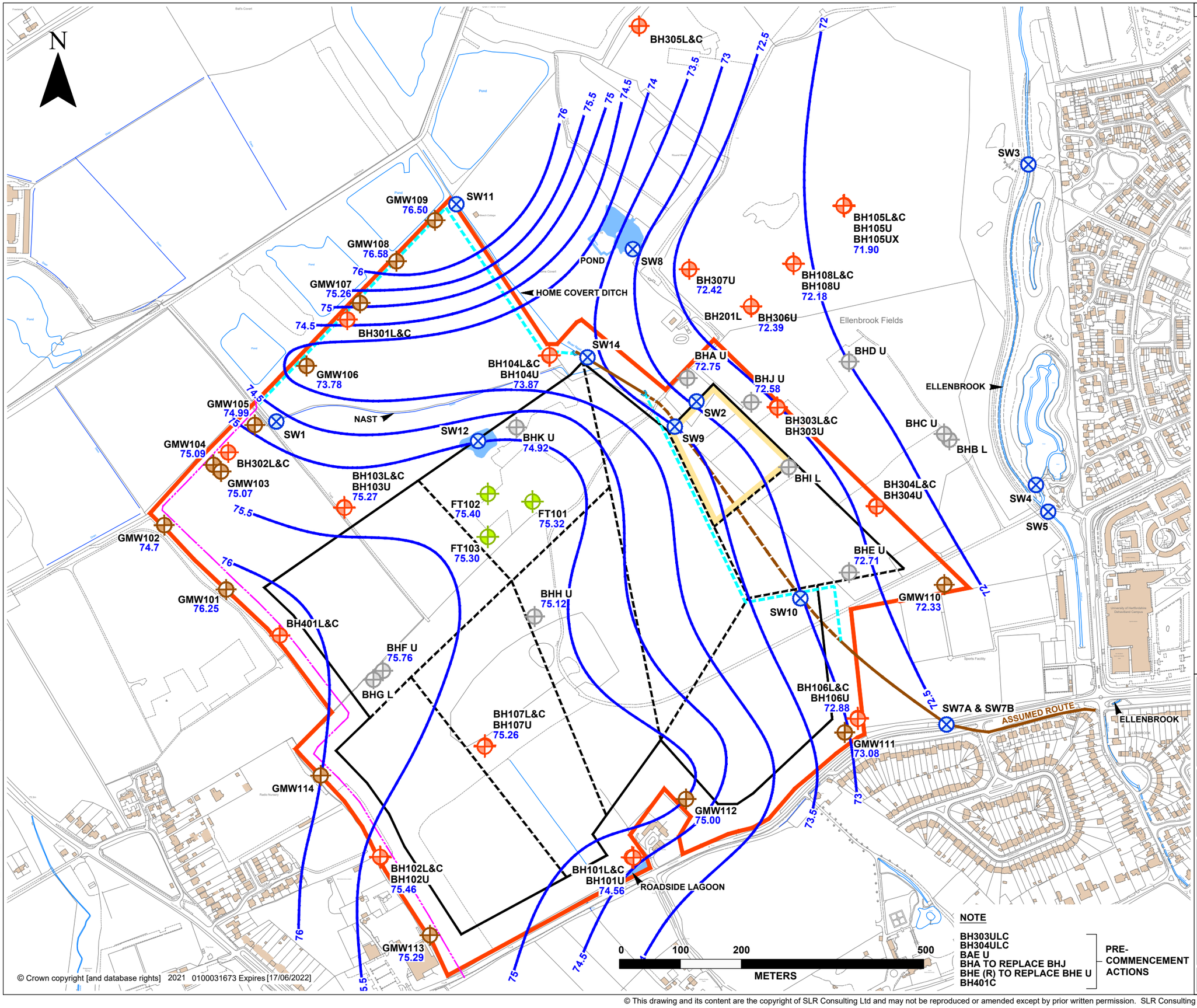
HQ 6/6

Scale: NTS (A3)

Date: SEPTEMBER 2021

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09885.00024.19.HQ6-6.0_UMH_GW_CONTOURS-0819.dwg



LEGEND

- SITE BOUNDARY
- EXISTING RIVER NAST CULVERT (TO BE RETAINED)
- EXISTING RIVER NAST CULVERT (TO BE ABANDONED)
- RIVER NAST CULVERT (PROPOSED ROUTE)
- NATIONAL GRID GAS PIPELINE (SURVEYED LOCATION)
- PROPOSED MINERAL DEVELOPMENT SITE
- PHASE BOUNDARY
- PROPOSED UPPER MINERAL LAGOON
- BHK U — PRE BRETT MONITORING WELLS

SLR BOREHOLES

- BH104L&C — DUAL MONITORING WELLS (LOWER MINERAL HORIZON AND CHALK)
- BH104U — SHALLOW MONITORING WELL (UPPER MINERAL HORIZON)
- SW2 — SURFACE WATER MONITORING POINT
- FT101 — FIRE TRAINING AREA MONITORING WELL
- GMW106 — GAS AND UPPER MINERAL AQUIFER MONITORING WELLS

PIEZOMETRIC SURFACE

- 65 — PIEZOMETRIC SURFACE ELEVATION (mAOD) - SLR (APRIL 2021)

NOTE

PRE-COMMENCEMENT ACTIONS
- BH303ULC
- BH304ULC
- BAE U
- BHA TO REPLACE BHJ
- BHE (R) TO REPLACE BHE U
- BH401C

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ENVIRONMENTAL STATEMENT

UPPER MINERAL HORIZON GROUNDWATER CONTOURS (APRIL 2021)

HQ 6/7

Scale: NTS (A3)

Date: SEPTEMBER 2021

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N

BH305L&C
72.24

BH105L&C
BH105U
68.94

BH108L&C
BH108U
69.65

BH201L
BH306U
68.72

BH303L&C
BH303U

BH304L&C
BH304U

BH106L&C
BH106U
65.82

BH301L&C
72.69

BH104L&C
BH104U
69.59

BH302L&C
72.85

BH103L&C
BH103U
71.24

BH401L&C

BHG L
70.91

BH107L&C
BH107U
69.62

BH102L&C
BH102U
70.4

BH101L&C
BH101U
67.63

BHB L
65.75

SW1
SW2
SW3
SW4
SW5
SW7A & SW7B
SW8
SW9
SW10
SW11
SW12
SW14

POND
HOME COVERT DITCH
NAST
ELLENBROOK
ROADSIDE LAGOON
ASSUMED ROUTE
Ellenbrook Fields

72 71 70 69 68 67 66 65 73

0 100 200 500
METERS

NOTE

BH303ULC
BH304ULC
BAE U
BHA TO REPLACE BHJ
BHE (R) TO REPLACE BHE U
BH401C

PRE-COMMENCEMENT ACTIONS

LEGEND

- SITE BOUNDARY
- EXISTING RIVER NAST CULVERT (TO BE RETAINED)
- EXISTING RIVER NAST CULVERT (TO BE ABANDONED)
- RIVER NAST CULVERT (PROPOSED ROUTE)
- NATIONAL GRID GAS PIPELINE (SURVEYED LOCATION)
- PROPOSED MINERAL DEVELOPMENT SITE
- PHASE BOUNDARY
- PROPOSED LOWER MINERAL LAGOON
- 100m STANDARD OFFSET FROM BH104
- BHK U — PRE BRETT MONITORING WELLS

SLR BOREHOLES

- BH104L&C — DUAL MONITORING WELLS (LOWER MINERAL HORIZON AND CHALK)
- BH104U — SHALLOW MONITORING WELL (UPPER MINERAL HORIZON)
- SW2 — SURFACE WATER MONITORING POINT
- GMW106 — GAS AND UPPER MINERAL AQUIFER MONITORING WELLS

PIEZOMETRIC SURFACE

- 65 — PIEZOMETRIC SURFACE ELEVATION (mAOD) - SLR (APRIL 2021)

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ENVIRONMENTAL STATEMENT

LOWER MINERAL HORIZON GROUNDWATER CONTOURS (APRIL 2021)

HQ 6/8

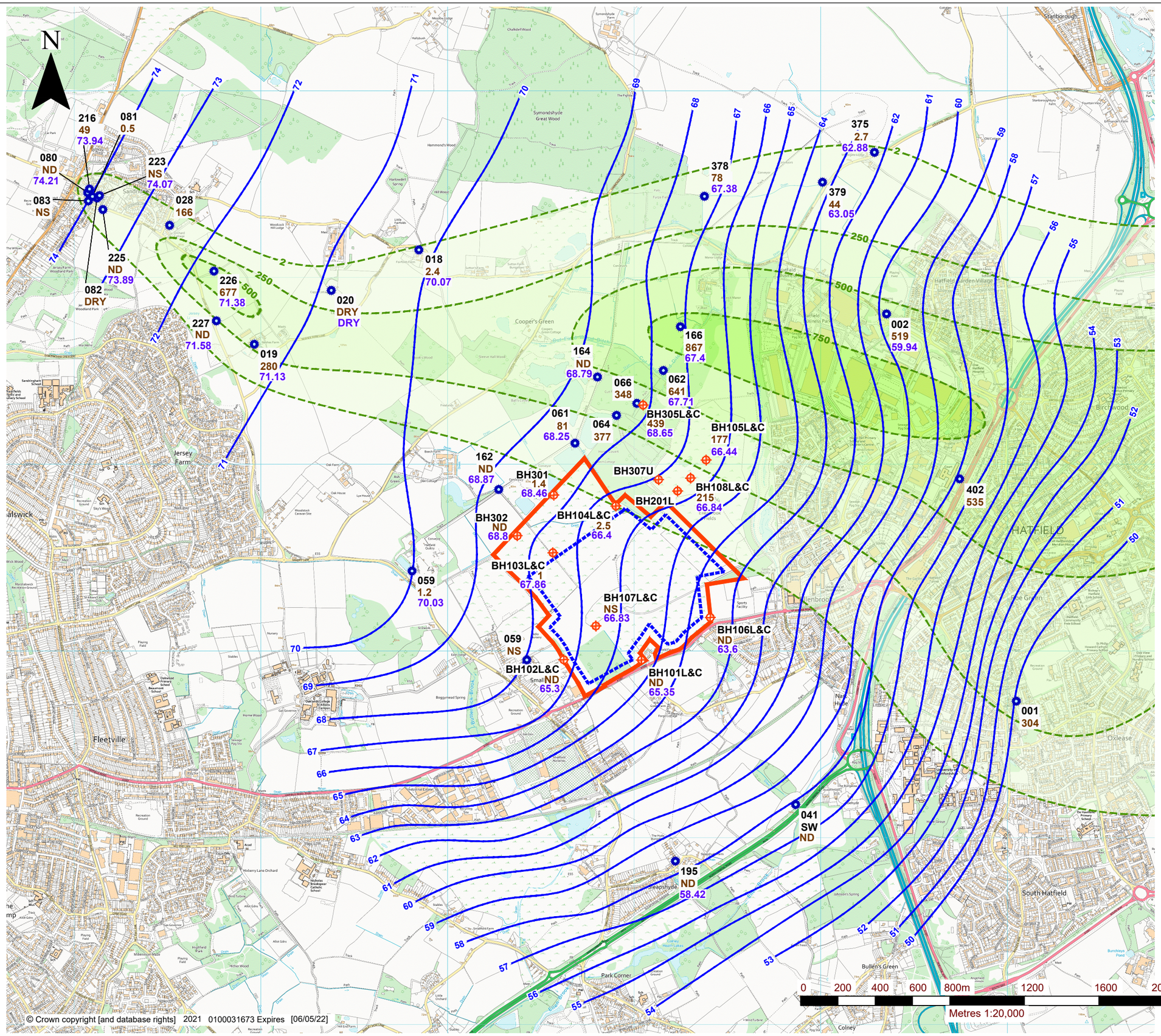
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LEGEND

- SITE BOUNDARY
- PROPOSED MINERAL DEVELOPMENT SITE
- 375 — WELL NUMBER (ENVIRONMENT AGENCY REFERENCE NUMBER)

SLR BOREHOLES AND MONITORING POINTS

- SLR WELLS

GROUNDWATER LEVELS

- 65.98 — GROUNDWATER ELEVATION mAOD
- 63 — GROUNDWATER CONTOURS mAOD

BROMATE CONCENTRATION (ug/l)

- 71.7 — BROMATE (ug/l)
- ND — NOT DETECTED
- NS — NOT SAMPLED
- SW — SURFACE WATER
- > 750
- 500 - 750
- 250 - 500
- 2 - 250

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ENVIRONMENTAL STATEMENT

REGIONAL BROMATE PLUME (CHALK) OCTOBER 2019

HQ 6/9

Scale 1:20,000 @ A3

Date SEPTEMBER 2021

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09885.00024.19.HQ6-9.0.BROMATE_CHALK_OCTOBER_2019-EXTRACT_OCT_20.dwg

N

BH305L&C
399
72.24

SW11

POND

SW8

HOME COVERT DITCH

BH301L&C
ND
72.69

BH104L&C
BH104U
0.7
69.59

SW14

BH201L
BH306U
ND
68.72

BH105L&C
BH105U
178.4
68.94

BH108L&C
BH108U
60.9
69.65

SW3

BH303L&C
BH303U

SW2

SW9

SW1

NAST

SW12

BH302L&C
ND
72.85

BH103L&C
BH103U
ND
71.24

BH401L&C

BHG L
70.91

BH107L&C
BH107U
ND
69.62

BH102L&C
BH102U
ND
70.4

BH101L&C
BH101U
ND
67.63

ROADSIDE LAGOON

SW10

BH304L&C
BH304U

ELLENBROOK

BHB L
17.2
65.75

SW4

SW5

BH106L&C
BH106U
ND
65.82

SW7A & SW7B

ASSUMED ROUTE

ELLENBROOK

Ellenbrook Fields

400 300 200 100 2

72 71 70 69 68 67 66 65 73

0 100 200 500
METERS

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BROMATE CONCENTRATION (ug/l)

71.7	BROMATE (ug/l)		200 - 300
ND	NOT DETECTED		100 - 200
	300 - 400		2 - 100

LEGEND

- SITE BOUNDARY
- EXISTING RIVER NAST CULVERT (TO BE RETAINED)
- EXISTING RIVER NAST CULVERT (TO BE ABANDONED)
- RIVER NAST CULVERT (PROPOSED ROUTE)
- NATIONAL GRID GAS PIPELINE (SURVEYED LOCATION)
- PROPOSED MINERAL DEVELOPMENT SITE
- PHASE BOUNDARY
- PROPOSED LOWER MINERAL LAGOON
- 100m STANDARD OFFSET FROM BH104
- BHK U — PRE BRETT MONITORING WELLS

SLR BOREHOLES

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- BH104U — SHALLOW MONITORING WELL (UPPER MINERAL HORIZON)
- SW2 — SURFACE WATER MONITORING POINT
- GMW106 — GAS AND UPPER MINERAL AQUIFER MONITORING WELLS

PIEZOMETRIC SURFACE

- 65 — PIEZOMETRIC SURFACE ELEVATION (mAOD) - SLR (APRIL 2021)

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ENVIRONMENTAL STATEMENT

LOWER MINERAL HORIZON GROUNDWATER CONTOURS (APRIL 2021)

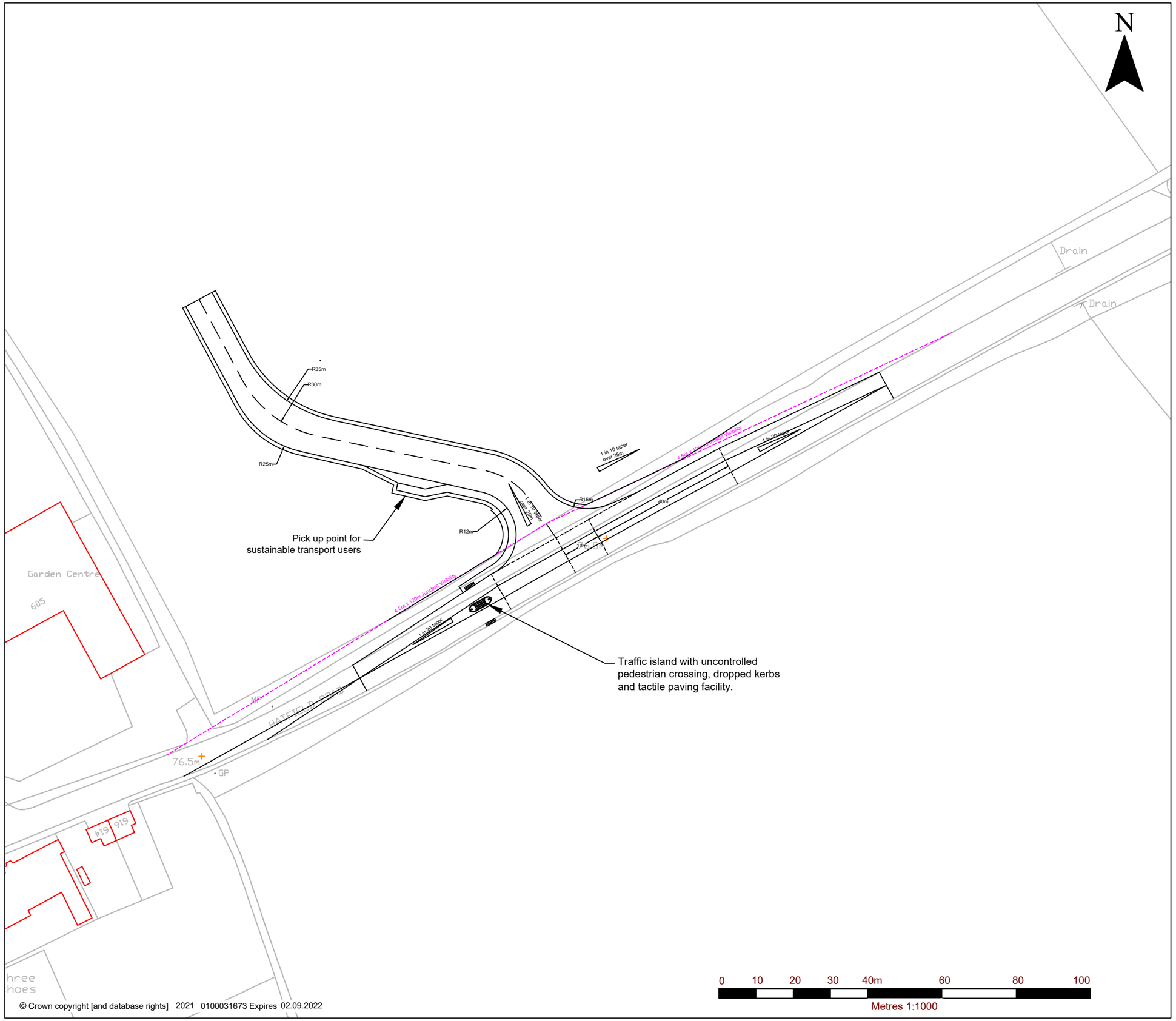
HQ 6/10

Scale: NTS (A3)

Date: SEPTEMBER 2021

09885.00024.19.HQ6-10.0_BROMATE_CON-APRIL2021.dwg

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NOTES

Hedges and vegetation will be cleared to achieve visibility requirement. The area within the visibility splays will be kept clear and maintained throughout the life of the development.

Revision	By	Chk'd By	Date	Comments
0	KW	CL	09/21	

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HATFIELD AERODROME

Project
PROPOSED NEW QUARRY

Drawing Title
PROPOSED SITE ACCESS ARRANGEMENTS GHOST RIGHT TURN LANE

Scale
1:1,000 @ A3

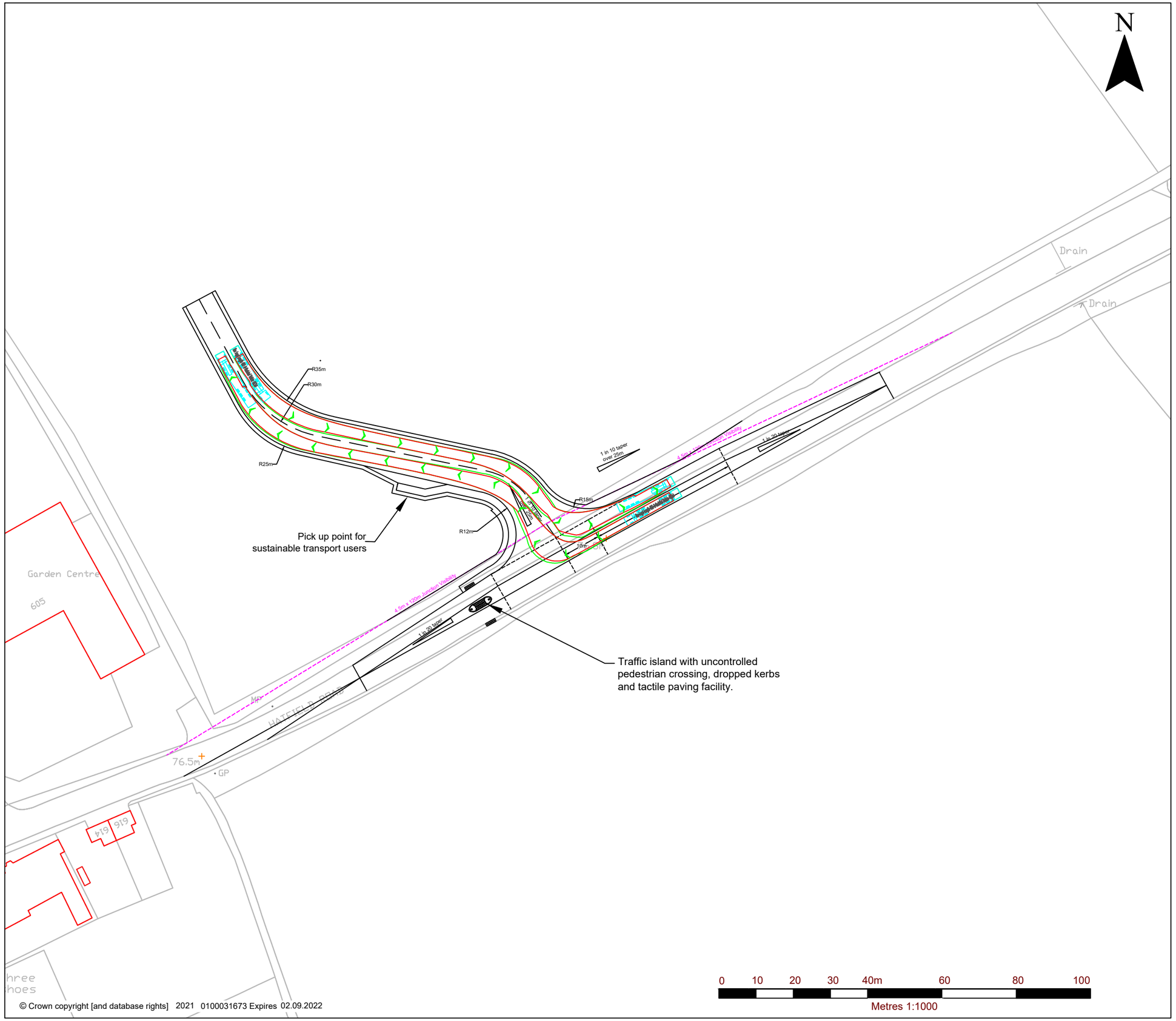
Date
SEPTEMBER 2021

Drawing Number
HQ 7/1

Revision
0

402.01009.00064.14.HQ7-1.0_Prop_Site_Access.dwg

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NOTES

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Revision	By	Chk'd By	Date	Comments
0	KW	CL	09/21	

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Project
PROPOSED NEW QUARRY

Drawing Title
PROPOSED SITE ACCESS ARRANGEMENTS GHOST RIGHT TURN LANE

Scale	Date
1:1,000 @ A3	SEPTEMBER 2021

Drawing Number	Revision
HQ 7/2	0

402.01009.00064.14.HQZ-1.0_Prop_Site_Access.dwg

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LEGEND

SITE BOUNDARY

VIEWPOINT

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

AERIAL PHOTOGRAPHY

HQ 8/1

Scale 1:5,000 @ A3

Date DEC 2015

160120_01009.00132.29.000_HQ8-1_DB.dwg

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LEGEND

AREA ASSESSED FOR ZTV

ELLENBROOK FIELDS

ZONES OF THEORETICAL VISIBILITY:

GREATER THAN 3 DEGREES VISIBLE VERTICAL ANGLE

BETWEEN 1 AND 3 DEGREES VISIBLE VERTICAL ANGLE

BETWEEN 0.25 AND 1 DEGREES VISIBLE VERTICAL ANGLE

1 VIEWPOINT

N

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

ZTV OF PLANT AT 13.3m HIGH

HQ 8/2

Scale 1:25,000 @ A3

Date DEC 2015

160120_01009.00132.29.000_HQ8-2_DB.dwg

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LEGEND

AREA ASSESSED FOR ZTV

ELLENBROOK FIELDS

ZONES OF THEORETICAL VISIBILITY:

GREATER THAN 3 DEGREES VISIBLE VERTICAL ANGLE

BETWEEN 1 AND 3 DEGREES VISIBLE VERTICAL ANGLE

BETWEEN 0.25 AND 1 DEGREES VISIBLE VERTICAL ANGLE

1 VIEWPOINT

N

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

ZTV OF PHASE A

HQ 8/3

Scale 1:25,000 @ A3

Date DEC 2015

LEGEND

AREA ASSESSED FOR ZTV

ELLENBROOK FIELDS

ZONES OF THEORETICAL VISIBILITY:

GREATER THAN 3 DEGREES VISIBLE VERTICAL ANGLE

BETWEEN 1 AND 3 DEGREES VISIBLE VERTICAL ANGLE

BETWEEN 0.25 AND 1 DEGREES VISIBLE VERTICAL ANGLE

1 VIEWPOINT

N

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ENVIRONMENTAL STATEMENT

ZTV OF MAX PIT

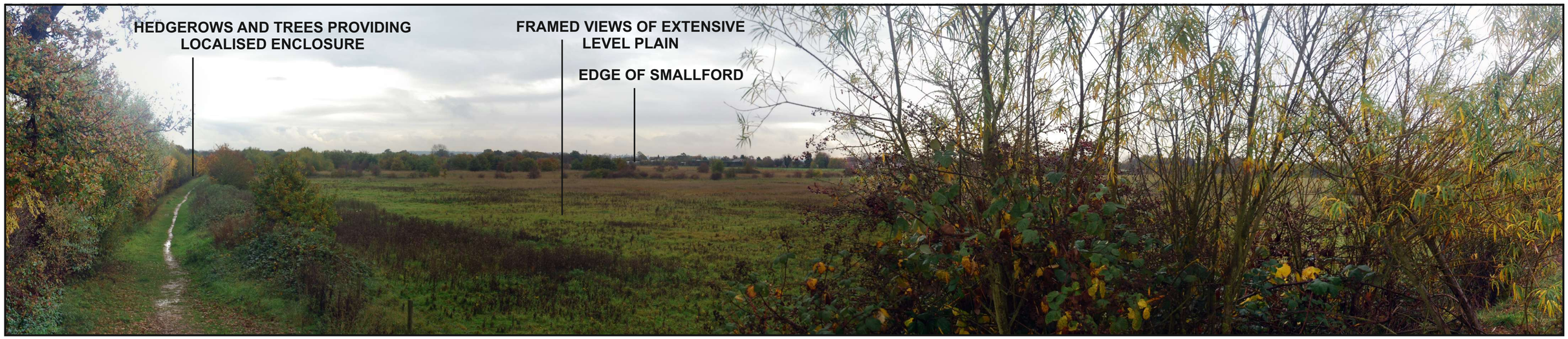
HQ 8/4

Scale 1:25,000 @ A3

Date DEC 2015



VIEWPOINT 1A: View south from public right of way to the north near conveyor crossing point.



VIEWPOINT 1B: View south from public right of way to the north near conveyor crossing point.



VIEWPOINT 1C: View south from public right of way to the north near conveyor crossing point.

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

VIEWPOINT 1

HQ 8/5

Scale	Date
AS SHOWN	DEC 2015

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VIEWPOINT 2A: View south public right of way as it joins the application site to the north.



VIEWPOINT 2B: View south public right of way as it joins the application site to the north.



VIEWPOINT 2C: View south public right of way as it joins the application site to the north.

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

VIEWPOINT 2

HQ 8/6

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VIEWPOINT 3A: View west from edge of Ellenbrook.



VIEWPOINT 3B: View west from edge of Ellenbrook.

NOTE:

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

VIEWPOINT 3

HQ 8/7

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VIEWPOINT 4A: View from Hatfield Road at entrance to Popefield Farm.



VIEWPOINT 4B: View from Hatfield Road at entrance to Popefield Farm.

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ENVIRONMENTAL STATEMENT

VIEWPOINT 4

HQ 8/8

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VIEWPOINT 5A: View from Hatfield Road at junction with public right of way, near proposed site entrance



VIEWPOINT 5B: View from Hatfield Road at junction with public right of way, near proposed site entrance

NOTE:

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

VIEWPOINT 5

HQ 8/9

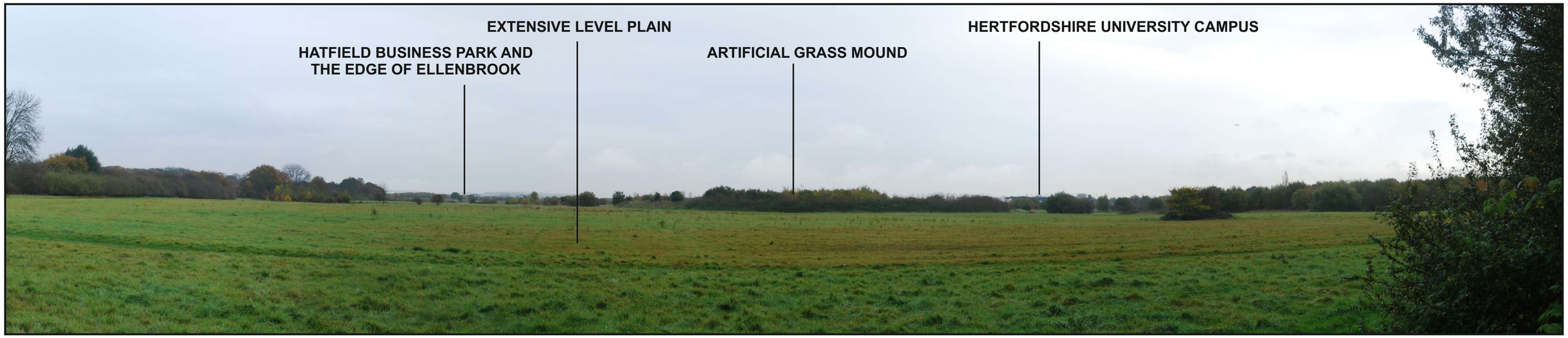
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VIEWPOINT 6A: View from public right of way to the west edge of application site.



VIEWPOINT 6B: View from public right of way to the west edge of application site.

NOTE:

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

VIEWPOINT 6

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VIEWPOINT 7A:View from residential properties, near to Oaklands Lane and public right of way.



VIEWPOINT 7B:View from residential properties, near to Oaklands Lane and public right of way.



VIEWPOINT 7C:View from residential properties, near to Oaklands Lane and public right of way.

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

VIEWPOINT 7

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VIEWPOINT 8A: View south from public right of way to the west, parallel to Oaklands Lane



VIEWPOINT 8B: View south from public right of way to the west, parallel to Oaklands Lane

NOTE:

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

VIEWPOINT 8

HQ 8/12

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LIMITATIONS AND TECHNICAL DIFFICULTIES XI

APPENDIX 1/1 – EIA LEGISLATION AND METHODOLOGY

A1.1 The EIA has been undertaken in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations), which came into force on 16 May 2017. Cognisance has also been given to the guidance set out in the online National Planning Practice Guidance and The Institute of Environmental Management and Assessment's "*Guidelines for Environmental Impact Assessment*".

ENVIRONMENTAL IMPACT ASSESSMENT

A1.2 EIA is an important procedure for ensuring that the likely effects of a new development on the environment are fully understood and taken into account before the development is allowed to proceed. The term EIA describes a procedure that must be followed for certain types of development before they are given "*development consent*", which in the UK includes the grant of a planning permission. The procedure is a means of drawing together, in a systematic way, an assessment of a project's likely **significant** environmental effects.

Statutory Background

European Context

A1.3 The Environmental Impact Assessment Directive[1] (the "*EIA Directive*") requires that, before granting '*development consent*' for projects, including development proposals, authorities should carry out a procedure known as environmental impact assessment (or "*EIA*") of any project which is likely to have significant effects on the environment. The aim of the EIA Directive is to ensure that the authority giving consent for a project makes its decision in the knowledge of any likely significant effects on the environment. The first EIA Directive (85/337/EEC) came into force in 1988 and was subsequently amended in 1999 (Directive 97/11/EC) extending the range of development to which the Directive applies and made some small changes to EIA procedures. The Directive was further amended in 2003 by Directive 2003/35/EC and in 2009 by Directive 2009/31/EC. The initial Directive of 1985 and its amendments were codified by Directive 2011/92/EU[2] of 13 December 2011. As a result of a review process[3], on 26 October 2012, the Commission adopted a proposal for a revised Directive[1]. The newly amended EIA Directive (2014/52/EU) came into force on 15 May 2014 to simplify the rules for assessing the potential effects of projects on the environment. This Directive has now been adopted by the governments in the UK, with new regulations coming into force in England on 16th May 2017.

[1] Directive 2014/52/EU of The European Parliament And Of The Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0052

[2] Directive 2011/92/EU of The European Parliament And Of The Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:026:0001:0021:EN:PDF

[3] Review of the Environmental Impact Assessment (EIA) Directive. http://ec.europa.eu/environment/eia/review.htm

National Context

A1.4 The EIA Directive has been implemented by regulations for development proposals under the Town and Country Planning Act 1990 (the 1990 Act). The current regulations for England are the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations') and the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. In relation to the application at Hatfield Aerodrome it is the former that are of relevance. Separate regulations also are in force for the devolved governments in Scotland, Wales and Northern Ireland.

A1.5 The EIA Regulations specify certain types of development for which EIA is mandatory (Schedule 1 projects), and categories of development where an EIA may be required (Schedule 2 projects) dependent upon the likely significance of the impacts. In connection with the proposals for Hatfield Aerodrome as the proposed development area exceeds 25 hectares (ha) then the development falls within the scope of Schedule 1.

The Environmental Statement

A1.6 An Environmental Statement (ES) is a report of an EIA that is required to be submitted with a planning application for major and other developments that are likely to have significant impacts on the environment. It evaluates the likely environmental impacts of the development, together with an assessment of how the severity of the impacts could be reduced.

A1.7 The EIA Regulations[4] indicate that an ES must include the information reasonably required for reaching a reasoned conclusion on the significant effects of the development on the environment, taking into account current knowledge and methods of assessment. Regulation 18(3) of the EIA Regulations indicates that an ES should include at least:

(a) a description of the proposed development comprising information on the site, design, size and other relevant features of the development;
(b) a description of the likely significant effects of the proposed development on the environment;
(c) a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;
(d) a description of the reasonable alternatives studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment;
(e) a non-technical summary of the information referred to in sub-paragraphs (a) to (d); and
(f) any additional information specified in Schedule 4 relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected.

A1.8 For ease of reference, the box below sets out the requirements of Schedule 4.

[4] Regulation 18(4)(b)

Table A1-1
Document Overview

Requirement	Location in the ES
1) A description of the development, including in particular: (a) a description of the location of the development; (b) a description of the physical characteristics of the whole development; (c) a description of the main characteristics of the operational phase of the development (d) an estimate of expected residues and emissions and quantities and types of waste produced during the construction and operation phases. 2) A description of the reasonable alternatives; 3) A description of the current baseline conditions and an outline of the likely evolution thereof without implementation of the development 4) A description of the factors specified in regulation 4(2) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape. 5) A description of the likely significant effects of the development on the environment resulting from, inter alia: (a) the construction and existence of the development, including, where relevant, demolition works; (b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources; (c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste; (d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters); (e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources; (f) the impact of the project on climate and the vulnerability of the project to climate change; (g) the technologies and the substances used. The description of the likely significant effects should cover	1) Chapter 2 for the description of location and site setting and Chapter 3 for a description of the development. 2) Chapter 5 sets out the alternatives considered as part of the EIA. 3) Chapters 6 to 13 describe the baseline in the context of the main environmental subjects to be assessed. 4) Chapters 6 to 13 describe the factors specified in reg. 4(2) in the context of the main environmental subjects to be assessed (and agreed through the scoping process). 5) Chapters 6 to 13 describe likely significant effects in the context of the main environmental subjects to be assessed. Chapter 14 sets out the cumulative effects. 6) Each of the chapters addressing main environmental subjects to be assessed (Chapters 6 to 13) describe the forecasting methods used. 7) Each of the chapters addressing main environmental subjects to be assessed (Chapters 6 to 13) describe the mitigation measures to be adopted. 8) Risks of major accidents and/or disasters has been scoped out of the EIA. 9) A separate Non Technical Summary is provided (Volume 3). 10) Details of sources used are clearly identified in the text of each chapter and included as footnotes to each chapter of the ES.

Requirement	Location in the ES
the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. 6) A description of the forecasting methods or evidence used including details of difficulties. 7) A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements. 8) A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned. 9) A non-technical summary of the information provided under paragraphs 1 to 8. 10) A reference list detailing the sources used	

Scoping

A1.9 The EIA Regulations require consideration of the likely significant environmental effects of a development proposal. However, the EIA Regulations and associated guidance need to be capable of being applied to all forms of development, and not purely mineral developments. Each development proposal is unique, and the potential impacts associated with one site may not be the same as another. Consequently, it is not always necessary to address all the areas identified in the EIA Regulations in the same amount of detail. It is therefore important to clearly identify or 'scope' the main environmental issues, as this allows for more detailed and targeted assessment to be carried out.

A1.10 A key consideration in relation to the current EIA to support the re-submitted planning application is the existence of a thorough EIA undertaken in 2015-2016, as reported in the 2016 ES.

A1.11 The applicant has carried out a formal scoping exercise, commencing with an internal scoping appraisal undertaken by SLR to establish the likely significant environmental effects, having regard to the findings of the 2016 ES. This was set out in the 'Scoping Report' submitted to the MPA on 10 May 2021, which described the proposed scope of the EIA, and was accompanied by a request for a 'Scoping Opinion'.

A1.12 Regulation 15 of the EIA Regulations, places a duty on the planning authority, if requested, to give their opinion (known as a 'Scoping Opinion') in writing to the applicant on the information to be provided in the ES. The MPA issued their Scoping Opinion on 14 July 2021, attached as **Appendix 1/2** to this chapter.

A1.13 In accordance with Regulation 15 of the EIA Regulations, the MPA consulted key statutory consultees and made their responses and advice available to the applicant to assist with the preparation of the EIA. In their scoping opinion, the MPA indicated that the main issues are:

- Air quality;
- Ecology;
- Highways and access;
- Hydrology and hydrogeology;
- Landscape and visual impact;
- Noise.

A1.14 The scoping opinion also indicated that consideration needs to be given to health.

A1.15 The EIA and attendant ES have, therefore, been prepared having regard to the MPA's Scoping Opinion (as required under Regulation 15 of the EIA Regulations), the scoping appraisal, and the advice received during these, and subsequent, consultation discussions.

A1.16 Finally, the assessments of environmental effects have been undertaken using guidance and professional standards relevant to the individual topic area, and are separately referenced in the appropriate chapter.

A1.17 Table A1-2 below provides a summary of the scoping opinion and where within the ES the information is provided.

Table A1-2
Summary of Scoping Opinion

Environmental Topic	Requirement	Where addressed
Air Quality	The 2016 Air Quality Impact Assessment considered baseline conditions, operational impacts on local sensitive receptors related to soil stripping, haulage, excavation, storage and processing of material, and restoration; operational impacts on local amenity and ecology; and impact of exhaust emissions from HGV traffic on local air quality. The 2016 assessment considered background particulate levels for PM10 and PM2.5 and proximity to sensitive receptors in line with appropriate guidance. The 2016 assessment concluded: - background levels are within acceptable limits; - the proposed development would not significantly increase PM10 or PM2.5 emissions above the levels specified within the Air Quality Objective; - there would be a low risk of adverse dust effects on sensitive receptors with mitigation measures in place, taking into account distance from the site, frequency of wind direction and proposed site operations; - negligible risk of residual effects; - insignificant potential impacts on ecological sites; - 'small' to 'imperceptible' impacts on air quality from additional HGV traffic using local roads, assessed as negligible impact measured against relevant criteria.	Chapter 9

Environmental Topic	Requirement	Where addressed
	The AQIA will require updating to address guidance published since 20164. The baseline data should be updated to reflect latest vehicle emission factors. The AQIA should also consider local air quality strategies adopted since 2016 and issues related to respirable crystalline silica. The ES should include the dust monitoring scheme (required as a pre-commencement condition). The proposed mitigation includes: limiting the duration of operations; no soil stripping above maximum wind speeds; suspending activities when conditions are unacceptable in the vicinity of sensitive receptors; providing water for dust suppression, appropriate loading of vehicles, sheeting HGVs on public highways, managing mineral stockpiles, appropriate haul road maintenance, enforcement of haul road speed controls, regular use of a road sweeper on haul roads, and timely restoration. In summary, the proposals to update the AQIA and mitigate adverse emissions to air are considered to be adequate.	
Ecology	No part of the application site falls within a sensitive area as defined within the EIA Regulations5. The ES for application 5/0394-16 identifies 13 main habitats types within the application site. The proposed development involves the complete destruction of four ponds containing Great Crested Newts populations. A single badger sett would also be relocated. The proposed mitigation includes; creation of new ponds, replacement habitats, and exclusion fencing installed prior to soil stripping. The Ecology Assessment should set out in full the detailed mitigation schemes. The baseline surveys should be updated to ensure all existing habitats and populations are accurately recorded, together with any new habitats established since 2016. The assessment should include proposals to avoid further habitat loss and fragmentation and make provision for biodiversity gains to be delivered at each stage of the development. The proposals for restoration should accord with the NPPF, in particular: - minimise the impacts on and provide net gains for biodiversity; - contribute to the establishment of coherent ecological networks resilient to current and future pressures; - support the maintenance and enhancement of green infrastructure and landscape across local authority boundaries; - identify and pursue opportunities for securing measurable net gains for biodiversity, and - deliver measurable biodiversity and ecological improvements in line with DEFRA Biodiversity Metric 2.0.	Chapter 11
Health	The 2017 regulations specifically require the EIA process to take account of the potential effects on population and human health. This should take the form of a Health Impact Assessment (HIA). The consultation response from Hertfordshire County Council as Public Health Authority confirms the ES should include a HIA Chapter. Further, they consider it will be essential to meet the developer before the HIA is commissioned in order to plan the scope and content of the HIA. This should ensure the HIA is robust and appropriate for public health purposes.	Chapter 13 and Appendix 13/1
Highways	The scoping request indicates the proposal would generate 164 HGV movements associated with the export of aggregates only. This is stated to equate to a net reduction of 10 HGV movements per day (compared with the previous scheme). There is some uncertainty whether the 164 HGV movements includes importation of waste. The Transport Assessment should therefore clarify the total number of HGV movements associated with export of sand and gravel and waste importation.	Chapter 7

Environmental Topic	Requirement	Where addressed
	The increase in HGV movements affecting the local highway network will impact a number of junctions between the site access, the A1057, A1000 and A1(M) with associated traffic congestion and road safety potential impacts. The Highway Authority response confirms that the TA should include recent traffic count surveys and junction queue lengths to establish demand and actual flows, and apply appropriate future traffic growth forecasts (when the quarry becomes operation and after 5 years); and provide appropriate junction modelling for: - A1057/Comet Way junction (Further discussions with HCC) - A1057/Mosquito Way (Further discussions with HCC) - Ellenbrook Lane/A1057 St Albans Road W/Albatross Way - A1057/Proposed Site Access Arrangements The TA should; review road safety and pedestrian and cycle accessibility/ safety; consider existing cycle/pedestrian infrastructure, and the need for cycle and pedestrian improvements, having regard to the A414 corridor Hatfield Consultation document. The revised site access should be subject to (Stage 1) Road Safety Audit (including designer response) and swept path analysis. In terms of cumulative impact, the TA should model HGV movements associated with other quarries in the local area, plus additional traffic generated by new development in the study area since 2016. In addition, the EIA should consider the potential effects of HGV traffic on the local environment and amenity of residential properties in the vicinity of the site.	
Hydrology and hydrogeology	Groundwater in the UMH aquifer is perched on the boulder clay interburden and flows in a north to northeast direction. The groundwater within the lower aquifer (LMH and Chalk) is regionally extensive and connected hydraulically i.e. in vertical continuity. The groundwater within the lower aquifer flows in a south east direction. The groundwater flows in the lower aquifer are affected by pumping rates at the Hatfield boreholes. The application site is located within the outer source protection zone (SPZ2) of two public water supply wells located at Hatfield (1,500m southeast) and at Colney Heath (2,200m south southeast) of the application site. The Hatfield boreholes are not used for public water supply. The Colney Heath boreholes are utilised for potable water supply. The Affinity Water consultation response confirms the EIA process will need to consider the following matters: (1) Assessment of potential risks caused by the new method of extraction from dry Upper Mineral Horizon (UMH) and wet Lower Mineral Horizon (LMH). Potential risks may include: – cross contamination between the LMH/Chalk and the UMH aquifer – extreme scenarios influencing the migration of the bromate plume – alteration of LMH aquifer storage and its influence on surrounding groundwater levels (2) Proposal for additional groundwater level and water quality monitoring to align with the renewed quarry plan in: – both the UMH and LMH pre-, post- and during operation – extreme scenarios that consider the new extraction method and triggers associated with this. (3) Reviewing the cumulative impact of recharge lagoons operated by both CEMEX and Brett quarries, and control mechanisms in place to ensure this does not exacerbate groundwater flood risk in the area. (4) Restoration of boulder clay layer (or similar of hydraulic properties) post-operation to ensure current hydraulic separation between UMH and LMH/Chalk is maintained.	Chapter 6 and associated appendices

Environmental Topic	Requirement	Where addressed
	The ES should provide as much information as possible to confirm the position of the Bromate plume in relation to the proposed mineral working. Sufficient borehole data should be provided, to include additional boreholes and the levels of Bromate and Bromide recorded for as many boreholes as possible, where such data is available. Additionally, the ES should include a Groundwater Management Plan to explain in detail how groundwater in the UMH and LMH will be managed during each phase of the mineral extraction and restoration.	
Landscape and Visual Impact	The proposed mineral extraction and related operations impact landform, landcover, landscape character, and visual amenity. Significant impacts are likely to occur during site preparation and mineral working. The proposed restoration could also have adverse visual effects. The Landscape and Visual Impact Assessment (LVIA) should assess temporary short terms effects during extraction and restoration, and long term effects (+10 years) on landscape character and visual amenity. The LVIA should include baseline studies of the site and its surroundings and a detailed assessment of landscape character. The LVIA should assess residual effects and their significance after mitigation, and, identify opportunities to enhance landscape character and amenity as part of the restoration. The LVIA should consider any potential cumulative effects from mineral working taking place at the application site concurrently with the recent permission for mineral extraction at Land adjoining Coopers Green Lane as an extension to Hatfield Quarry.	Chapter 8
Noise	The noise assessment (2016) predicted noise levels would not exceed NPG maximum thresholds based on worst case scenarios. Proposed noise mitigation includes perimeter bunds /acoustic fencing, enclosures constructed around plant, broadband reverse warning systems for all mobile machinery, and good management practices. The 2016 noise assessment should be reviewed to ensure baseline noise survey is robust and sufficient mitigation is available in relation to mineral processing and transport. The review should include measures to control or mitigate noise emissions in accordance with NPG provisions. The noise mitigation scheme should include specific proposals to protect the amenity of the nearby noise-sensitive receptors.	Chapter 10

Assessment Procedures

A1.18 The EIA has identified a range of potential environmental issues, many of which vary in terms of the stage in which they occur within the life cycle of the development and the length of time over which they are experienced. For the quarry workings, being an extension to an existing mineral working, works typically associated with the construction phase (establishment of site infrastructure for example) have already been undertaken. Notwithstanding this, some operations during the Operational Phase of the quarry development are akin to those that occur during a Construction Phase; for example soil stripping and bund formation.

Phase	Duration
Construction Phase	This would cover a period of around 12-18 months during which the site preparation works for the quarry, including initial stripping of soils, installation of processing plant, excavation of lagoons and erection of peripheral screen bunds.

Operational Phase	This would cover the development of the quarry for the period of around 30 years.
Restoration Phase	This would cover the period following mineral extraction and include the removal of the processing plant and the final restoration works within the extraction area. As the workings would be progressively restored, the final restoration works would be completed within c. 24 months of the cessation of mineral processing operations. Following completion of the restoration works a period of aftercare management would ensue.

A1.19 Identified impacts can have differing durations, and the EIA has generally classified impacts into three timeframes; short term, medium term and long-term.

Timeframe	**Description**
Short Term	Typically being from a few months up to three years in duration.
Medium Term	This would cover a period of around three to ten years.
Long Term	This would cover a period in excess of ten years.

A1.20 Notwithstanding this, assessments that have been carried out as part of the EIA may use different definitions for these timescales. Where this is the case, they are clearly outlined in the respective chapter.

A1.21 Identified effects can be temporary or permanent; direct or indirect; and positive or negative.

Temporary/Permanent Effects

A1.22 In relation to the different time frames above, some of the effects would be temporary, for example, the mineral extraction and restoration operations, whilst others would be permanent, such as the impact of new landforms on the landscape.

Direct/Indirect Effects

A1.23 The proposed development could potentially have direct effects upon nearby properties and settlements, together with the environment as a whole in relation to emissions of noise and dust. Indirect impacts can also occur such as those relating to the transportation of aggregates.

Positive/Negative Effects

A1.24 The proposed development could generate both negative effects and positive benefits, either by virtue of the proposals themselves or as a result of the mitigation measures proposed.

Cumulative Impacts

A1.25 Cumulative impacts can be described[5] as those caused by the sum of the project's impacts on the environmental components, and/or the project's impact when combined with those of other past, present or future projects. Cumulative impacts can be;

- additive, aggregative or "nibbling", namely the simple sum of all the impacts;
- synergistic, where impacts interact to produce an impact greater than the sum of the individual impact; and
- neutralising or antagonistic impact, where the impacts counteract each other, reducing the overall impact.

A1.26 Such cumulative impacts have been addressed in each of the respective chapters within the ES. However, there is also the potential for unrelated impacts, which in themselves are not significant, to collectively generate an overall impact that is unacceptable. For example, the sum of minor impacts on noise, odour and traffic could potentially produce an overall significant impact.

A1.27 The various impacts are assessed individually within their respective chapters and then collectively in Chapter 14 of this ES.

Depth of Assessment

A1.28 As noted earlier, a formal 'scoping' exercise was conducted by SLR in May 2021. The purpose of this exercise was to provide the MPA with sufficient information to enable them, along with other consultees, to set out the scope of the various assessments that make up an EIA.

A1.29 A fundamental aspect of any EIA is to determine the baseline environmental conditions prevailing at the application site, both now, and how they may change over time. These form the benchmark against which predicted changes resulting from the proposed development can be assessed to determine the magnitude of any impact.

A1.30 The baseline conditions have been determined by a number of different methods, including desktop research, analytical modelling and the acquisition of data from third party sources.

A1.31 Methodologies for predicting the nature and magnitude of any potential environmental impacts are entirely dependent on the subject area. Quantitative methods of assessments are employed to predict values which can be compared against published thresholds and indicative data contained within Government guidance and standards. However, it is not always possible to ascribe quantitative values to environmental assessments and, in these instances, qualitative assessments are used. This type of assessment is largely subjective and therefore relies on previous experience and professional judgement to arrive at a sound conclusion.

[5] Methods of Environmental Impact Assessment. P. Morris and R. Therivel. UCL Press, 2000

A1.32 Finally, if significant environmental impacts are predicted in the EIA process, then the ES provides measures which would be employed to eliminate or ameliorate the impact to acceptable levels. Mitigation measures have been formulated based on a hierarchy of avoid, reduce, compensate, remediate and enhance (often referred to as the mitigation hierarchy). As such mitigation measures can be in the form of changes to operational practice, or changes/additions to the design of the site. Accordingly, the EIA process forms part of the iterative design process.

STATEMENT OF SIGNIFICANCE

A1.33 Assessing the significance of effects relies, at least in part, on value judgements including placing weight or value on the environmental receptors likely to experience the change. The significance of effects at the assessment stage relates to the sensitivity of receptors to accommodate change.

A1.34 The significance of an effect is derived from an analysis of:

- the sensitivity of the receiving environment or receptor to change, including its capacity to accommodate the kinds of changes the proposed development may bring about;
- the amount and type of change, often referred to as the impact magnitude which includes the timing, scale, size and duration of the impact;
- the likelihood of the impact occurring, which may range from certainty to a remote possibility;
- comparison of the impacts on the environment that would result from the proposed development relative to any changes that would occur without the proposed development, often referred to as the “do nothing” or “do minimum” comparison; and
- expressing the significance of the effects of the project, usually in relative terms, based on the principle that the more sensitive the receptor, the more likely the predicted changes, and the greater the magnitude of those changes (when compared with the do nothing scenario), the greater will be the significance of the effect.

A1.35 As the significance of effects will differ depending on the context and the receptors affected by the proposed development, there is no general definition of what constitutes significance. In EIA, the term significance reflects both its literal meaning of ‘importance’ and its statistical meaning where there is an element of quantification. This combination of judgemental/subjective and quantifiable/objective tests has become the standard approach to understanding and applying the test of ‘significance’.

A1.36 Significant effects are defined in each of the topic specific chapters. Any effects associated with the proposed development are assumed to be negative except where they are stated to be positive.

LIMITATIONS AND TECHNICAL DIFFICULTIES

A1.37 In general, no technical difficulties were encountered when undertaking the EIA despite the Covid-19 pandemic. In considering the potential impacts of the proposals on nearby properties, it should be noted that observations and measurements were generally made from public areas

(such as rights of way and highways). It is considered that this has not prevented the accurate assessment of potential environmental impacts or the identification of appropriate mitigation measures.

Mr. Richard Ford
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Fax : 01992 556202
Contact : Chay Dempster

14th July 2021

Dear Mr Ford,

The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 ("2017 EIA Regulations)
Regulation 6: Request for screening opinions
Regulation 15: Scoping opinions of the local planning authority
Regulation 17: Procedure to facilitate preparation of environmental statements

Proposed development: Proposed sand and gravel quarry land at Hatfield Quarry

I write further to your request for a screening opinion dated 10th May 2021 for the above proposed development.

The propose development is regarded to fall within Schedule 1 of the 2017 EIA.

EIA Process

Regulation 4 of the 2017 EIA Regulations sets out the information to be provided as part of Environmental Statements, including:

(1) A description of the development, including in particular:
  (a) the location of the development;
  (b) the physical characteristics of the whole development e.g. land-use requirements during the construction and operational phases;
  (c) the main characteristics of the operational phase of the development e.g. the quantity of the materials and natural resources (including water, land, soil and biodiversity) used; and
  (d) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, and types of waste produced during the construction and operation phases.
(2) A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) relevant to the proposed project and its specific characteristics, and reasons for selecting the chosen option, including a comparison of the environmental effects.
(3) A description of the relevant aspects of the current state of the environment (baseline scenario)
(4) A description of the factors likely to be significantly affected by the development: population, human health, biodiversity (e.g fauna and flora), land (e.g. land take), soil (e.g. organic matter, erosion, compaction, sealing), water (e.g. hydromorphological changes, quantity and quality), air, climate (e.g. greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape

Regulation 5 of the 2017 EIA Regulations identifies the description of likely significant effects should cover: direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, and the positive and negative effects of the development.

Site context

The proposal involves mineral extraction on land at the former Hatfield Aerodrome. The former aerodrome buildings and runway have been demolished and part of the site has been redeveloped[1]. The remainder of the site to west of the Ellenbrook is proposed to be used as a country park in accordance with the provisions of the associated section 106 agreement.

The proposed mineral extraction area is situated on the western side of the former aerodrome. The land north of the mineral extraction area is enclosed by fences and is used for conservation grazing. The southern part of the site is used for informal public open space. Additional landscaping has been provided within Ellenbrook Fields as part of an interim agreement with Welwyn Hatfield Borough Council in 2010.

The mineral deposit comprises a superficial drift formed in lower and upper horizons separated by boulder clay. The deposit is underlain by chalk.

The site topography has a gentle fall between 77 and 78m AOD in the northwest corner of the site to between 74 and 76m AOD in the southeast edge of the site adjacent to the A1057.

[1] S6/1999/1064/OP granted planning permission for demolition of the runway and buildings and redevelopment for a business park, hotels, primary school, district centre

The nearest residential settlements to the proposed mineral extraction are situated at Salisbury Village, Ellenbrook, and Smallford.

Proposed development

The area of the proposed mineral extraction is some 87.1 hectares.

The new quarry would comprise the following elements:

- new access onto the public highway (A1057) and internal access road;
- two weighbridges and small office to the north of the site entrance;
- plant site (processing plant, stockpiles, office and other ancillary facilities);
- peripheral screening mounds;
- infiltration lagoon (upper mineral horizon); and
- mineral extraction divided into 7 sequential phases.

The proposal is amended from previous application 5/0394-16 in the following aspects:

- the erection and operation of a concrete batching plant has been removed;
- the distance between the mineral extraction area (LMH) and site boundary increased from 50m to 100m;
- no dewatering from the LMH; and
- relocation of the quarry access 5m to the east to provide space for construction of an acoustic bund on the western flank of the site.

The proposed hours of operation are 0700 to 1800 hours Monday to Friday and 0700 to 1300 hours on Saturdays.

Plant site

The plant site comprises an 11 hectare parcel of land located to the west of Home Covert in the northern part of the site. The River Nast which runs through the plant site area would be diverted from its current course around the north east edge of the plant site. The processing plant consists of static plant comprising a feed hopper, primary screen, washing plant, main screens, cone crusher and linatex sand tower. The aggregate processing plant includes a surge stockpile area, processed stockpiles, freshwater and silt lagoons, and an administration building. A water recharge lagoon would be excavated into the UMH on the eastern boundary of the proposed application site.

Site entrance and haul road

The new highway access with the A1057 would be constructed in the south west corner of the site. The haul road would connect the plant site with the highway access. A wheel wash facility and 2no. weighbridges would be constructed to the north of the highway access.

Extraction

The mineral working would be worked progressively from east to west in 7 sequential phases (A to G). The mineral deposit in the UMH and LMH would be worked in each phase over 4 years. The working method involves the use of excavator to fully remove the mineral from the UMH. The interburden would then be removed in a series of smaller 'cells' to allow extraction of the underlying deposit from within the LMH. The mineral deposit within the LMH would then be worked to a depth not less than 1m above the Chalk surface.

The edges of the mineral void in the UMH would be sealed using low permeability material keyed into the interburden layer at the base of the UMH. A drain would be installed behind the back wall of the cell to convey groundwater away from the mineral working. Any residual water would be pumped from the UMH into the recharge lagoon. The mineral deposit within the LMH would then be excavated from beneath the water table i.e. without dewatering.

Reclamation

Suitable indigenous overburden and interburden materials would be replaced into the base of the LMH in each cell in order to raise the operation above groundwater levels. At which point an engineered barrier of suitable thickness would be constructed and keyed into the engineered barrier formed around the inner edge of the cell. The remaining void would be infilled using both suitable indigenous and imported inert restoration material.

Restoration would be delivered on a progressive basis. The restored landform consists of conservation grassland parcels separated by hedgerows and wetland and pond features. The land use would be similar in character and appearance to the existing Ellenbrook Fields. The objective is to maintain current levels of public access. The restoration would seek to improve net biodiversity interest and value. The reclamation would provide all necessary groundwater and surface water management engineering requirements.

Summary of environmental effects

The likely significant environmental effects relate to:

- Groundwater
- Public Health
- Transport
- Air Quality
- Ecology
- Noise
- Landscape

Groundwater

Groundwater in the UMH aquifer is perched on the boulder clay interburden and flows in a north to northeast direction. The groundwater within the lower aquifer (LMH and Chalk) is regionally extensive and connected hydraulically i.e. in vertical continuity. The groundwater within the lower aquifer flows in a south east direction. The groundwater flows in the lower aquifer are affected by pumping rates at the Hatfield boreholes.

The application site is located within the outer source protection zone (SPZ2) of two public water supply wells located at Hatfield (1,500m southeast) and at Colney Heath (2,200m south southeast) of the application site. The Hatfield boreholes are not used for public water supply. The Colney Heath boreholes are utilised for potable water supply.

The Affinity Water consultation response confirms the EIA process will need to consider the following matters:

(1) Assessment of potential risks caused by the new method of extraction from dry Upper Mineral Horizon (UMH) and wet Lower Mineral Horizon (LMH).
Potential risks may include:
- cross contamination between the LMH/Chalk and the UMH aquifer
- extreme scenarios influencing the migration of the bromate plume
- alteration of LMH aquifer storage and its influence on surrounding groundwater levels

(2) Proposal for additional groundwater level and water quality monitoring to align with the renewed quarry plan in:
- both the UMH and LMH pre-, post- and during operation
- extreme scenarios that consider the new extraction method and triggers associated with this.

(3) Reviewing the cumulative impact of recharge lagoons operated by both CEMEX and Brett quarries, and control mechanisms in place to ensure this does not exacerbate groundwater flood risk in the area.

(4) Restoration of boulder clay layer (or similar of hydraulic properties) post-operation to ensure current hydraulic separation between UMH and LMH/Chalk is maintained

The ES should provide as much information as possible to confirm the position of the Bromate plume in relation to the proposed mineral working. Sufficient borehole data should be provided, to include, additional boreholes and the levels of Bromate and Bromide recorded for as many boreholes as possible, where such data is available. Additionally, the ES should include a Groundwater Management Plan to explain in detail how groundwater in the UMH and LMH will be managed during each phase of the mineral extraction and restoration.

Public Health

The 2017 regulations specifically require the EIA process to take account of the potential effects on population and human health. This should take the form of a Health Impact Assessment (HIA). The consultation response from Hertfordshire County Council as Public Health Authority confirms the ES should include a HIA Chapter. Further, they consider it will be essential to meet the developer before the HIA is commissioned in order to plan the scope and content of the HIA. This should ensure the HIA is robust and appropriate for public health purposes.

Transport

The scoping request indicates the proposal would generate 164 HGV movements associated with the export of aggregates only. This is stated to equate to a net reduction of 10 HGV movements per day (compared with the previous scheme). There is some uncertainty whether the 164 HGV movements includes importation of waste. The Transport Assessment should therefore clarify the total number of HGV movements associated with export of sand and gravel and waste importation.

The increase in HGV movements affecting the local highway network will impact a number of junctions between the site access, the A1057, A1000 and A1(M) with associated traffic congestion and road safety potential impacts.

The Highway Authority response confirms that the TA should include recent traffic count surveys and junction queue lengths to establish demand and actual flows, and apply appropriate future traffic growth forecasts (when the quarry becomes operation and after 5 years); and provide appropriate junction modelling for:

- A1057/Comet Way junction (Further discussions with HCC)
- A1057/Mosquito Way (Further discussions with HCC)
- Ellenbrook Lane/A1057 St Albans Road W/Albatross Way
- A1057/Proposed Site Access Arrangements

The TA should; review road safety and pedestrian and cycle accessibility/ safety; consider existing cycle/pedestrian infrastructure, and the need for cycle and pedestrian improvements, having regard to the A414 corridor Hatfield Consultation document. The revised site access should be subject to (Stage 1) Road Safety Audit (including designer response) and swept path analysis.

In terms of cumulative impact, the TA should model HGV movements associated with other quarries in the local area, plus additional traffic generated by new development in the study area since 2016. In addition, the EIA should consider the potential effects of HGV traffic on the local environment and amenity of residential properties in the vicinity of the site.

Air Quality

The 2016 Air Quality Impact Assessment considered baseline conditions, operational impacts on local sensitive receptors related to soil stripping, haulage, excavation, storage and processing of material, and restoration; operational impacts on local amenity and ecology; and impact of exhaust emissions from HGV traffic on local air quality.

The 2016 assessment considered background particulate levels for PM10 and PM2.5 and proximity to sensitive receptors in line with appropriate guidance[2].

The 2016 assessment concluded:

- background levels are within acceptable limits;
- the proposed development would not significantly increase PM10 or PM2.5 emissions above the levels specified within the Air Quality Objective;
- there would be a low risk of adverse dust effects on sensitive receptors with mitigation measures in place, taking into account distance from the site, frequency of wind direction and proposed site operations;
- negligible risk of residual effects;
- insignificant potential impacts on ecological sites;
- 'small' to 'imperceptible' impacts on air quality from additional HGV traffic using local roads, assessed as negligible impact measured against relevant criteria[3].

The AQIA will require updating to address guidance published since 2016[4]. The baseline data should be updated to reflect latest vehicle emission factors. The AQIA should also consider local air quality strategies adopted since 2016 and issues related to respirable crystalline silica. The ES should include the dust monitoring scheme (required as a pre-commencement condition).

The proposed mitigation includes: limiting the duration of operations; no soil stripping above maximum wind speeds; suspending activities when conditions are unacceptable in the vicinity of sensitive receptors; providing water for dust suppression, appropriate loading of vehicles, sheeting HGVs on public highways, managing mineral stockpiles, appropriate haul road maintenance, enforcement of haul road speed controls, regular use of a road sweeper on haul roads, and timely restoration.

In summary, the proposals to update the AQIA and mitigate adverse emissions to air are considered to be adequate.

[2] LAQM.TG(09)
[33] IAQM / EPUK assessment
[4] Guidance on the Assessment of Mineral Dust Impacts for Planning: Institute of Air Quality Management: September 2016

Ecology

No part of the application site falls within a sensitive area as defined within the EIA Regulations[5]. The ES for application 5/0394-16 identifies 13 main habitats types[6] within the application site.

The proposed development involves the complete destruction of four ponds containing Great Crested Newts populations[7]. A single badger sett would also be relocated. The proposed mitigation includes; creation of new ponds, replacement habitats, and exclusion fencing installed prior to soil stripping. The Ecology Assessment should set out in full the detailed mitigation schemes[8].

The baseline surveys[9] should be updated to ensure all existing habitats and populations are accurately recorded, together with any new habitats established since 2016. The assessment should include proposals to avoid further habitat loss and fragmentation and make provision for biodiversity gains to be delivered at each stage of the development.

The proposals for restoration should accord with the NPPF[10], in particular:

- minimise the impacts on and provide net gains for biodiversity;
- contribute to the establishment of coherent ecological networks resilient to current and future pressures;
- support the maintenance and enhancement of green infrastructure and landscape across local authority boundaries;
- identify and pursue opportunities for securing measurable net gains for biodiversity, and
- deliver measurable biodiversity and ecological improvements in line with DEFRA Biodiversity Metric 2.0.

Noise

The noise assessment (2016) predicted noise levels[11] would not exceed NPG maximum thresholds[12] based on worst case scenarios[13].

Proposed noise mitigation includes perimeter bunds /acoustic fencing, enclosures constructed around plant, broadband reverse warning systems for all mobile machinery, and good management practices.

The 2016 noise assessment should be reviewed to ensure baseline noise survey is robust and sufficient mitigation is available in relation to mineral processing and transport. The review should include measures to control or mitigate noise emissions in accordance with NPG provisions[14]. The noise

[5] i.e. sites of special scientific interest, National Park or Broads, World Heritage Site, scheduled monument, area of outstanding natural beauty or European site
[6] unmanaged neutral grassland; species-poor semi-improved mown grassland; grazed neutral grassland; neutral to acidic grassland; early succession communities with calcareous element; tall ruderal; hedgerows; scattered / dense scrub; recent plantation; and waterbodies, watercourses/wet ditches, recently disturbed bare ground; hard surfaces associated with the former aerodrome use.
[7] Approximate location of the four ponds: (1) Home Covert (2) recharge lagoon, (3) plant area, (4) Phase C
[8] Where European Protected Species are affected an EPS Licence will be required from Natural England
[9] habitat and population surveys: 2016 Environmental Statement
[10] NPPF paragraphs 170, 172, 174
[11] measured against background noise levels
[12] Paragraph: 021 Reference ID: 27-021-20140306
[13] Maximum noise levels measured at the nearest sensitive receptor with operations taking place concurrently
[14] Paragraph: 019 Reference ID: 27-019-20140306

mitigation scheme should include specific proposals to protect the amenity of the nearby noise-sensitive receptors.

Landscape

The proposed mineral extraction and related operations impact landform, landcover, landscape character, and visual amenity. Significant impacts are likely to occur during site preparation and mineral working. The proposed restoration could also have adverse visual effects.

The Landscape and Visual Impact Assessment (LVIA) should assess temporary short terms effects during extraction and restoration, and long term effects (+10 years) on landscape character and visual amenity. The LVIA should include baseline studies of the site and its surroundings and a detailed assessment of landscape character. The LVIA should assess residual effects and their significance after mitigation, and, identify opportunities to enhance landscape character and amenity as part of the restoration.

The LVIA should consider any potential cumulative effects from mineral working taking place at the application site concurrently with the recent permission for mineral extraction at Land adjoining Coopers Green Lane as an extension to Hatfield Quarry[15].

Conclusion

The likely significant environmental effects are considered to relate to: groundwater, public health, transport, air quality, ecology, noise and landscape. The Environmental Statement should include baseline surveys which are up to date and based on local data sources, in particular for air quality. The Environmental Statement should consider the relevant effects of development[16] and the reasonable alternatives. The above scoping opinion addresses the main environmental features likely to be significantly affected in accordance with relevant guidance[17].

Yours sincerely



Brian Owen
Team Leader, Development Management

[15] 5/0394-16 – resolution to grant subject to s106
[16] direct and indirect effects, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development
[17] Paragraph: 036 Reference ID: 4-036-20170728: Enviornmental Statements should be proportionate, tailored to the specific characteristics of the development

BOREHOLE LOG

BOREHOLE No. **BH101L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	12/08/13	75.75maOD	E520040.513 N207950.805

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							75.35		0.40	Grass onto: Firm orange-brown sandy CLAY.	
0.60-0.90	B1								(0.90)	Orange brown sandy fine to coarse GRAVEL. Gravel is fine to coarse rounded to subangular flint.	
							74.45		1.30		
							73.95		(0.50) 1.80	Stiff black grey orange mottled gravelly CLAY. Gravel is fine to medium angular flint.	
1.90-2.20	B2									Orange brown sandy fine to coarse sandy GRAVEL. Gravel is fine to coarse rounded to subangular flint.	
									(2.70)		
3.90-4.20	B3									3.90 ...becoming very sandy...	
							71.25		4.50		
							71.05		4.70	Yellow brown slightly gravelly fine to coarse SAND. Gravel is medium to coarse subrounded flint.	
										Yellow brown silty medium to coarse SAND.	
									(1.90)		
5.90-6.20	B4						69.15		6.60		
7.00-7.50	U100									Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
									(2.70)		
							66.45		9.30		
9.50-10.00	B5								(1.00)	Orange brown slightly sandy GRAVEL. Gravel is fine to coarse rounded to subrounded flint.	

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.2m.
2) Bored 250mm casing to 8.9m, 200mm casing to 19m, bentonite seal from 7.9-8.9m.
3) Two 50mm wells installed, screen from 10.0-14.3m and 16.0-19.0m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	DH	PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH101L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	12/08/13	75.75maOD	E520040.513 N207950.805

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							65.45		10.30		
							65.25		10.50	Firm brown sandy CLAY.	
11										Orange brown slightly sandy GRAVEL. Gravel is fine to coarse angular to rounded flint.	
11.90-12.40	B6									11.90 ...very sandy..	
13									(4.00)		
13.90-14.40	B7						61.25		14.50		
15										White grey CHALK. (recovered as very soft gravelly chalk silt. Gravel is angular flint, chert and chalk)	
16											
17									(4.50)		
18											
19							56.75		19.00		
										Borehole complete at 19.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.2m.
2) Bored 250mm casing to 8.9m, 200mm casing to 19m, bentonite seal from 7.9-8.9m.
3) Two 50mm wells installed, screen from 10.0-14.3m and 16.0-19.0m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	DH	PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH101U**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	13/08/13	75.74maOD	E520037.814 N207951.650

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							75.34		0.40	Grass onto: Firm orange-brown sandy CLAY.	
1.10-1.50	B1						74.44		(0.90) 1.30	Orange brown silty very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint.	
							73.94		(0.50) 1.80	Stiff black grey orange mottled gravelly CLAY. Gravel is fine to medium angular flint.	
3.10-3.50	B2						71.44		(2.50) 4.30	Orange brown slightly silty very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint.	
							69.44		(2.00) 6.30	Yellow brown slightly gravelly fine to coarse SAND. Gravel is medium to coarse subrounded flint.	
							69.04		6.70	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
										Borehole complete at 6.70m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.2m.
2) Bored 200mm to 6.7m.
3) 50mm well installed, screened from 2.1-6.1m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 200	DH	PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH102L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	22/08/13	77.99maOD	E519623.953 N207952.320

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							77.69		0.30	Grass onto: Firm orange-brown sandy CLAY.	
							76.29		(1.40) 1.70	Firm orange brown sandy CLAY.	
							75.99		2.00	Soft orange brown gravelly CLAY. Gravel is fine to coarse rounded flint and quartz.	
3.00-3.40	B1								(3.20)	Soft orange brown very sandy gravelly CLAY. Gravel is fine to medium with occasional coarse rounded to subrounded flint and quartz.	
5.00-5.40	B2						72.79		5.20		
							71.29		(1.50) 6.70	Orange brown silty very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint / chert and quartz.	
									(3.90)	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.2m.
2) Bored 250mm casing to 7.5m, 200mm casing to 18m, bentonite seal from 6.5-7.5m.
3) Two 50mm wells installed, screened from 11.4-13.4m & 15.0-18.0m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	DH	PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH102L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	22/08/13	77.99maOD	E519623.953 N207952.320

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							67.39		10.60	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk. *(continued)*	
							66.99		11.00	Stiff Orange brown slightly sandy CLAY.	
12.00-12.40	B3								(3.10)	Orange brown very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint / chert and quartz.	
							63.89		14.10		
									(3.90)	White grey CHALK. (recovered as very soft gravelly chalk silt. Gravel is angular, fine to coarse flint / chert and chalk).	
							59.99		18.00		
										Borehole complete at 18.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.2m.
2) Bored 250mm casing to 7.5m, 200mm casing to 18m, bentonite seal from 6.5-7.5m.
3) Two 50mm wells installed, screened from 11.4-13.4m & 15.0-18.0m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	DH	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH102U**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	23/08/13	77.94maOD	E519624.815 N207951.093

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							77.64		0.30	Grass onto: Firm orange brown sandy CLAY.	
							76.24		(1.40) 1.70	Firm orange brown sandy CLAY.	
							75.94		2.00	Soft orange brown gravelly CLAY. Gravel is rounded fine to coarse flint and quartz.	
4.00-4.40	B1						72.74		(3.20) 5.20	Soft orange brown very sandy gravelly CLAY. Gravel is fine to medium with occasional coarse, rounded to subrounded flint and quartz.	
6.00-6.40	B2						71.24		(1.50) 6.70	Orange brown very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint, chert and quartz.	
							70.94		7.00	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
										Borehole complete at 7.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm casing to 7M. 3) 50mm well installed, screened from 2.5-6.5m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 200	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH103L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	09/08/13	77.27maOD	E519565.451 N208525.664

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							77.17		0.10	Grass onto: Brown gravelly medium to coarse SAND. Gravels are fine to medium, rarely coarse, rounded to very rounded chert.	
									(0.70)	Soft brown gravelly CLAY. Gravel is fine to medium angular flint and rare chalk.	
							76.47		0.80		
1									(0.60)	Soft to firm brown gravelly slightly sandy CLAY. Gravel is fine to medium angular slightly tabular flint and subangular chert and chalk.	
							75.87		1.40		
2 2.00-2.00	B1								(1.50)	Brown silty very gravelly fine to coarse SAND with rare clay. Gravel is fine to coarse angular to rounded flint and chert. 1.80 ...becoming increasingly gravelly...	
							74.37		2.90		
3									(0.50)	Soft brown slightly gravelly CLAY. Gravel is fine subrounded to subangular chert.	
							73.87		3.40		
									(1.30)	Firm becoming soft grey slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded chert and rare chalk.	
4							72.57		4.70		
5 5.00-5.00	B2								(1.30)	Brown slightly gravelly fine to coarse SAND. Gravel is fine, occasionally medium, angular to subrounded chert.	
							71.27		6.00		
6									(0.50)	Soft grey slightly gravelly CLAY. Gravel is fine, occasionally medium, subrouded to subangular chert.	
							70.77		6.50		
7									(4.20)	Stiff locally very stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded chert and chalk.	
8 8.00-8.45	U100										
9											

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 7.0, 200mm casing to 19.5m, bentonite seal from 6.0-7.0m. 3) Two 50mm wells installed. screened from 16.3-19.5m and 11.0-14.7m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	CS	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH103L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	09/08/13	77.27maOD	E519565.451 N208525.664

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							66.57		10.70	Stiff locally very stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded chert and chalk. *(continued)*	
11							66.27		11.00	Stiff locally very stiff brown slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded chert and chalk	
12.00-12.00	B3						64.27	(2.00)	13.00	Brown and grey slightly sandy GRAVEL. Gravel is fine to coarse angular to rounded mixed lithologies.	
13							63.47	(0.80)	13.80	Brown occasionally grey gravelly coarse SAND. Gravel is fine to medium angular to subrounded quartz and chalk.	
14.00-14.00	B4						61.87	(1.60)	15.40	Brown and grey very sandy GRAVEL. Gravel is fine to coarse angular to rounded chalk and mixed lithologies.	
15							60.47	(1.40)	16.80	White CHALK (recovered as slightly cobbly gravel. Gravel is medium to coarse, occasionally fine, angular to subrounded chalk with occasional black, very angular to angular, medium to coarse flint clasts).	
16.00-16.00	B5						57.77	(2.70)	19.50	White grey CHALK (recovered as slightly silty gravel. Gravel is medium to coarse, occasionally fine, angular to subrounded chalk with rare black angular medium to coarse flint).	
17											
18											
19										Borehole complete at 19.50m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.2m.
2) Bored 250mm casing to 7.0, 200mm casing to 19.5m, bentonite seal from 6.0-7.0m.
3) Two 50mm wells installed. screened from 16.3-19.5m and 11.0-14.7m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	CS	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH103U**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	06/08/13	77.23maOD	E519564.713 N208526.769

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							77.13		0.10	Grass onto: Brown gravelly medium to coarse SAND. Gravel is fine to medium, rarely coarse, rounded to very rounded flint.	
							76.43		(0.70) 0.80	Soft brown gravelly CLAY. Gravel is fine to medium angular slightly tabular flint.	
							75.83		(0.60) 1.40	Soft brown gravelly slightly sandy CLAY. Gravel is fine to medium angular slightly tabular flint and subangular chert and chalk.	
2.00-2.00	B1						74.33		(1.50) 2.90	Brown gravelly coarse SAND with rare clay. Gravel is fine to coarse angular to rounded flint and chert	
							73.83		(0.50) 3.40	Soft brown slightly gravelly CLAY. Gravel is fine to medium subrounded to subangular chert.	
3.40-3.85	U100						72.53		(1.30) 4.70	Firm grey slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded chert and rare chalk.	
							71.23		(1.30) 6.00	No recovery.	
							69.73		(1.50) 7.50	Stiff to very stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded chert and rare chalk.	
										Borehole complete at 7.50m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm casing to 7.5m. 3) 50mm well installed. screened from 3.0-6.0m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: CS	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH104L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	14/08/13	75.06maOD	E519902.757 N208776.232

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							74.76		0.30	Grass onto: Very stiff slightly sandy CLAY.	
							74.06		(0.70) 1.00	Firm to stiff grey and grey brown gravelly CLAY. Gravel is angular to subangular, medium to coarse flint and rare chert.	
2.00-2.00	B1						72.76		(1.30) 2.30	Brown and grey sandy GRAVEL with rare cobbles. Gravel is fine, occasionally medium, rarely coarse, angular to rounded flint and mixed lithologies. Cobbles are subangular to rounded mixed lithologies.	
							71.16		(1.60) 3.90	Brown occasionally orange-brown gravelly coarse SAND. Gravel are fine to medium angular to rounded mixed lithologies.	
							68.46		(2.70) 6.60	Stiff to very stiff grey slightly gravelly CLAY. Gravel is fine to medium, rarely coarse, subangular to rounded chert and chalk.	
7.00-7.45	U100						67.66		(0.80) 7.40	Stiff to very stiff brown slightly gravelly CLAY. Gravel is fine to medium, rarely coarse, subangular to rounded chert and chalk.	
8.00-8.00	B2									Brown and grey slightly to very sandy GRAVEL. Gravel is fine to coarse angular to rounded mixed lithologies.	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 7.0, 200mm casing to 18.5m, bentonite seal from 6.0-7.0m. 3) Two 50mm wells installed. screened from 14.5-18.5m and 8.5-13.5m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: CS	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH104L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	14/08/13	75.06maOD	E519902.757 N208776.232

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
10.00-10.00	B3									Brown and grey slightly to very sandy GRAVEL. Gravel is fine to coarse angular to rounded mixed lithologies. *(continued)*	
12.00-12.00	B4						58.66		(9.00) 16.40		
							56.46		(2.20) 18.60	White CHALK (recovered as cobbly gravels in a chalk silt matrix. Gravel is rounded to subround chalk and angular flint. Cobbles ae rounded to subrounded chalk)	
										Borehole complete at 18.60m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 7.0, 200mm casing to 18.5m, bentonite seal from 6.0-7.0m. 3) Two 50mm wells installed. screened from 14.5-18.5m and 8.5-13.5m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: CS	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH104U**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	19/08/13	75.05maOD	E519901.770 N208775.531

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							74.75		0.30	Grass onto: Firm orange-brown sandy CLAY.	
							74.05		(0.70) 1.00	Firm orange brown gravelly CLAY. Gravel is medium to coarse rounded to subrounded flint.	
1.50-1.70	B1						72.75		(1.30) 2.30	Orange brown very sandy GRAVEL. Gravel is medium to coarse rounded to subrounded flint.	
3.50-3.70	B2						71.15		(1.60) 3.90	Yellow brown gravelly fine to coarse SAND. Gravel is medium to coarse round to subrounded flint.	
							70.55		(0.60) 4.50	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
										Borehole complete at 4.50m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm to 4.5m. 3) 50mm well installed, screened from 1.4-3.9m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 200	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

Form SLR AGS3 UK BH File 140707_408.01009.00064_X_COMPLETE_LCP_LOGS_PW.GPJ 07-07-14

BOREHOLE LOG

BOREHOLE No. **BH105L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	13/08/13	79.86maOD	E520386.899 N209022.845

Project: **HATFIELD AERODROME**

Sheet: 1 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							78.86		(1.00) 1.00	MADE GROUND - Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is medium to coarse angular flint and subangular chert.	
							78.85		1.01	MADE GROUND - Black plastic membrane.	
							78.66		1.20	MADE GROUND - Red COBBLES. Cobbles are angular brick.	
									(2.40)	Soft to stiff brown slightly gravelly CLAY. Gravel is medium to coarse angular flint and chert.	
							76.26		3.60		
							75.16		(1.10) 4.70	Soft to stiff brown slightly gravelly CLAY. Gravel is medium to coarse subangular chert.	
4.70-5.00	B1						74.76		5.10	Brown to orange brown slightly clayey slightly gravelly coarse SAND. Gravel is fine occasionally medium, subangular to subrounded flint.	
									(5.40)	Brown slightly silty to very silty/clayey gravelly fine to coarse SAND. Gravel is fine to medium angular to subrounded flint and chalk.	
6.50-7.00	B2										
8.50-9.00	B3										

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.2m.
2) Bored 250mm casing to 11.5, 200mm casing to 21m, bentonite seal from 10.5-11.5m.
3) Two 50mm wells installed. screened from 17.7-21.0m and 13.7-16.3m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	CS	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH105L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	13/08/13	79.86maOD	E520386.899 N209022.845

Project: **HATFIELD AERODROME**

Sheet: 2 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							69.36		10.50	Brown slightly silty to very silty/clayey gravelly fine to coarse SAND. Gravel is fine to medium angular to subrounded flint and chalk. *(continued)*	
							68.36		(1.00) 11.50	Stiff grey slightly gravelly CLAY. Gravel is fine to coarse angular to subrounded chalk and rare flint.	
12.00-12.45	U100						66.26		(2.10) 13.60	Stiff brown sandy slightly gravelly CLAY. Gravel is medium to coarse angular flint.	
							65.36		(0.90) 14.50	Brown and grey slightly sandy GRAVEL. Gravel is fine to coarse angular to rounded mixed lithologies.	
							64.86		(0.50) 15.00	Stiff brown CLAY.	
15.50-16.00	B4						63.46		(1.40) 16.40	Brown and grey slightly sandy GRAVEL. Gravel is fine to coarse angular to rounded mixed lithologies.	
							61.86		(1.60) 18.00	White CHALK (recovered as slightly cobbly gravel. Gravel is coarse to medium subangular to subrounded chalk with rare black angular medium to coarse flint. Cobbles are subangular to subrounded chalk).	
									(3.00)	White CHALK (recovered as silty gravel. Gravel is medium to coarse subangular to subrounded chalk with rare black angular medium to coarse flint).	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 11.5, 200mm casing to 21m, bentonite seal from 10.5-11.5m. 3) Two 50mm wells installed. screened from 17.7-21.0m and 13.7-16.3m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	CS	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH105L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	13/08/13	79.86maOD	E520386.899 N209022.845

Project: **HATFIELD AERODROME**

Sheet: 3 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
										White CHALK (recovered as silty gravel. Gravel is medium to coarse subangular to subrounded chalk with rare black angular medium to coarse flint). *(continued)*	
							58.86		21.00		
21										Borehole complete at 21.00m	
22											
23											
24											
25											
26											
27											
28											
29											

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.2m.
2) Bored 250mm casing to 11.5, 200mm casing to 21m, bentonite seal from 10.5-11.5m.
3) Two 50mm wells installed. screened from 17.7-21.0m and 13.7-16.3m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	CS	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH105U**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	14/08/13	79.87maOD	E520387.082 N209021.113

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							78.87		(1.00) 1.00	MADE GROUND - Very stiff brown slightly gravelly CLAY. Gravel is medium to coarse angular flint and chert.	
							78.77		1.10	MADE GROUND - Red COBBLES. Cobbles are angular brick.	
									(2.50)	Soft to stiff brown slightly gravelly CLAY. Gravel is medium to coarse angular flint and chert.	
							76.27		3.60		
							75.17		(1.10) 4.70	Soft to stiff brown slightly gravelly CLAY. Gravel is medium to coarse subangular chert and chalk.	
4.70-5.00	B1	0					74.77		5.10	Very soft brown to orange brown mottled grey very sandy CLAY.	
6.00-6.00	B2	0							(5.40)	Brown to orange brown slightly slity/clayey slightly gravelly fine to coarse SAND. Gravel is fine to medium subangular to subrounded flint and chalk.	
8.00-8.00	B3	0									

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm casing to 11m. 3) 50mm well installed. screened from 4.5-10.5m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: CS	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH105U**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	14/08/13	79.87maOD	E520387.082 N209021.113

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							69.37		10.50	Brown to orange brown slightly slity/clayey slightly gravelly fine to coarse SAND. Gravel is fine to medium subangular to subrounded flint and chalk. *(continued)*	
							68.87		(0.50) 11.00	Firm to stiff grey CLAY.	
										Borehole complete at 11.00m	

11 12 13 14 15 16 17 18 19

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm casing to 11m. 3) 50mm well installed. screened from 4.5-10.5m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: CS	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH106L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	07/08/13	73.82maOD	E520409.292 N208178.906

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							73.52		0.30	Grass onto: Firm orange brown sandy CLAY.	
							72.92		(0.60) 0.90	Brown slightly sandy CLAY.	
0.90-1.20	B1								(1.60)	Orange brown very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint.	
2.50-2.70	B2						71.32		2.50	Yellow brown gravelly coarse SAND. Gravel is medium to coarse rounded to subround flint.	
4.50-4.70	B3								(2.70)		
6.00-6.50	U100						68.62		5.20	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
8.60-8.90	B4						65.32		(3.30) 8.50	Orange brown sandy GRAVEL. Gravel is medium to coarse rounded to subrounded flint.	
									(2.10)		

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.2m.
2) Bored 250mm casing to 7.5m, 200mm casing to 19m, bentonite seal from 6.5-7.5m.
3) Two 50mm wells installed, screened from 9.0-12.0m & 15.0-19.0m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	DH	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH106L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	07/08/13	73.82maOD	E520409.292 N208178.906

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							63.22		10.60	Orange brown sandy GRAVEL. Gravel is medium to coarse rounded to subrounded flint. *(continued)*	
							62.72	(0.50)	11.10	Soft yellow brown slightly gravelly CLAY. Gravel is fine rounded to subrounded flint and rare chalk.	
11.10-11.30	B5						62.22	(0.50)	11.60	Orange brown sandy GRAVEL. Gravel is fine to coarse rounded to subrounded flint.	
							61.92		11.90	Soft yellow brown sandy CLAY.	
							60.32	(1.60)	13.50	Orange brown slightly to very sandy fne to coarse GRAVEL. Gravel is rounded to subrounded flint.	
13.10-13.30	B6						58.82	(1.50)	15.00	White CHALK. (recovered silty gravel and cobbles. Gravel is angular medium flint and chalk. Cobbles are angular chalk).	
							54.82	(4.00)	19.00	White CHALK (recovered soft chalk silt)	
										Borehole complete at 19.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 7.5m, 200mm casing to 19m, bentonite seal from 6.5-7.5m. 3) Two 50mm wells installed, screened from 9.0-12.0m & 15.0-19.0m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH106U**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	08/08/13	73.82maOD	E520409.017 N208180.311

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							73.52		0.30	Grass onto: Firm orange brown sandy CLAY.	
							72.92		(0.60) 0.90	Brown slightly sandy CLAY.	
1.30-1.50	B1						71.32		(1.60) 2.50	Orange brown sandy GRAVEL. Gravel is fine to coarse rounded to subangular flint.	
3.30-3.50	B2						68.62		(2.70) 5.20	Yellow brown gravelly fine to coarse SAND. Gravel is fine to coarse rounded to subrounded flint.	
							68.32		5.50	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
										Borehole complete at 5.50m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm to 5.5m. 3) 50mm well installed, creened from 2.3-5.3m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 200	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH107L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	18/02/14	77.25maOD	E519796 N208135

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							76.35		(0.90) 0.90	Grass onto: Soft brown sandy CLAY.	
1.50-2.00	B1									Orangebrown very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint.	
3.00-3.50	B2						73.05		(3.30) 4.20		
4.50-5.00	B3						72.75		4.50	Stiff brown orange mottled sandy gravelly CLAY. Gravel is fine to medium angular flint.	
									(2.00) 6.50	Yellow brown fine to coarse SAND.	
6.50-6.90	D4						70.75				
							70.35		6.90	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
										Borehole complete at 6.90m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 0.5m - pit infilled with water. 2) Bored 150mm to 6.9m. 3) 50mm well installed, screened from 0.7-6.7m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 150	Logged By: RM	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **FT101**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	16/08/13	76.46maOD	E519874.462 N208535.875

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							75.96		(0.50) 0.50	Grass onto: Firm orange brown sandy CLAY.	
0.50-0.70	B1									Orange brown clayey sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint and chert.	
2.50-2.70	B2								(3.50)		
							72.46		4.00		
							71.96		(0.50) 4.50	Orange brown slightly gravelly medium SAND. Gravel is angular to rounded fine to coarse flint.	
							71.66		4.80	Stiff orange brown CLAY.	
										Borehole complete at 4.80m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm to 4.8m. 3) 50mm well installed, screened from 2.0-4.5m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 200	Logged By: DH	Approved By: PW

Form SLR AGS3 UK BH File 140707_408.01009.00064_X_COMPLETE_LCP_LOGS_PW.GPJ 07-07-14

BOREHOLE LOG

BOREHOLE No. **FT102**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	15/08/13	77.07maOD	E519801.096 N208548.599

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							76.87		0.20	Grass onto: Firm orange brown sandy CLAY.	
							76.57		0.50	Firm dark brown sandy slightly gravelly CLAY. Gravel is angular fine flint.	
0.50-0.70	B1									Orange brown sandy GRAVEL with occasional sandy clay lenses. Gravel is medium to coarse rounded to subangular flint / chert.	
									(2.00)		
							74.57		2.50		
2.50-2.70	B2									Light grey clayey very sandy GRAVEL with occasional sandy clay lenses. Gravel is medium to coarse rounded to subangular flint / chert.	
									(1.90)		
							72.67		4.40		
4.50-4.70	B3									Orange brown slightly gravelly medium SAND. Gravel is fine angular flint.	
									(1.80)		
							70.87		6.20		
							70.57		6.50	Stiff orange brown CLAY.	
							70.27		6.80	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
										Borehole complete at 6.80m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm to 6.8m. 3) 50mm well installed, screened from 2.0-6.0m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 200	Logged By: DH	Approved By: PW

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BOREHOLE LOG

BOREHOLE No. **FT103**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	14/08/13	77.69maOD	E519800.953 N208477.891

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							77.49		0.20	Grass onto: Firm orange brown sandy CLAY.	
									(1.00)	Light brown firm mottled sandy CLAY.	
							76.49		1.20		
1.20-1.50	B1									Orange brown slightly silty sandy to very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint / chert.	
									(2.90)		
3.20-3.50	B2										
							73.59		4.10		
							73.39		4.30	Firm light brown sandy CLAY.	
4.30-4.50	B3									Orange brown slightly gravelly medium SAND. Gravel is medium to coarse angular flint.	
5.30-5.50	B4								(2.60)		
							70.79		6.90		
							70.49		7.20	Firm light brown sandy CLAY.	
							69.99		(0.50) 7.70	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
										Borehole complete at 7.70m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm to 7.7m. 3) 50mm well installed, screened from 1.8-6.8m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 200	Logged By: DH	Approved By: PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No.
BH105UX

Client:
BRETT AGGREGATES LTD

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	20/05/14	80.04maOD	E520385 N209021

Project:
HATFIELD AERODROME

Sheet:
1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							79.94		0.10	Grass onto TOPSOIL (Brown sandy CLAY containing rootlets occasional coarse flinty gravel).	
									(1.10)	Soft orange brown slightly sandy slightly gravelly CLAY. Gravel is fine with rare coarse chert.	
1							78.84		1.20		
									(1.60)	Soft to firm orange brown and grey mottled slightly gravelly CLAY. Gravel comprises medium subangular flint.	
2							77.24		2.80		
									(1.90)	Stiff to very stiff light brown sandy gravelly CLAY. Gravel is fine chalk and fine to coarse subangular to subrounded flint, quartz and chert.	
3							75.34		4.70		
4							75.24		4.80	Orange to pale yellow slightly clayey fine SAND.	
										Orange to pale yellow brown gravelly fine to medium becoming coarse SAND. Gravel is fine to coarse subangular to rounded flint.	
5									(5.70)		
6											
7											
8											
9											

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) 50mm well installed, screened 4.5-10.5m.

All dimensions in metres Scale 1:62.5	Contractor: SLR Consulting Plant: Dando	Method: Cable Percussion Hole Size: 200mm	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH105UX**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	20/05/14	80.04maOD	E520385 N209021

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							69.54		10.50	Orange to pale yellow brown gravelly fine to medium becoming coarse SAND. Gravel is fine to coarse subangular to rounded flint. *(continued)*	
							68.94		(0.60) 11.10	Firm grey brown slightly sandy CLAY with flecks of chalk and fine to medium flint gravel.	
										Borehole complete at 11.10m	

11 12 13 14 15 16 17 18 19

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) 50mm well installed, screened 4.5-10.5m.

All dimensions in metres Scale 1:62.5	Contractor: SLR Consulting Plant: Dando	Method: Cable Percussion Hole Size: 200mm	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH107L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	02/05/14	77.21maOD	E519795 N208133

Project: **HATFIELD AERODROME**

Sheet: 1 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							76.71		(0.50) 0.50	Grass onto TOPSOIL (Brown sandy CLAY containing rootlets).	
							76.01		(0.70) 1.20	Firm orange brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded to subangular flint.	
1.20-2.20	B1	<5								Orange brown sandy fine to coarse GRAVEL. Gravel is subangular to rounded flint with occasional subrounded flint cobbles.	
2.20-3.20	B2	<5							(2.10)		
3.20-4.20	B3	<5					73.91		3.30		
							73.71		3.50	Orange brown sandy CLAY with occasional gravel. Gravel is fine to medium subangular chert and flint.	
4.20-5.20	B4	<5								Orange brown slightly gravelly fine to coarse SAND. Gravel is medium to coarse subangular to subrounded flint with rare chalk.	
5.20-6.20	B5	<5							(3.00)		
							70.71		6.50		
							70.21		(0.50) 7.00	Brown fine to medium SAND with at 6.80m pockets of soft red brown clay.	
									(2.00)	Firm to stiff grey slightly sandy gravelly CLAY. Gravel comprises fine subangular flint and chalk.	
							68.21		9.00		
							67.41		(0.80) 9.80	Firm to stiff orange brown slightly sandy slightly gravelly CLAY. Gravel is fine subangular to subrounded chert and chalk.	
9.80-10.80	B6	<5					67.31		9.90	Soft to firm orange brown slightly sandy gravelly CLAY. Gravel is fine to medium	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) Bored 250mm to 9.0m and 200mm to base. 3) 50mm wells installed, screened 11.0-16.0m and 20.3-23.3m.

All dimensions in metres Scale 1:62.5	Contractor: SLR Consulting Plant: Dando	Method: Cable Percussion Hole Size: 250/200mm	Logged By: DH	Approved By: PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH107L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	02/05/14	77.21maOD	E519795 N208133

Project: **HATFIELD AERODROME**

Sheet: 2 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
										angular to rounded flint, quartz and chert with occasional cobbles of flint. Brown sandy medium to coarse GRAVEL. Gravel is subangular to rounded flint and quartz with frequent flint cobbles. *(continued)*	
10.80-11.80 11	B7	<5							(1.70)		
							65.61		11.60		
11.80-12.80 12	B8	<5								Brown very sandy medium to coarse GRAVEL with pockets of clay. Gravel is subangular to rounded flint, quartz and chert with occasional rounded to subrounded flint cobbles.	
12.80-13.80 13	B9	<5									
13.80-14.80 14	B10	<5									
14.80-15.80 15	B11	<5							(6.20)		
15.80-16.80 16	B12	<5									
16.80-17.80 17	B13	<5									
							59.41		17.80		
17.80-18.30 18	B14	<5							(0.50)	Brown very sandy medium to coarse GRAVEL.Gravel is subangular to round flint, quartz and chert with frequent rounded to subrounded flint and occasional chalk cobbles.	
							58.91		18.30		
19										Grey white CHALK. (Recovered as coarse gravel to cobble sized fragments of chalk).	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) Bored 250mm to 9.0m and 200mm to base. 3) 50mm wells installed, screened 11.0-16.0m and 20.3-23.3m.

All dimensions in metres	Contractor: SLR Consulting	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando	Hole Size: 250/200mm	DH	PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH107L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	02/05/14	77.21maOD	E519795 N208133

Project: **HATFIELD AERODROME**

Sheet: 3 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
										Grey white CHALK. (Recovered as coarse gravel to cobble sized fragments of chalk). *(continued)*	
21									(5.00)		
22											
23							53.91		23.30		
										Borehole complete at 23.30m	
24											
25											
26											
27											
28											
29											

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) Bored 250mm to 9.0m and 200mm to base. 3) 50mm wells installed, screened 11.0-16.0m and 20.3-23.3m.

All dimensions in metres Scale 1:62.5	Contractor: SLR Consulting Plant: Dando	Method: Cable Percussion Hole Size: 250/200mm	Logged By: DH	Approved By: PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH108L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	19/05/14	79.71maOD	E520303 N208926

Project: **HATFIELD AERODROME**

Sheet: 1 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							79.31		0.40	Turf onto TOPSOIL (Brown sandy CLAY containing rootlets).	
									(4.30)	Soft to firm becoming stiff to very stiff orange brown and grey mottled slightly sandy slightly gravelly CLAY. Gravel is fine to medium rounded to subrounded flint with occasional coarse subrounded gravel.	
							75.01		4.70		
4.70-5.70	B1	<5							(5.90)	Orange yellow brown slightly gravelly fine to medium SAND. Gravel is fine to coarse rounded to subrounded flint and quartz, becoming more gravelly at 6.5m with clay pockets near base.	
5.70-6.70	B2	<5									
6.70-7.70	B3	<5									
7.70-8.70	B4	<5									
8.70-9.70	B5	<5									
9.70-10.50	B6	<5									

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) Bored 250mm to 11.9m and 200mm to base. 3) 50mm wells installed, screened 14.0-15.5m and 18.5-21.5m.

All dimensions in metres	Contractor: SLR Consulting	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando	Hole Size: 250/200mm	DH	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH108L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	19/05/14	79.71maOD	E520303 N208926

Project: **HATFIELD AERODROME**

Sheet: 2 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							69.11		10.60	Orange yellow brown slightly gravelly fine to medium SAND. Gravel is fine to coarse rounded to subrounded flint and quartz, becoming more gravelly at 6.5m with clay pockets near base. *(continued)*	
							68.51	(0.60)	11.20	Very stiff grey brown sandy gravelly CLAY. Gravel is fine rounded to subrounded flint and flecks of chalk.	
							65.91	(2.60)	13.80	Stiff to very stiff brown sandy gravelly CLAY. Gravel is fine to medium rounded to subrounded flint, quartz and scattered fine chalk. With occasional rounded to subrounded flint cobbles.	
14.00-15.00	B7	<5					65.71		14.00	Firm to stiff becoming soft brown sandy gravelly CLAY with frequent coarse subangular to subrounded gravel and flint, chert and quartz cobbles.	
							65.01	(0.70)	14.70	Brown slightly sandy GRAVEL becoming clayey at base. Gravel is fine to coarse angular to rounded flint and chert with occasional rounded flint cobbles.	
15.00-16.00	B8	<5					64.61		15.10	Brown gravelly medium to coarse SAND. Gravel is fine to coarse subangular to rounded flint, chert and quartz.	
16.00-16.50	B9	<5					63.21	(1.40)	16.50	Brown slightly sandy GRAVEL. Gravel is fine to coarse angular to rounded flint, chert and quartz with occasional rounded to subrounded flint cobbles.	
							63.11		16.60	Gey white gravelly chalky CLAY. Gravel is coarse chalk and flint.	
							61.71	(1.40)	18.00	Grey white CHALK (Recovered as coarse gravel to cobble sized fragments of chalk with rare flint cobbles).	
							61.31		18.40	Flint GRAVEL and COBBLES	
										White CHALK. (Recovered as coarse gravel to cobble sized fragments of chalk).	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) Bored 250mm to 11.9m and 200mm to base. 3) 50mm wells installed, screened 14.0-15.5m and 18.5-21.5m.

All dimensions in metres Scale 1:62.5	Contractor: SLR Consulting Plant: Dando	Method: Cable Percussion Hole Size: 250/200mm	Logged By: DH	Approved By: PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH108L&C**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	19/05/14	79.71maOD	E520303 N208926

Project: **HATFIELD AERODROME**

Sheet: 3 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
									(3.10)	White CHALK. (Recovered as coarse gravel to cobble sized fragments of chalk). *(continued)*	
21							58.21		21.50		
										Borehole complete at 21.50m	
22											
23											
24											
25											
26											
27											
28											
29											

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.20m.
2) Bored 250mm to 11.9m and 200mm to base.
3) 50mm wells installed, screened 14.0-15.5m and 18.5-21.5m.

All dimensions in metres	Contractor: SLR Consulting	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando	Hole Size: 250/200mm	DH	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH108U**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	08/05/14	79.71maOD	E520303 N208927

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							79.31		0.40	Grass onto TOPSOIL (Brown clayey SAND containing rootlets).	
									(4.30)	Stiff orange grey brown mottled sandy slightly gravelly CLAY. Gravel comprises fine to medium rounded to subrounded flint.	
							75.01		4.70		
4.70-5.70	B1	<5							(5.80)	Orange to pale yellow slightly gravelly fine to medium grading into coarse SAND. Gravel comprises rounded to subrounded flint and occasional quartz with occasional pockets of clay at 10.1m.	
5.70-6.70	B2	<5									
6.70-7.70	B3	<5									
7.70-8.70	B4	<5									
8.70-9.70	B5	<5									
9.70-10.50	B6	<5									

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) 50mm well installed, screened 4.5 to 10.5m.

All dimensions in metres Scale 1:62.5	Contractor: SLR Consulting Plant: Dando	Method: Cable Percussion Hole Size: 200mm	Logged By: DH	Approved By: PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH108U**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	08/05/14	79.71maOD	E520303 N208927

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							69.21		10.50		
							68.71		(0.50) 11.00	Very stiff grey brown sandy gravelly CLAY. Gravel is fine rounded to subrounded flint and flecks of chalk.	
										Borehole complete at 11.00m	

11 12 13 14 15 16 17 18 19

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) 50mm well installed, screened 4.5 to 10.5m.

All dimensions in metres Scale 1:62.5	Contractor: SLR Consulting Plant: Dando	Method: Cable Percussion Hole Size: 200mm	Logged By: DH	Approved By: PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH201L**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	14/05/14	79.00maOD	E520233 N208856

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							78.50		(0.50) 0.50	Grass onto TOPSOIL (Brown sandy CLAY containing rootlets).	
							74.70		(3.80) 4.30	Firm to stiff orange grey slightly sandy slightly gravelly CLAY. Gravel is fine flint with rare coarse fragments.	
							73.50		(1.20) 5.50	Stiff to very stiff brown grey gravelly CLAY. Gravel is fine to medium rounded to subrounded chalk with occasional fine to medium flint and occasional chalk cobbles.	
5.50-6.50	B1	<5					69.30		(4.20) 9.70	Orange brown fine to medium becoming coarse SAND.	
6.50-7.50	B2	<5									
7.50-8.50	B3	<5									
8.50-9.50	B4	<5									

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) Bored 250mm to 11.0m, 200mm to 15.5m, 150mm to base. 3) 50mm wells installed, screened 12.9-13.9m and 15.0-18.3m.

All dimensions in metres Scale 1:62.5	Contractor: SLR Consulting Plant: Dando	Method: Cable Percussion Hole Size: 250/200/150mm	Logged By: DH	Approved By: PW

Form SLR AGS3 UK BH File 140703_402.01009.00064_BH107TOBH201_2014_LCP_LOGS_PW.GPJ 07-07-14

BOREHOLE LOG

BOREHOLE No. **BH201L**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	14/05/14	79.00maOD	E520233 N208856

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							67.40		(1.90) 11.60	Stiff to very stiff grey to dark grey slightly sandy gravelly CLAY. Gravel is fine to coarse subangular to rounded chalk and rare flint. *(continued)*	
							66.10		(1.30) 12.90	Firm brown sandy gravelly CLAY. Gravel is medium to coarse rounded to subrounded flint with scattered fine chalk and occasional flint cobbles.	
12.90-13.90	B5	<5					65.10		(1.00) 13.90	Orange brown sandy coarse GRAVEL. Gravel is fine to coarse angular to rounded flint with occasional cobbles.	
							64.80		14.20	Firm to stiff orange brown slightly sandy slightly gravelly CLAY. Gravel is coarse subangular flint.	
							63.50		(1.30) 15.50	Soft orange brown grey mottled slightly gravelly CLAY. Gravel is medium to coarse subangular to rounded flint.	
15.50-16.50	B6	<5					61.60		(1.90) 17.40	Grey slightly clayey sandy GRAVEL. Gravel is fine to coarse angular to rounded flint and quartz with occasional flint cobbles.	
16.50-17.40	B7	<5					60.90		(0.70) 18.10	Soft brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded flint and quartz.	
							60.70		18.30	Brown coarse sandy GRAVEL with pockets of chalky clay. Gravel is subangular to subrounded flint with occasional cobbles.	
							60.40		18.60	Stiff light brown to white slightly gravelly CLAY. Gravel is fine chalk and coarse rounded to subangular flint.	
							60.10		18.90	Grey white CHALK. (Recovered as coarse gravel to cobble sized fragments of chalk).	
										Borehole complete at 18.90m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.20m.
2) Bored 250mm to 11.0m, 200mm to 15.5m, 150mm to base.
3) 50mm wells installed, screened 12.9-13.9m and 15.0-18.3m.

All dimensions in metres	Contractor: SLR Consulting	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando	Hole Size: 250/200/150mm	DH	PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No.
BH 301 L&C

Client:
ROBERT BRETT & SONS LTD

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	27/09/16	76.67maOD	E519569.963 N208834.843

Project:
HATFIELD AERODROME

Sheet:
1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.50	E	<1							(0.80)	MADE GROUND: Light brown slightly gravelly SAND. Gravel is subangular to subrounded fine to coarse flint.	
0.80	E	<1					75.87		0.80	0.60 - 0.70 2" clay pipe, dry. NW-SE orientation.	
1 1.50	E	1							(0.80)	Light brown slightly clayey gravelly SAND. Gravel is fine to medium angular to subrounded flint, with localised pockets of firm light grey gravelly CLAY. Gravel is fine to medium angular to subrounded flint.	
2 2.00	E	1					75.07		1.60	Light brown fine GRAVEL of sub angular to angular flint and quartz, rare medium gravel.	
3 3.00	E	<1					73.87		(1.20) 2.80	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine subangular to angular flint.	
4 4.00	E	2									
5 5.00	E	<1							(4.20)	5.00 - 7.00 Becoming Stiff dark grey brown slightly gravelly CLAY. Gravel is fine rounded chalk.	
6 6.00	E	<1									
7 7.00	E	<1					69.67		7.00	Light brown/yellow fine SAND with occasional gravel. Gravel is fine to medium subangular to subrounded flint.	
8 8.00	E	<1					68.67		(1.00) 8.00	Light brown/orange sandy GRAVEL. Gravel is fine to medium angular to rounded flint and occasional flint cobbles with dark grey clay pockets (undefined layers).	
9 9.00	E	<1					67.07		(1.60) 9.60	Yellow/ light brown CHALK recovered as chalk silt with gravel of angular fine to medium flint, sub rounded medium off-white chalk gravel and occasional flint cobbles.	
10 10.00	E	<1									
11 11.00	E	<1									

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Dual well installed, screened 7.3m to 9.3m and 12.0 - 15.0m.

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 2000	Method: Cable Percussion Hole Size: 200mm	Logged By: CC	Approved By: JH

BOREHOLE LOG

BOREHOLE No.
BH 301 L&C

Client:
ROBERT BRETT & SONS LTD

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	27/09/16	76.67maOD	E519569.963 N208834.843

Project:
HATFIELD AERODROME

Sheet:
2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
12 12.00	E	<1								Yellow/ light brown CHALK recovered as chalk silt with gravel of angular fine to medium flint, sub rounded medium off-white chalk gravel and occasional flint cobbles. *(continued)*	
13 13.00	E	<1							(5.40)		
14 14.00	E	<1									
15							61.67		15.00		
										Borehole complete at 15.00m	
16											
17											
18											
19											
20											
21											
22											

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Dual well installed, screened 7.3m to 9.3m and 12.0 - 15.0m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 2000	Hole Size: 200mm	CC	JH

BOREHOLE LOG

BOREHOLE No.
BH302 L&C

Client:
ROBERT BRETT & SONS LTD

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	06/10/16	76.27maOD	E519374.23 N208616.749

Project:
HATFIELD AERODROME

Sheet:
1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.50	HS	<1					75.67		(0.60) 0.60	MADE GROUND: Light brown gravelly SAND. Gravel is angular to subangular fine to coarse flint, brick and concrete.	
1 1.00	HS	<1								Light brown sandy clayey GRAVEL. Gravel is subangular to rounded, fine to medium flint with occasional cobbles.	
										1.50 - 4.00 No longer clayey.	
2 2.00	HS	<1							(3.40)		
3 3.00	HS	<1									
4 4.00	HS	<1					72.27		4.00		
							71.77		4.50	Light brown slightly gravelly SAND. Gravel is angular to subangular fine flint.	
							71.67		4.60	Firm light brown mottled light grey slightly sandy CLAY.	
5 5.00	HS	<1							(1.60)	Firm dark grey CLAY. 5.00 rare gravels.	
6 6.00	HS	<1					70.07		6.20		
7 7.00	HS	<1								Light orange brown sandy GRAVEL. Gravel is rounded to angular fine to coarse flint, sandstone and quartz with occasional cobbles.	
8 8.00	HS	<1							(4.80)		
9 9.00	HS	<1									
10 10.00	HS	<1									
11 11.00	HS	<1					65.27		11.00		
										Firm brown grey slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to medium flint.	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Dual well installed, screened 15.3m to 16.0m and 18.0 - 22.0m.

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 2000	Method: Cable Percussion Hole Size: 200mm	Logged By: CC	Approved By: JH

Form SLR AGS3 UK BH File 161014_402.01009.00174_BH_LOGS_TW.GPJ 23-03-17

BOREHOLE LOG

BOREHOLE No. **BH302 L&C**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	06/10/16	76.27maOD	E519374.23 N208616.749

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
									(1.00)	Firm brown grey slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to medium flint. *(continued)*	
12 12.00	HS	<1					64.27		12.00	Stiff dark grey brown slightly gravelly CLAY. Gravel is subrounded to rounded fine chalk and subangular to subrounded fine to medium flint and siltstone.	
13 13.00	HS	<1							(3.00)		
14 14.00	HS	<1									
15 15.00	HS	<1					61.27		15.00		
							60.97		15.30	Stiff orange brown slightly gravelly CLAY. Gravel is subrounded to subangular fine to medium flint, quartz and siltstone.	
							60.27		(0.70) 16.00	Light brown sandy GRAVEL. Gravel is rounded to subangular fine to course flint, sandstone and quartz with occasional cobbles.	
16 16.00	HS	<1					59.97		16.30	Stiff orange brown slightly gravelly slightly sandy CLAY. Gravel is subrounded to angular fine to medium flint, sandstone and chalk.	
17 17.00	HS	<1								Yellow white CHALK recovered as weathered chalk silt with sub rounded to rounded fine to medium chalk gravel and fine to medium angular flint. 16.30 Recovered chalk gravel. 17.00 Sample recovered as chalk gravel.	
18 18.00	HS	<1								18.00 First sign of weathered chalk.	
19 19.00	HS	<1							(5.70)		
20 20.00	HS	<1									
21 21.00	HS	<1								21.00 Sample recovered as chalk gravel.	
22 22.00	HS	<1					54.27		22.00		
										Borehole complete at 22.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Dual well installed, screened 15.3m to 16.0m and 18.0 - 22.0m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 2000	Hole Size: 200mm	CC	JH

BOREHOLE LOG

BOREHOLE No.
BH305 L&C

Client:
ROBERT BRETT & SONS LTD

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	13/10/16	79.05maOD	E520049.621 N209317.092

Project:
HATFIELD AERODROME

Sheet:
1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							78.65		0.40	MADE GROUND: Grass over brown slightly gravelly slightly sandy SILT. Gravel comprises fine to coarse angular to rounded flint, brick and ceramic with frequent rootlets.	
0.50		<1								Firm orange brown slightly gravelly slightly sandy CLAY. Gravel comprises subangular to subrounded fine to coarse flint and chalk, sand is fine to coarse.	
1 1.20		<1							(2.40)		
2 2.00		<1					76.25		2.80		
2.80		<1								Firm to stiff brown mottled grey and white slightly sandy gravelly CLAY. Gravel comprises fine to medium subrounded to rounded chalk and flint, sand is fine to coarse. 3.00 - 4.80 Becoming stiff clay 3.50 - 4.80 No longer mottled grey and with fine to coarse gravel	
3 4 4.00		<1							(2.00)		
4.80		<1					74.25		4.80		
5 6 6.00		<1								Orange brown slightly gravelly SAND. Gravel comprises fine to coarse subrounded to rounded flint, sand is medium to coarse.	
7 7.20		<1							(2.40)		
8							71.85		7.20		
9 9.00		<1								Stiff dark brown mottled grey slightly sandy gravelly CLAY. Gravel comprises fine to coarse subangular to rounded flint, sand is fine to coarse. 7.40 - 10.50 Becoming dark grey	
10 10.00		<1							(3.80)		
										10.50 - 11.00 Becoming brown mottled grey	
11 11.00		<1					68.05		11.00		
										Firm soft orange brown sandy very gravelly CLAY. Gravel comprises fine to coarse subrounded to rounded flint, sand is fine to coarse.	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Dual well installed, screened 14.0-16.9m and 19.5-22.5m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 2000	Hole Size: 200mm	FC	JH

BOREHOLE LOG

BOREHOLE No. **BH305 L&C**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	13/10/16	79.05maOD	E520049.621 N209317.092

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
									(1.00)	Firm soft orange brown sandy very gravelly CLAY. Gravel comprises fine to coarse subrounded to rounded flint, sand is fine to coarse. *(continued)*	
12 12.00		<1					67.05		12.00		
									(0.60)	Orange brown slightly gravelly clayey SAND. Gravel comprised fine to coarse subangular to rounded flint, sand is fine to coarse.	
12.60		<1					66.45		12.60	12.20 - 12.60 Becoming very gravelly	
13										Orange brown sandy GRAVEL. Gravel comprises fine to coarse subangular to rounded, sand is fine to coarse.	
13.50		2							(2.40)		
14										14.00 - 15.00 Becoming very sandy	
14.50	E	3									
15 15.00		1					64.05		15.00		
							63.95		15.10	Soft orange brown sandy CLAY. Sand is fine to coarse.	
15.50		1								Orange brown sandy GRAVEL. Gravel comprises fine to coarse subangular to rounded, sand is fine to coarse.	
16 16.00		1							(2.40)		
16.50		2									
17							61.55		17.50		
17.50		2								Soft white mottled brown slightly gravelly CLAY. Gravel is subangular/subrounded of chalk.	
18											
18.50		3							(2.00)		
19 19.00		3					59.55		19.50		
										Silty GRAVEL and COBBLES. Gravel and cobbles comprise subrounded to rounded flint within a silty chalk matrix.	
20											
21									(3.00)		
22											
							56.55		22.50		
										Borehole complete at 22.50m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Dual well installed, screened 14.0-16.9m and 19.5-22.5m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 2000	Hole Size: 200mm	FC	JH

BOREHOLE LOG

BOREHOLE No. **BH306U**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	17/10/16	79.01maOD	E520234.233 N208855.845

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.40	HS	<1					78.51		0.50	Grass over brown very sandy CLAY containing rootlets and occasional sub angular to sub rounded fine to medium flint.	
1.00	HS	<1								Firm to stiff orange mottled grey CLAY with rare fine sub angular flint gravel.	
1.50	HS	<1									
2.00	HS	<1							(3.70)		
3.00	HS	<1									
4.00	HS	<1					74.81		4.20		
4.50	HS	<1								Stiff brown gravelly CLAY. Gravel comprises sub angular to sub rounded fine to medium off-white chalk, rare chalk cobbles and occasional sub angular to sub rounded fine to medium flint.	
5.00	HS	<1							(1.30)		
							73.51		5.50		
6.00	HS	<1								Orange brown fine to medium SAND.	
7.00	HS	<1									
8.00	HS	<1							(4.40)		
9.00	HS	<1									
							69.11		9.90		
10.00	HS	<1							(0.80)	Stiff to very stiff dark grey slightly gravelly CLAY. Gravel comprises angular to sub rounded fine to medium flint and chalk.	
							68.31		10.70		
										Borehole complete at 10.70m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 4.6m to 9.9m

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 3000	Method: Cable Percussion Hole Size: 200mm	Logged By: CB	Approved By: JH

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BOREHOLE LOG

BOREHOLE No. **BH307U**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	14/10/16	79.69maOD	E520132.067 N208917.503

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.20	HS	<1					79.29		0.40	MADE GROUND: Brown clayey gravelly SAND. Gravel comprises fine to coarse angular to sub rounded flint and occasional fine red brick fragments. Sand is fine.	
1.00	HS	<1								Firm orange brown mottled grey gravelly CLAY. Gravel comprises fine to coarse angular to rounded flint and off-white chalk fragments.	
2.00	HS	<1							(3.20)		
3.00	HS	<1					76.09		3.60		
4.00	HS	<1								Firm orange brown mottled grey, slightly gravelly CLAY. Gravel comprises fine to medium sub angular to sub rounded flint.	
5.00	HS	<1									
6.00	HS	<1							(5.10)		
8.00	HS	<1									
8.50	HS	<1					70.99		8.70		
							70.49		9.20	Stiff dark grey slightly gravelly CLAY. Gravel comprises angular to sub rounded fine to medium flint and chalk.	
										Borehole complete at 9.20m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 3.6m to 8.6m.

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 3000	Method: Cable Percussion Hole Size: 200mm	Logged By: CB	Approved By: JH

BOREHOLE LOG

BOREHOLE No. **GMW101**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	11/10/16	78.78maOD	E519370.944 N208391.466

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.50	HS	<1					78.18		(0.60) 0.60	Brown silty, sandy CLAY with rare fine subangular flint gravel. Sand is fine.	
1.00	HS	<1					77.68		1.10	Orange brown sandy gravelly CLAY. Sand is fine. Gravel comprises fine to coarse angular to rounded flint.	
1.50	HS	<1								Orange SAND and GRAVEL. Sand is fine. Gravel comprises fine to medium (with occasional coarse) angular to subrounded flint.	
2.00	HS	<1									
2.50	HS	<1							(3.00)		
3.00	HS	<1									
3.50	HS	<1					74.68		4.10		
4.50	HS	<1					74.08		(0.60) 4.70	Orange brown mottled grey slightly gravelly CLAY with occasional sand pockets. Sand is fine to medium. Gravel is fine to medium angular to subrounded flint.	
5.00	HS	<1					73.28		(0.80) 5.50	Stiff grey CLAY with occasional subangular to subrounded, fine white chalk gravel.	
5.50	HS	<1								Borehole complete at 5.50m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 0.5m to 4.1m.

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 3000	Method: Cable Percussion Hole Size: 200mm	Logged By: CB	Approved By: JH

Form SLR AGS3 UK BH File 161014_402.01009.00174_BH_LOGS_TW.GPJ 23-03-17

BOREHOLE LOG

BOREHOLE No. **GMW102**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	10/10/16	78.46maOD	E519269.089 N208497.184

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.50	HS	<1									
1.00	HS	<1					77.06		(1.40) 1.40	Brown silty CLAY with occasional fine to medium subangular to subrounded flint.	
1.50	HS	<1									
2.00	HS	<1									
2.50	HS	<1									
3.00	HS	<1							(2.50)	Orange brown slightly clayey sandy GRAVEL. Gravel comprises fine to medium, angular to rounded flint.	
3.50	HS	<1					74.56		3.90		
4.00	HS	<1							(0.80)	Orange brown mottled grey gravelly CLAY. Gravel comprises fine to medium angular to subrounded flint.	
4.50	HS	<1					73.76		4.70		
5.00	HS	<1							(0.80)	Stiff grey CLAY with occasional subangular to subrounded fine white chalk gravel.	
5.50	HS	<1					72.96		5.50		
										Borehole complete at 5.50m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 0.5m to 3.9m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 3000	Hole Size: 200mm	CB	JH

Form SLR AGS3 UK BH File 161014_402.01009.00174_BH_LOGS_TW.GPJ 23-03-17

BOREHOLE LOG

BOREHOLE No. **GMW103**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	11/10/16	76.99maOD	E519565.451 N208525.664

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.50		<1					76.39		(0.60) 0.60	Grass over slightly sandy slightly gravelly SILT. Gravel comprises fine to medium subangular flint, sand is fine to coarse.	
1.00		<1					75.39		(1.00) 1.60	Brown sandy clayey GRAVEL. Gravel comprises fine to coarse subangular flint, sand is fine to coarse.	
2.00		<1							(2.70)	Brown and grey slightly sandy GRAVEL. Gravel comprises fine to coarse subangular/subrounded flint, sand is fine to coarse. ...Becoming sandy below 2.2m.	
3.00		<1									
4.00		<1					72.69		4.30		
							72.49		4.50	Greyish brown slightly gravelly very sandy CLAY. Gravel comprises fine subangular flint, sand is fine to coarse.	
5.00	E	<1							(1.50)	Grey slightly sandy SILT. Sand is fine.	
6.00		<1					70.99		6.00		
7.00		<1							(2.30)	Stiff grey CLAY.	
8.00		<1					68.69		8.30		
8.30		<1					68.49		8.50	Firm locally soft orange brown sandy clayey SILT, with occasional 1-2mm partings of medium sand. Sand is fine to medium.	
9.00		<1					67.99		9.00	Orange brown GRAVEL. Gravel comprises fine to coarse subangular to subrounded flint. recovered as sand and gravel layer.	
										Borehole complete at 10.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Duel Well installed, screen from 0.5m to 5.9m and 8.5-10m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 2000	Hole Size: 200mm	JC	JH

BOREHOLE LOG

BOREHOLE No. **GMW104**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	04/10/16	76.53maOD	E519349.961 N208596.215

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.35	HS	<1					75.83		(0.70) 0.70	Light brown gravelly SAND. Gravel is fine to medium angular to subrounded flint with occasional cobbles.	
0.90	HS	<1					75.03		(0.80) 1.50	Firm light brown slightly sandy gravelly CLAY. Gravel is fine to medium angular to subrounded flint.	
1.50	HS	<1					72.53		(2.50) 4.00	Light brown sandy GRAVEL of fine to coarse angular to subrounded flint and quartz including rare cobbles.	
4.00	HS	<1					69.53		(3.00) 7.00	Dark grey brown slightly gravelly clayey SAND/SILT with occasional gravels of fine to medium subrounded to angular flint.	
7.00	HS	<1								Borehole complete at 7.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 0.5m to 5.5m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 2000	Hole Size: 200mm	CC	JH

BOREHOLE LOG

BOREHOLE No. **GMW105**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	07/10/16	75.87maOD	E519417.119 N208661.337

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							75.37		0.50	Made Ground: Turf over firm brown slightly sandy gravelly CLAY. Gravel comprises fine to coarse subangular to rounded brick, sand is fine to coarse.	
0.50		<1					75.17		0.70	Brown slightly sandy clayey GRAVEL. Gravel comprises subangular flint, sand is fine to coarse.	
							75.07		0.80		
1 1.00		<1					74.87		1.00	Firm blue grey slightly sandy slightly gravelly CLAY. Gravel is fine subangular flint, sand is fine to coarse.	
							74.57		1.30	Soft brown slightly sandy very gravelly CLAY. Gravel comprises fine to coarse angular to subangular flint, sand is fine to coarse.	
2 2.00		<1							(1.60)	Brown clayey sandy GRAVEL. Gravel comprises subangular to subrounded flint, sand is fine to coarse.	
							72.97		2.90	Brown grey sandy GRAVEL. Gravel comprises fine to medium angular to subangular flint, sand is fine to coarse. 1.50 - 2.90 Becoming fine to coarse gravel.	
3 3.00		<1					72.67		3.20	Very sandy GRAVEL. Gravel is fine to medium subangular flint, sand is fine to coarse.	
							72.57		3.30	Firm gravelly CLAY. Gravel comprises fine to medium subangular flint.	
							71.77	?	(0.80) 4.10	No Recovery.	
4										Firm brown gravelly CLAY. Gravel comprises fine to medium subangular to subrounded flint and chalk.	
5 5.00		<1							(2.40)		
6 6.00		<1					69.37		6.50		
7										Borehole complete at 6.00m	
8											
9											
10											
11											

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened ??

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 2000	Method: Cable Percussion Hole Size: 200mm	Logged By: JC	Approved By: JH

Form SLR AGS3 UK BH File 161014_402.01009.00174_BH_LOGS_TW.GPJ 23-03-17

BOREHOLE LOG

BOREHOLE No. **GMW106**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	30/09/16	75.80maOD	E519503.054 N208758.721

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.40	E	<1					74.80		(1.00) 1.00	Light brown slightly gravelly SAND. Gravel is fine to coarse subrounded to subangular flint and occasional cobbles. 0.60 clayey pocket.	
1.10	E	<1					74.20		(0.60) 1.60	Light brown clayey gravelly SAND. Gravel is fine to coarse rounded to subangular flint.	
2.00	E	<1					73.60		(0.60) 2.20	Firm light brown mottled light grey sandy gravelly CLAY with gravelly SAND (mixed undefined layers). Gravel is fine to coarse rounded to subangular flint.	
							73.20		2.60	Stiff light brown mottled light grey slightly gravelly sandy CLAY. Gravel is fine to medium rounded to subangular flint.	
3.00	E	<1					72.60		(0.60) 3.20	Light brown gravelly SAND with firm slightly sandy gravelly CLAY (undefined layers). Gravel is fine to medium rounded to subangular flint.	
							72.20		3.60	Light brown/orange gravelly SAND. Gravel is fine to coarse rounded to subangular flint, sand is medium to coarse.	
							70.80	?	(1.20) 5.00	3.60 slightly clayey. No recovery, large flint cobble driven down.	
5.00	E	<1					69.80		(1.00) 6.00	Stiff light brown/dark grey slightly sandy slightly gravelly CLAY. Gravel is fine to coarse rounded to subrounded flint and chalk.	
6.00	E	<1					68.80		(1.00) 7.00	Stiff dark grey slightly gravelly CLAY. Gravel is rounded to subrounded, fine to medium chalk.	
7.00	E	<1								Borehole complete at 7.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 0.5m to 5.5m.

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 2000	Method: Cable Percussion Hole Size: 200mm	Logged By: CC	Approved By: JH

BOREHOLE LOG

BOREHOLE No. **GMW107**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	04/10/16	77.20maOD	E519590.946 N208862.076

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.30	HS	<1							(1.00)	Brown silty, slightly gravelly fine SAND. Gravel comprises fine to medium subangular to subrounded flint. 0.40 - 1.00 Increased gravel content.	
0.80	HS	<1					76.20		1.00		
1.50	HS	1					75.60		(0.60) 1.60	Orange brown SAND and GRAVEL. Sand is fine to coarse. Gravel comprises fine angular to subrounded flint.	
1.70	HS	<1					75.40		1.80	Firm orange sandy gravelly CLAY. Gravel comprises angular to subrounded fine to medium flint. Sand is fine.	
2.00	HS	2					75.00		2.20	Orange sandy GRAVEL. Sand is fine to coarse. Gravel comprises angular to subrounded fine to coarse flint (predominantly fine subangular).	
2.50	HS	<1							(1.30)	Firm orange brown mottled grey sandy gravelly CLAY. Gravel comprises subangular to subrounded fine to medium flint and subangular to subrounded, fine white chalk.	
3.00	HS	<1					73.70		3.50		
4.00	HS	<1					72.80		(0.90) 4.40	Orange SAND and GRAVEL. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded flint.	
4.50	HS	<1					72.50		4.70	Stiff grey CLAY with occasional subangular to subrounded, fine white chalk gravel.	
										Borehole complete at 5.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 0.5m to 4.3m.

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 3000	Method: Cable Percussion Hole Size: 200mm	Logged By: CB	Approved By: JH

Form SLR AGS3 UK BH File 161014_402.01009.00174_BH_LOGS_TW.GPJ 23-03-17

BOREHOLE LOG

BOREHOLE No. **GMW108**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	06/10/16	77.79maOD	E519650.758 N208930.597

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.50	HS	<1					76.89		(0.90) 0.90	Brown slightly clayey slightly gravelly, fine SAND. Gravel is fine to medium angular to rounded flint.	
1.00	HS	<1					75.99		(0.90) 1.80	Orange SAND and GRAVEL. Sand is fine to coarse. Gravel comprises fine to coarse angular to rounded flint.	
1.50	HS	<1					74.99		(1.00) 2.80	Orange slightly gravelly, fine to coarse SAND. Gravel comprises fine angular to subrounded flint.	
2.00	HS	<1					74.69		3.10	Firm orange brown sandy gravelly CLAY. Sand is fine. Gravel comprises fine to medium subangular flint.	
2.50	HS	<1					73.29		(1.40) 4.50	Stiff grey CLAY with occasional subangular to subrounded, fine white chalk and flint gravel.	
3.00	HS	<1								Borehole complete at 4.50m	
3.50	HS	<1									
4.00	HS	<1									
4.50	HS	<1									

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 0.5m to 2.9m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 3000	Hole Size: 200mm	CB	JH

Form SLR AGS3 UK BH File 161014_402.01009.00174_BH_LOGS_TW.GPJ 23-03-17

BOREHOLE LOG

BOREHOLE No. **GMW109**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	07/10/16	77.45maOD	E519714.098 N208998.003

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.50	HS	<1					76.65		(0.80) 0.80	Orange brown clayey, gravelly fine SAND. Gravel comprises fine to medium angular to subrounded flint.	
1.00	HS	<1					76.05		(0.60) 1.40	Orange clayey SAND and GRAVEL. Gravel comprises fine subangular to subrounded flint.	
1.50	HS	<1					75.90		1.55	Orange mottled grey sandy, gravelly CLAY. Gravel is fine to medium angular to rounded flint. Sand is fine.	
2.00	HS	<1							(1.65)	Orange SAND and GRAVEL. Sand is fine to medium. Gravel comprises fine to medium angular to subrounded flint.	
2.50	HS	<1									
3.00	HS	<1					74.25		3.20		
3.50	HS	<1							(1.70)	Orange fine to coarse SAND.	
4.00	HS	<1									
4.50	HS	<1					72.55		4.90		
5.00	HS	<1					72.25		5.20	Firm grey mottled brown slightly sandy, slightly gravelly CLAY. Sand is fine. Gravel is fine subangular flint.	
5.50	HS	<1					71.95		5.50	Stiff grey CLAY with occasional subangular to subrounded, fine white chalk gravel.	
										Borehole complete at 4.90m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 0.5m to 4.8m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 3000	Hole Size: 200mm	CB	JH

BOREHOLE LOG

BOREHOLE No. **GMW110**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	29/09/16	75.52maOD	E520551.445 N208399.232

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.50	HS	<1					74.92		(0.60) 0.60	MADE GROUND: Grass over brown slightly gravelly, clayey SAND. Gravel comprises rare fine red brick fragments, occasional asphalt fragments and subangular to subrounded fine to medium flint.	
							74.62		0.90	Firm orange brown sandy CLAY.	
1.00	HS	<1								Soft orange brown CLAY.	
1.50	HS	<1							(1.30)		
2.00	HS	<1					73.32		2.20		
2.50	HS	<1					72.92		2.60	Orange brown sandy gravelly CLAY. Gravel comprises fine to medium angular to subrounded flint.	
2.70	HS	<1					72.62		2.90	Orange brown slightly gravelly fine to medium SAND. Gravel comprises fine to medium angular to subrounded flint.	
3.00	HS	<1					72.32		3.20	Orange brown SAND and GRAVEL. Sand is fine to medium. Gravel comprises fine to coarse angular to subrounded flint.	
3.50	HS	<1								Firm grey mottled brown slightly sandy, slightly gravelly CLAY. Sand is fine to medium. Gravel comprises fine subangular to subrounded flint.	
4.00	HS	<1							(1.70)	3.20 - 4.90 Becoming more sandy and more gravelly with depth.	
							70.62		4.90		
									(1.80)	Orange brown gravelly SAND. Sand is fine to medium. Gravel comprises fine to coarse sub angular to subrounded flint.	
							68.82		6.70		
							68.42		7.10	Firm dark grey CLAY with occasional subangular to subrounded, fine white chalk gravel.	
									(1.40)	Off-white CHALK, recovered as chalk silt with fine angular to subrounded chalk.	
							67.02		8.50		
							66.52		9.00	Firm dark grey CLAY with occasional fine subangular to subrounded flint and chalk gravel.	
										Borehole complete at 7.10m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 0.5m to 6.5m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 3000	Hole Size: 200mm	CB	JH

BOREHOLE LOG

BOREHOLE No. **GMW111**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	03/10/16	74.06maOD	E520387.722 N208156.595

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							73.46		(0.60) 0.60	MADE GROUND: Grey brown slightly clayey, slightly gravelly SAND. Gravel comprises one piece of metal, subangular to subrounded fine to medium flint.	
0.50	E	<1					73.06		1.00	Orange brown slightly clayey, slightly gravelly, fine SAND. Gravel comprises fine to medium subangular to subrounded flint.	
1 0.90	HS	<1							(0.80)	Orange brown SAND and GRAVEL. Sand is fine to medium. Gravel comprises fine to coarse angular to subrounded flint (predominantly fine subangular).	
1.50	HS	<1					72.26		1.80		
2 2.00	HS	<1								Yellow-orange, fine to coarse SAND with occasional angular to subangular coarse flint gravel.	
3 3.00	HS	<1							(2.90)		
4 4.00	HS	<1									
4.50	HS	<1					69.36		4.70		
							69.06		5.00	Orange brown sandy CLAY. Sand is fine	
5 5.00	HS	<1					68.56		5.50	Firm-stiff grey CLAY with occasional subangular to subrounded, fine chalk gravel.	
6										Borehole complete at 5.00m	
7											
8											
9											
10											
11											

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 0.5m to 4.7m.

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 3000	Method: Cable Percussion Hole Size: 200mm	Logged By: CB	Approved By: JH

BOREHOLE LOG

BOREHOLE No. **GMW112**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	29/09/16	76.87maOD	E520126.788 N208047.15

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.60	E	<1					76.07		(0.80) 0.80	MADE GROUND: Light brown gravelly SAND. Gravel is fine to medium angular to subrounded flint, with rare brick fragments.	
1.10	E	<1					75.47		(0.60) 1.40	Light brown slightly clayey slightly gravelly SAND. Gravel is fine to medium angular to subangular flint.	
2.00	E	3							(2.60)	Light brown slightly clayey sandy GRAVEL. Gravel is fine to medium subangular to rounded flint.	
3.00	E	1					72.87		4.00		
4.00	E	1							(1.00)	Soft light brown slightly sandy gravelly CLAY. Gravel is fine to medium subangular to subrounded flint.	
5.00	E	1					71.87		5.00		
6.00	E	1							(1.00)	Stiff dark grey slightly gravelly CLAY. Gravel is fine to medium rounded to subrounded chalk.	
							70.87		6.00		
										Borehole complete at 6.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 0.5m to 5.0m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 3000	Hole Size: 200mm	CC	JH

BOREHOLE LOG

BOREHOLE No. **GMW113**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	12/10/16	77.42maOD	E519705.832 N207823.538

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.40	HS	<1					76.82		(0.60) 0.60	MADE GROUND: Brown sandy CLAY with rare fine to medium subangular to subrounded flint, red brick and rootlets.	
1.00	HS	<1					76.12		(0.70) 1.30	Firm orange brown sandy CLAY with occasional fine to medium angular to subrounded flint.	
2.00	HS	<1					75.22		(0.90) 2.20	Orange brown clayey SAND and GRAVEL. Sand is fine to medium. Gravel comprises fine to coarse angular to subrounded flint (predominantly fine angular to subangular).	
3.00	HS	<1							(4.80)	Orange SAND and GRAVEL. Sand is fine to medium. Gravel comprises fine to medium angular to subrounded flint.	
4.00	HS	<1									
5.00	HS	<1									
6.00	HS	<1									
7.00	HS	<1					70.42		7.00		
							70.12		7.30	Orange brown sandy, gravelly CLAY. Sand is fine to medium. Gravel comprises fine to medium subrounded to subangular flint.	
							69.42		(0.70) 8.00	Firm to stiff grey CLAY with occasional subangular to subrounded, fine white chalk fragments.	
										Borehole complete at 8.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 0.5m to 7.0m.

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 3000	Method: Cable Percussion Hole Size: 200mm	Logged By: CB	Approved By: JH

BOREHOLE LOG

BOREHOLE No. **GMW114**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	18/10/16	77.81maOD	E519525.331 N208085.263

Project: **HATFIELD AERODROME**

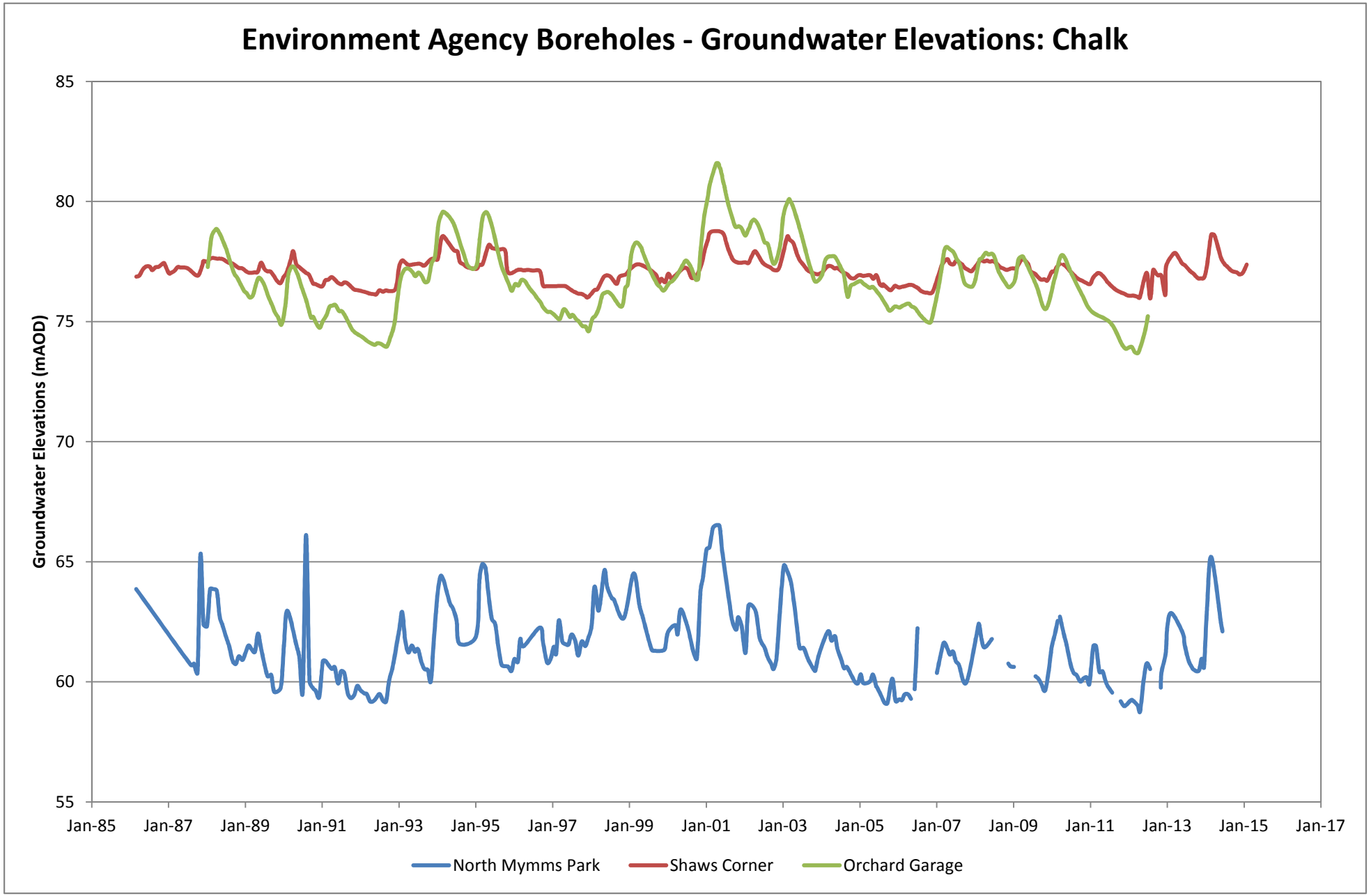
Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							77.11		(0.70) 0.70	Grass over brown very gravelly slightly sandy CLAY. Gravel comprises fine to coarse subangular flint, sand is fine to coarse.	
1 1.00		<1								Grey sandy GRAVEL. Gravel comprises fine to medium subangular flint, sand is fine to coarse.	
2 2.00		<1								...Becoming fine to coarse Gravel below 2.0m	
3 3.00		<1							(3.80)		
4 4.00		<1					73.31		4.50		
5 5.00		<1								Brown very gravelly, fine to medium SAND. Gravel comprises fine to medium subangular flint.	
6 6.00		<1							(2.40)		
7 7.00		<1					70.91		6.90		
							70.61		7.20	Brown slighty clayey slightly gravelly, fine to medium SAND. Gravel comprises fine to medium flint.	
							70.01		(0.60) 7.80	Grey brown slightly sandy gravelly CLAY. Gravel is fine to medium subangular chalk and flint, sand is fine. 7.40 - 7.80 Clay becomes stiff.	
8										Borehole complete at 7.80m	
9											
10											
11											

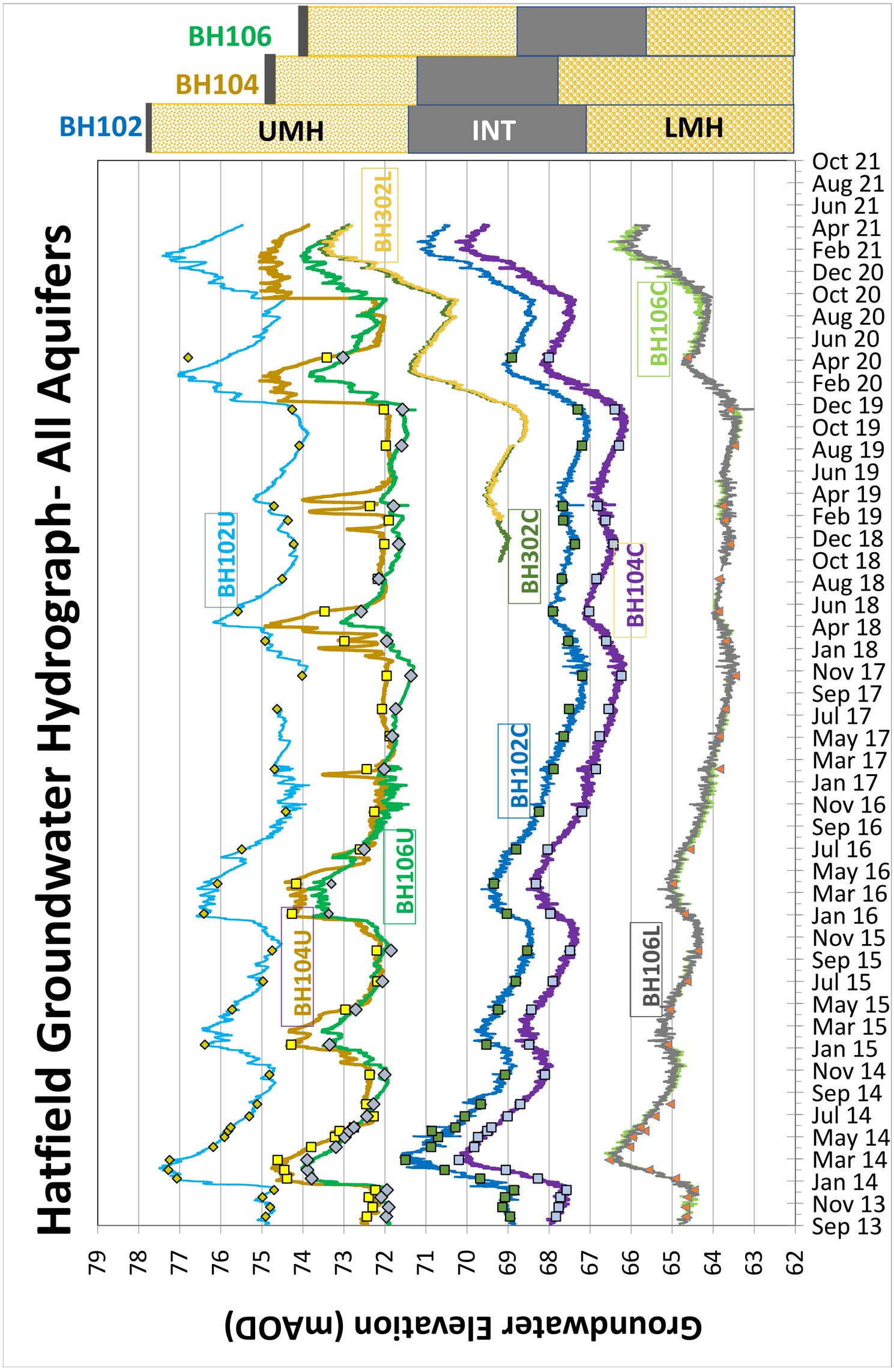
Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 1.2m to 7.2m.

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 3000	Method: Cable Percussion Hole Size: 200mm	Logged By: JC	Approved By: JH

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Environment Agency Boreholes - Groundwater Elevations: Chalk
Groundwater Elevations (mAOD)
85
80
75
70
65
60
55
Jan-85
Jan-87
Jan-89
Jan-91
Jan-93
Jan-95
Jan-97
Jan-99
Jan-01
Jan-03
Jan-05
Jan-07
Jan-09
Jan-11
Jan-13
Jan-15
Jan-17
North Mymms Park
Shaws Corner
Orchard Garage

Hatfield Groundwater Hydrograph- All Aquifers



global environmental solutions

Hatfield Aerodrome

Land Quality Risk Assessment

SLR Ref: 403.01009.00132

January 2016

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DRAWINGS

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Drawing 2 **Regional Chalk Surface and Subcrop with Mineral Deposits**
Drawing 3 **Regional Geological Cross Section**
Drawing 4 **Regional Bromate Plume – July 2014**
Drawing 5 **LMH Piezometric Surface and Bromate Concentrations (2013-2015)**

APPENDICES

Appendix A **GroundSure Historical Map Extracts & Site Photographs**
Appendix B **GroundSure EnviroInsight Report**
Appendix C **GroundSure GeoInsight Report**
Appendix D **Groundwater Quality Summary Data Tables**

1.0 INTRODUCTION

1.1 Background

SLR Consulting (SLR) has been commissioned by Brett Aggregates Limited (Brett) to undertake this land quality risk assessment (LQRA) in support of a planning application for a proposed sand and gravel quarry, new access onto the A1057, aggregate processing plant, concrete batching plant and other ancillary facilities on land at the former Hatfield aerodrome, Hertfordshire (the Site).

1.2 Proposed Development

The proposed development is an 8Mt sand and gravel quarry to be worked in phases over 30 years with processing facilities to the north of the Site. Inert material would be used to infill the void as work progresses. The proposed development and method of working is described in detail in Section 3 of the Environmental Statement[1].

1.3 Objectives

The primary objective of this LQRA is to establish if there is any evidence of significant subsurface contamination from past or present activities on or adjacent to the Site which could give rise to abnormal development costs (e.g. expenditure on remedial works to address unacceptable risks to the environment or Brett employees / contractors visiting any future developments on the Site).

1.4 Scope of Work

The scope of work for the LQRA included:

- a review of site data to identify and record on and off site land uses, potential areas of concern with respect to soil and groundwater contamination and potential contaminants of concern;
- a review of geological and hydrogeological data for the Site;
- analysis of historical maps and aerial photographs to establish the history of the Site as well as past on and off site potentially contaminative activities;
- a review of relevant information held by Brett and other parties;
- collection and analysis of environmental data from a proprietary database; and
- reporting.

1.5 Data Sources

This report has been produced following consultation with the sources of information summarised in Table 1-1.

Table 1-1
Information Sources

Information Type	Source
General topography and site setting	Google Earth Bing Maps Ordnance Survey 1:25,000 mapping

[1] SLR Hatfield Aerodrome Environmental Statement 403-01009-00132.

Information Type	Source
Site and background information	GroundSure Historical Map Extracts purchased 27th January 2014, and historical aerial photographs sourced from Historic England (Appendix A). GroundSure EnviroInsight Report purchased 16th October 2015 (Appendix B).
Hydrogeology and Geology	Environment Agency (EA) (Website and personal contact with EA Hatfield). British Geological Society GroundSure GeoInsight Report purchased 16th October 2015 (Appendix C).

1.6 References and Historic Reports

SLR previously undertook site investigations and a desk based review[2] of published literature relevant to contamination at the Site and in the surrounding area. Several references are included below which have been reviewed as a background source of data, although they are not specifically referenced within this or the previous report. Affinity plc[3] and the Agency have provided borehole and groundwater sample data for the wider site area.

- Affinity Water plc 2013 & 2014: Hatfield Boreholes construction details and abstraction rates in 2013 and 2014, hydrographs for Sleapshyde OBH, precipitation data
- Butler R M 2005: Remediation of Bromate Contaminated Groundwater. PhD Thesis, School of Industrial and Manufacturing Science, Cranfield University
- Butler R M et al, 2005: Bromate Environmental Contamination: Review of Impact and Possible Treatment. Critical Reviews in Environmental Science and Technology, 35:193-217
- Cook S J, 2010: The Hydrogeology of Bromate Contamination in the Hertfordshire Chalk: Incorporating Karst in Predictive Models. PhD Thesis, Dept. of Earth Sciences, UCL
- Cook, S. et al 2007: Geological Controls on Hydrodynamics and Contaminant Transport in the Hertfordshire Chalk Aquifer. Poster Series
- Environment Agency 2013-14: Groundwater monitoring data from selected wells in the Hatfield/Sandridge area.
- Fitzpatrick, C. M. 2007: The Evolution of Bromate Contamination in the Hertfordshire Chalk Aquifer. Poster Series
- BGS Mineral Assessment Reports: 67 Hatfield & Cheshunt, 69 Welyn Garden City, 71 St Albans and Watford, and 112 Hertford
- Shand P et al, 2003: Baseline Report Series; 6. The Chalk of the Colne and Lee River Catchments. Environment Agency Science Group, Solihull, BGS Keyworth, Nottingham
- Symes D K, 1994: Sand & Gravel Assessment, Hatfield Aerodrome. Land & Mineral Resource Consultants Ltd., on behalf of Hertfordshire County Council

SLR field engineers discovered 10 pre-existing monitoring wells across the Site during site works completed in 2013 and 2014. SLR developed and monitored water levels and has sampled groundwater quality in all of these wells and has used this data in the development of the Site Conceptual site Model (CSM). SLR was able to determine which geological zones were being monitored based on depth and water level but we did not have borehole logs or understand their origin or context.

[2] SLR (November 2014) Hatfield Mineral Development Site Hatfield Hertfordshire. Site Investigation. Ref: 402.01009.00064.

[3] Operator of several PWS wells in the area

In January 2016 we learnt that investigations were undertaken in 2001 by Stanger and in 2009/10 by BAE on behalf of Arlington Properties and that the 10 pre-existing boreholes incorporated into our own sampling regime are likely to be part of these investigations. However, we have not managed to locate all the reports relating to these investigations which we will continue to pursue over the coming months to incorporate relevant data into our site data base. Data will be used in furthering our understanding of the Site and therefore any development strategy going forward.

2.0 SITE DETAILS, SETTING AND HISTORY

2.1 Site Vicinity Description

Table 2-1 summarises the Site details. Information within the table has been derived from Ordnance Survey (OS) mapping and site visits over the past year.

Table 2-1
Site Details

Address	Former Hatfield Aerodrome north of A1057.	
Site Location	This site of approximately 87.1 hectares is located to the west of Hatfield, north of A1057 (Drawing 1). It is situated at the edge of a mixed agricultural, industrial and residential area and former sand and gravel quarrying has taken place to the north and west of the Site.	
Recent Site Activities	The current use of the Site is public open space and grazing. A concrete roadway extended west into the centre of the Site from Albatross Way and a number of earth bunds and banks are present on site from the earlier airfield.	
Site Description	The Site is irregularly shaped, with the southern boundary running parallel to the A1057, with sides broadly perpendicular to this. Access to the Site is currently off Albatross Way. The northern boundary is irregular and follows the field boundaries with old sand and gravel lakes (Hatfield Quarry) and a wooded area (Home Covert) outside of the Site. The Site is currently vegetated by grass with some scrub/trees predominantly along the old field boundaries. There is an ephemeral watercourse (River Nast) which originates northwest of the Site and flows east before joining with an ephemeral ditch flowing south along the boundary with Home Covert. This combined water course is then culverted southeast beneath the former runway area and remerges at the A1057. Whilst no other surface water features are shown on the current Ordnance Survey map, site visits indicate there are a few shallow ponds to the north of the centre of the Site.	
Surrounding Land Use	North	To the north of the Site is old sand and gravel quarry workings and silt lagoons (Hatfield Quarry) which have been restored to agricultural land via landfill or left as lakes.
	West	To the west of the Site the following are located: radio station, garden centre, nurseries, agricultural land and residential premises.
	South	To the south of the Site is the A1057, beyond which is agricultural land and residential properties.
	East	To the east, immediately adjacent to the boundary is more open land of the former Hatfield Aerodrome and a small playing field. Beyond these are a business park, residential area and part of the campus of the University of Hertfordshire.

2.2 Regional Site Setting

This section presents the regional geology, hydrogeology and hydrology and is based upon literature sources and site data. This data was used to develop the Conceptual Site Model (CSM) upon which the subsequent phases of investigation work were based.

2.2.1 Regional Geology

London Basin

The Site is located on the northern limb of the London Basin which forms an asymmetrical syncline with its axis trending southwest-northeast and plunging east. The boundary of the

synclinal basin is formed by the Chilterns to the north and the North Downs to the south where the Chalk forms the predominant hard geology.

The Chalk is subdivided into Lower, Middle and Upper and is overlain in the centre of the London Basin by Paleogene rocks (Thanet Sands, Reading Beds), and the Eocene London Clay. Figure 1 illustrates the solid geology of the region with the area of the Site circled in red. A northwest to southeast cross section depicting the southeast dipping strata in the London Basin is shown as Figure 2.

Figure 1
Regional Solid Geology (Shand P, 2003)

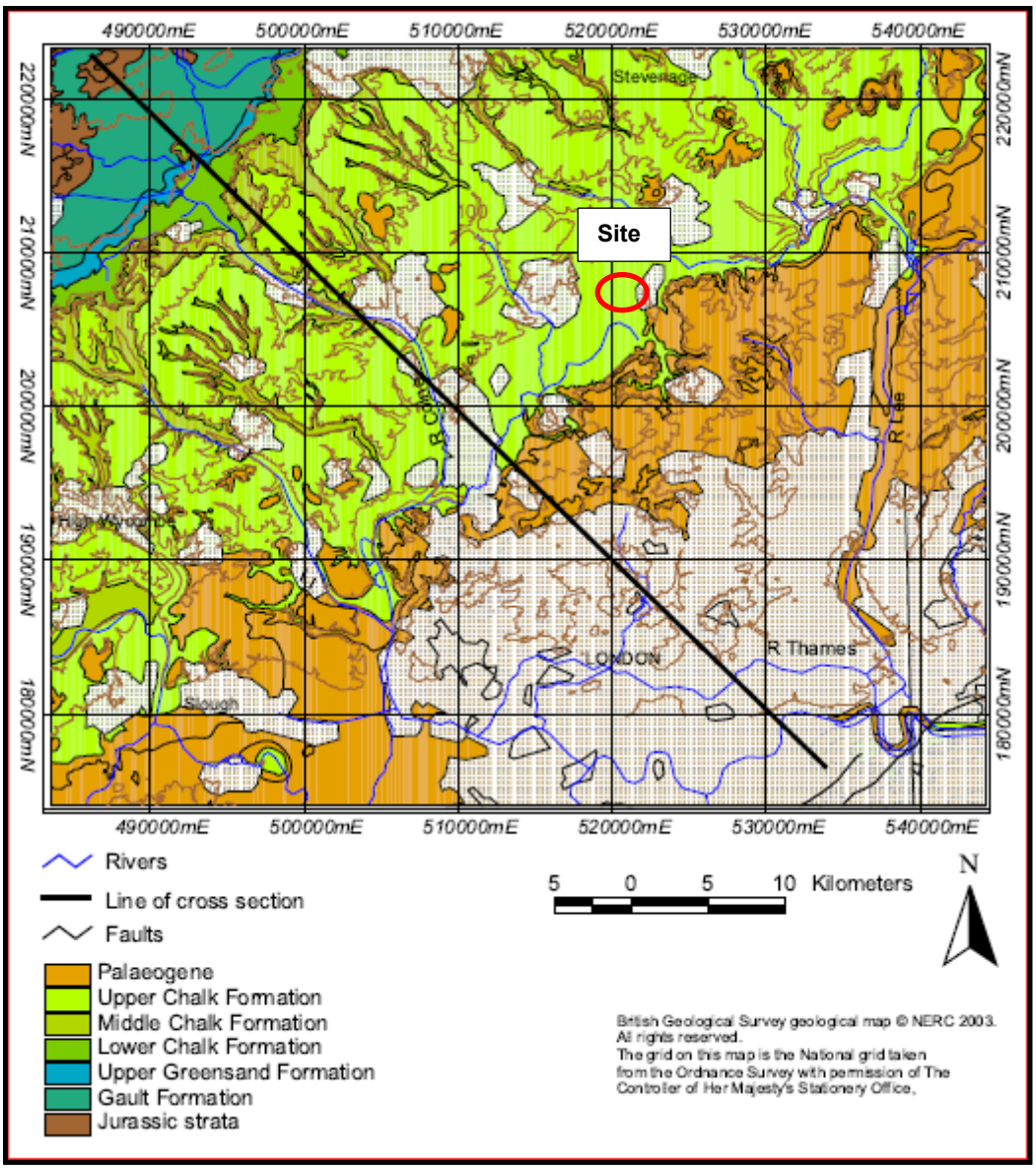
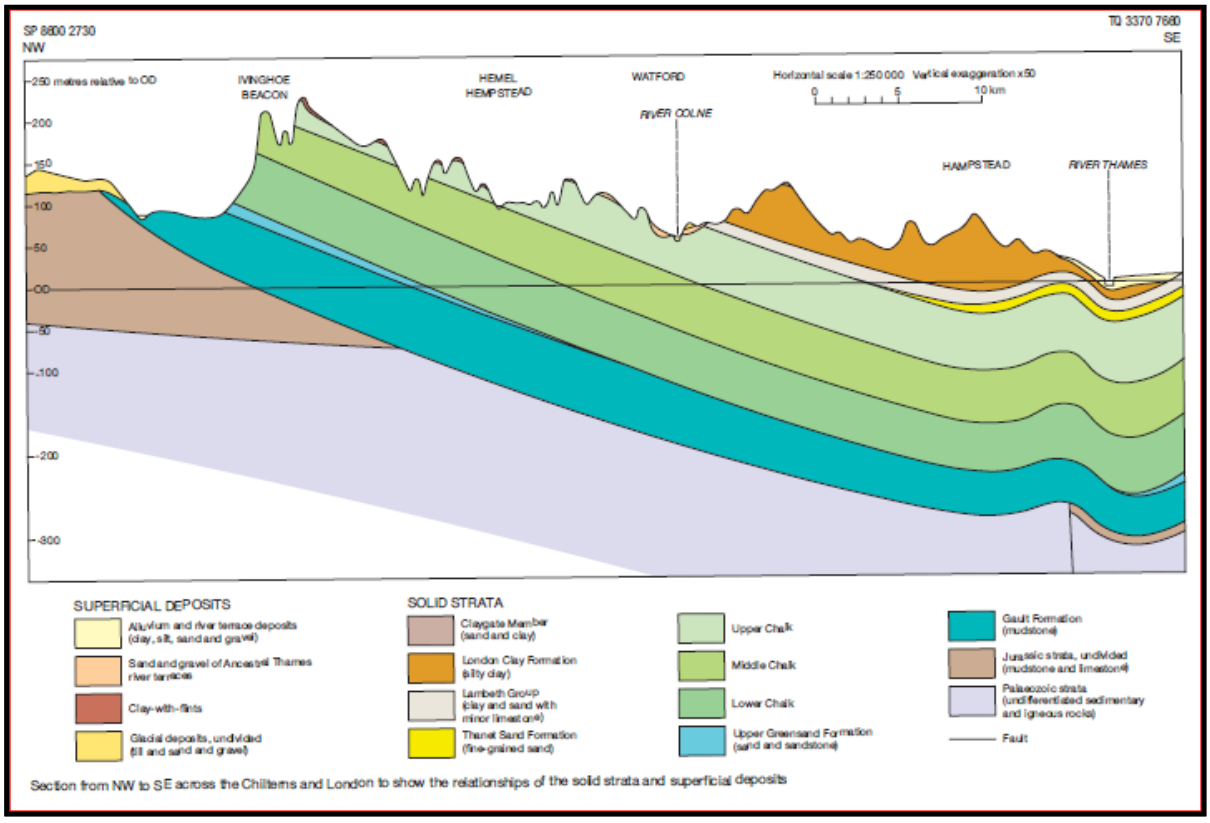


Figure 2
Regional Geology Cross Section - Solid and Superficial (Shand P, 2003)



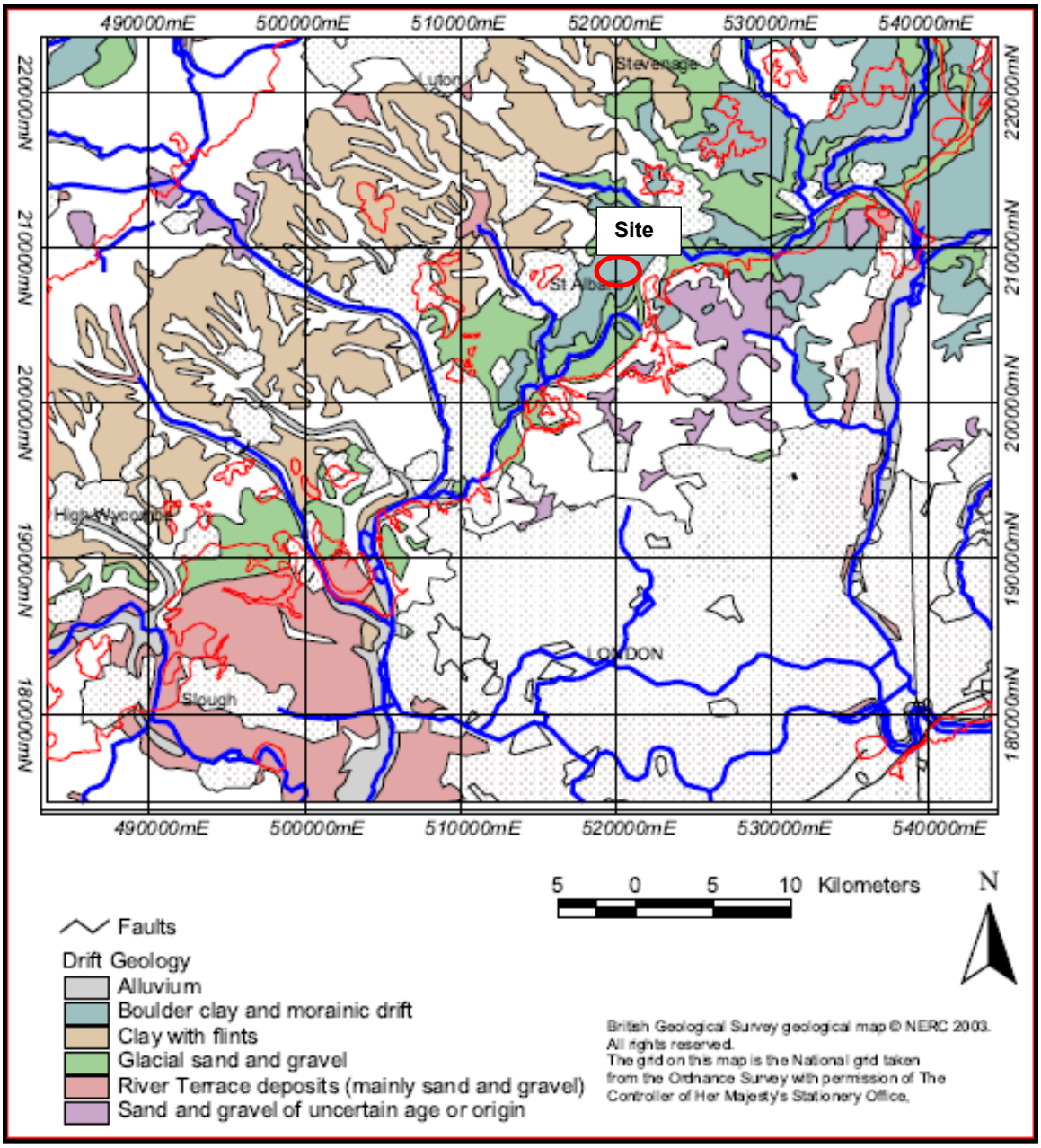
The solid geology beneath the Site comprises the Lewes Nodular Chalk (Bristow et al., 1997) being the lowermost part of the Upper Chalk, with a characteristic hard band close to the Chalk sub crop. Middle and Lower Chalk underlies the Lewes Nodular Chalk.

Figure 3
Southern England Chalk (Bristow et al 1998)

	Formation	Member
Erosional bedrock surface beneath the Site	Chalk	Upper Chalk	Portsdown Chalk Spetisbury Chalk Tarrant Chalk Newhaven Chalk Seaford Chalk
			Lewes Nodular Chalk
		Middle Chalk	New Pit Chalk Hoywell Nodular Chalk
		Lower Chalk	Zig Zag Chalk West Melbury Marly Chalk

The solid geology is overlain by Quaternary superficial deposits comprising glacial gravels infilling valleys cut into the Lewes Nodular Chalk, with boulder clay and clay with flints across higher ground. Figure 4 illustrates the distribution of superficial deposits across the area with the study site circled in red.

Figure 4
Regional Drift Geology (Shand P, 2003)



Vale of St Albans

The Site lies within the Vale of St Albans; a broad northeast to southwest orientated plain between higher land to the northwest and southeast. The higher land to the west comprises Upper Chalk solid geology at outcrop locally with a cover of superficial drift (Clay with Flints). In contrast the higher land to southeast comprises Upper Chalk overlain by the feathering margins of the Lower London Tertiaries and some superficial drift.

The Vale of St Albans corresponds with the route of a pre-glacial water course (Proto-Thames) that is understood to have flowed northeast into East Anglia[4]. Tertiary period strata

[4] Catt J. Hertfordshire Geology and Landscape. 2010.

are absent beneath the Site and the Vale of St Albans and the chalk solid geology is shown sub cropping[5] beneath a sequence of glacial deposits comprising boulder clay and gravels.

Within the Vale of St Albans a number of previous studies[6][7][8] have identified three broad superficial drift units comprising upper and lower granular formations (sands, gravels) separated by a relatively thin but laterally continuous boulder clay. The following geological sequence is indicated to be present beneath the Site area.

Figure 5
Site Geological Sequence

Drift/Solid	Geological Unit
Superficial Drift	Upper Mineral Horizon (UMH)
	Boulder Clay (BC)
	Lower Mineral Horizon (LMH)
Solid Geology	Upper Chalk (Lewes Nodular Chalk)

SLR has gathered borehole data from the Site area and beyond from the BGS Mineral Sheets and has used this data to prepare a contour plan of the chalk surface which in places is at outcrop and in others subcrops beneath the drift deposits. The areas shaded pink on Drawing 2 identify where chalk is overlain by mineral deposits.

The chalk erosional surface contours illustrates that the Site sits within a trough or paleo-valley with the chalk surface rising up to the northwest and southeast but also falling towards the northeast and the south. The point at which the chalk erosional surface falls from northeast to south coincides with the watershed between the River Colne and the River Lea surface water catchments.

2.2.2 Regional Hydrogeology

Groundwater in the general area of the Site is dominated by the Chalk aquifer which is designated by the Agency as a Principal Aquifer.

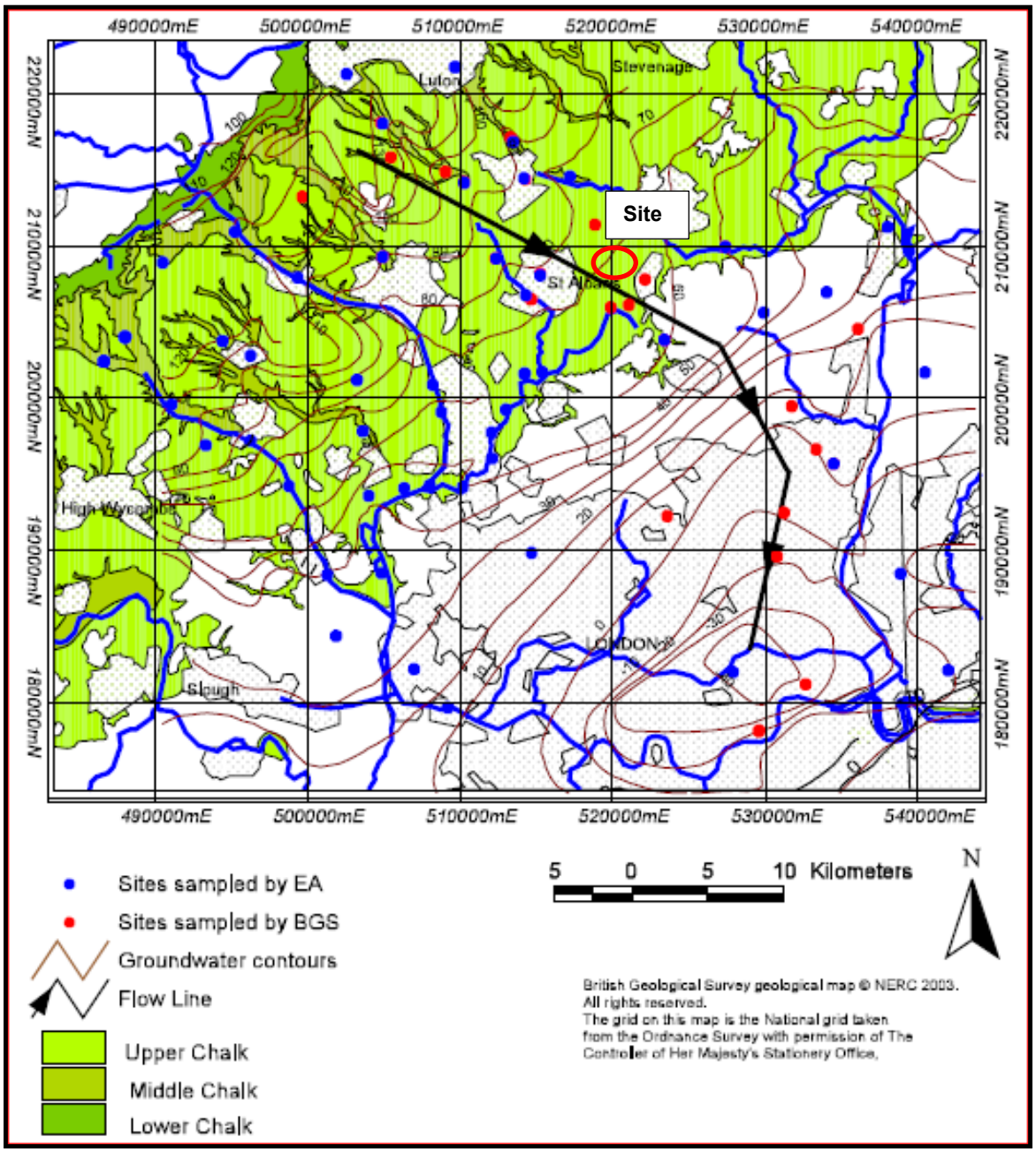
The area shaded green on Figure 6 is where the Chalk bedrock outcrops or where it is overlain locally by Quaternary drift deposits. The Chalk aquifer is typically unconfined where it outcrops to the northwest, although where incised valleys cut into the Chalk it can be filled with Quaternary drift in which case the Chalk can be locally confined beneath cohesive drift deposits. The Chalk becomes confined by Tertiary sediments to the southeast (Figure 6) although the lowermost Tertiary sediments (Thanet Sands and the Reading Beds) are generally considered part of the Chalk hydrostratigraphic system, with the London Clay acting as the confining aquitard unit.

The Chalk is a dual porosity aquifer with high matrix porosity but low matrix permeability, but is also highly fractured, typically within 10m - 30m of the water table due to dissolution which widens the fractures. The Chalk also contains hard bands that are layers of higher fracture permeability due to lithological differences in the lithology, which can be traced across the region, and which may exist close to the Chalk subcrop beneath the Site[5].

[5] British Geological Survey Sheet 239 Drift. Hertford. 1978.
[6] Symes D K, 1998: Sand & Gravel Assessment, Hatfield Aerodrome. On behalf of Hertfordshire County Council
[7] Cook S J. The Hydrogeology of Bromate Contamination in the Hertfordshire Chalk: Incorporating Karst in Predictive Models. EngD Thesis UCL. April 2011.
[8] Little J A & Atkinson J H. Some Engineering Properties of Anglian Tills in the Vale of St Albans. QJEG. 21. Pp183-199. 1988.

Figure 6 also illustrates the regional groundwater head in the Chalk Aquifer with a maximum elevation of about 120mAOD on strike with the outcrop approximately 15km northwest of the Site and approximately -30mAOD in Central London, 30km to the southeast. Regional groundwater flow is therefore towards the southeast.

Figure 6
Regional Geology and Piezometric Surface – Chalk Aquifer (Shand P, 2003)



The Upper Chalk is a Principal Aquifer[9] and the granular superficial drift deposits are classified as Secondary aquifers[10].

[9] Rock or drift deposits that have high inter-granular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale (Environment Agency (EA)).

[10] Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers (EA).

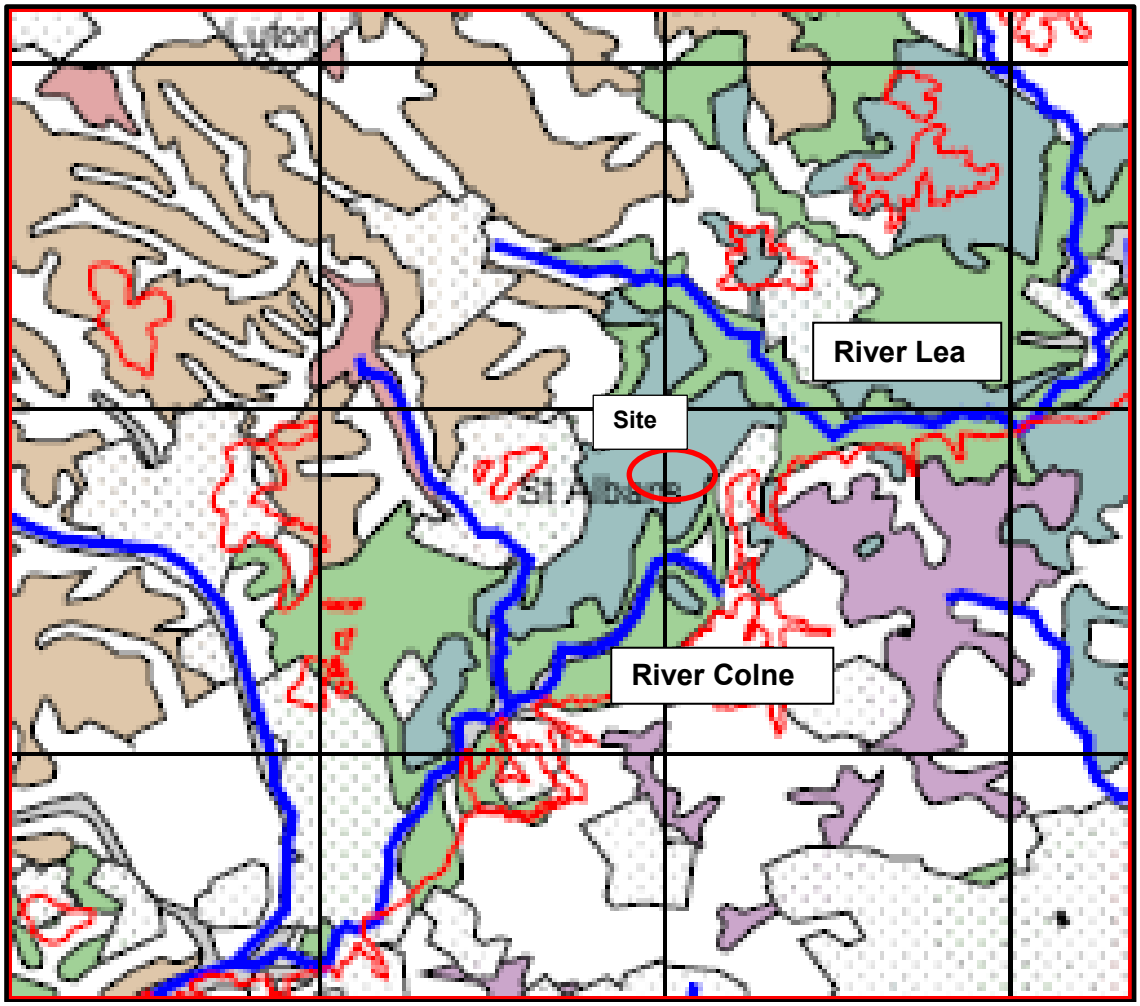
The BGS[11] indicates that the elevation of groundwater table (piezometric surface) in the Chalk in the area of the Site is approximately 60 to 70mAOD (i.e. 8m to 14m below ground level) with a southeast flow direction. This may vary locally due to seasonal fluctuations and local abstractions.

Drawing 3 is an East to West cross section through the Site (line of section shown on Drawing 2) illustrating the location of the Site within the drift filled erosional surface of the Chalk. Of note is the regional piezometric surface of the Chalk aquifer crossing into the drift from the Chalk and saturating the LMH which is then confined by the intermediate boulder clay.

2.2.3 Regional Hydrology

As illustrated on Figure 7, the Hatfield Aerodrome Site lies on or near what is considered to be the watershed between the River Colne catchment to the south-southwest and the River Lea to the northeast. More description and discussion of the nearby surface water features are presented in Section 2.3.

Figure 7
Major Surface Water Catchments



Key: As Figure 4

[11] Institute of Geological Sciences Hydrogeological Map of the area between Cambridge and Maidstone. BGS.

2.2.4 Regional Contamination

Regional groundwater has been impacted by a historical release of bromate into the Chalk aquifer at Sandridge located 3km to the northwest of the Site and a bromate plume extends east-southeast over a large part of Hertfordshire, so of primary importance was the need to assess the nature and extent of bromate impacted groundwater present beneath the Site, if any. The lateral extent of the bromate plume is illustrated on Drawing 4.

Bromate in the Chalk aquifer at Sandridge has migrated laterally with groundwater flow east-southeast from the source. However, although the bromate originally impacted the Chalk at its source (there is no saturated mineral present at Sandridge), the chalk aquifer piezometric surface crosses the Chalk/LMH geological boundary approximately 1 km east of the source which has resulted in the plume being present in both the Chalk and the LMH. It is at this location that the axis of the plume extends west to east towards the northern end of the Aerodrome plume before it turns again in an east-southeast direction.

The slightly unusual shape to the bromate plume described above could be due to the presence of low permeability material within Hatfield Quarry Landfills in place of more permeable mineral deposits hydraulically up-gradient of the former Hatfield Aerodrome. This would act as a barrier to flow causing the plume to migrate around the workings before it resumes its flow direction towards the southeast, which appears to be towards the Hatfield Boreholes operated by Affinity plc.

As shown on Drawing 4 the bromate plume does not appear to cross the northern boundary of the application site and exists principally beneath the northern half of the former undeveloped Aerodrome.

2.3 Physical Site Setting

A summary of the main physical features of the Site are given in Table 2-2. Information has been derived from the GroundSure EnviroInsight Report, previous SLR site investigations and other sources.

Table 2-2
Summary of Physical Site Features

Geography and Geology	Gradient	The Site is gently sloping and falls slightly from the western boundary of the Site to the north, east and south. The gradient is approximately 1 in 50.
	Elevation	The Site has the greatest elevation in the west (c.79-78mAOD) and lowest in the south east corner (c. 74mAOD). There are no permanent structures on site, however, demolition of the former aerodrome runway which ran south west to north east across the majority of the central part of the application site and crossed the eastern site boundary, causes localised high ground associated with this feature up to 83mAOD.
	Made Ground	The runway and race track area are reworked as well the mock film village which was offsite. There will probably be made ground with the associated aerodrome buildings and fire training area. Borehole logs have identified no other made ground on site but show an area around BH105 where the mock village for the 'Saving Private Ryan' and 'Band of Brothers' film set was located.
	Superficial Drift Geology	Site investigations and studies have identified four broad glacial superficial drift units comprising an upper and lower granular formation (sands, gravels known as the Upper Mineral Horizon ad Lower Mineral Horizon respectively) separated by

		boulder clay and all overlain by a gravelly clay overburden. An alluvium deposit is associated with the part of the Nast channel that is currently culverted beneath the majority of the Site. These superficial drift deposits are recorded to have a highly variable permeability from high to very low.
	Solid Geology	The solid geology beneath the application site comprises undifferentiated Lewes Nodular Chalk Formation and Seaford Chalk Formation. This dips to the south-east and is underlain by undifferentiated Holywell Nodular Chalk Formation and New Pit Chalk Formation. Further details for geology and hydrogeology are provided in section 4 of this report.
	Radon Gas	Brett's proposal does not include the development of dwellings, but in any case no radon protective measures are necessary.
	Mining, and Ground Stability Hazards	GroundSure shows numerous old sand and gravel pits to the immediate north and northwest of the Site and suggests there was a small area of sand and gravel extraction near the course of the Nast in the proposed processing area. The report also notes that some occasional minor mining for chalk may have occurred at the Site but no area is identified. There are very low to negligible ground stability hazards from shrinking / swelling clay, landslides, ground dissolution, collapsible ground, compressible ground and running sands. There is considered to be moderate compressible ground risk in the area of the alluvium channel, however, this will be removed as part of the proposed development.
Hydrology	Surface Water and River Network	• The ephemeral River Nast originates in the northwest of the Site and flows east before joining with an ephemeral un-named water course in a ditch that flows south along the site boundary with the Home Covert wooded area. This combined water course is then culverted southeast under the old runway area and Hatfield University playing fields before eventually joining the Ellenbrook offsite. • There are a few shallow small ponds onsite close to the course of the Nast. • Lagoons from previous mineral workings exist to the immediate north of the Site. • A tributary of the Ellenbrook is located c.200m east of the Site. There are also retention basins for the residential area which feed into the brook at this location. • To the west of the Site is a small stream called Boggymead Spring which is c.500m at its closest point this flows south and joins the Ellenbrook. • The Ellenbrook joins the River Colne which flows east to west and is approximately 2km south of the Site.
	Flood Risk	The majority of the Site lies within Zone 1 Floodplain; however, a small part of the Site near the playing fields relating to the culverted River Nast is designated as Zone 2. A Flood Risk Assessment has been undertaken and found there will be minimal impact due to the nature of the proposed development.
	Surface Water Abstractions	There are no surface water abstraction licences within 2km of the Site.
	Surface Water Safeguard Zones	The Site is within a Surface Water Drinking Water Safeguard Zone.

Hydrogeology	Aquifer	The glacial drift deposits of sand, gravel and clay (Overburden, Upper Mineral Horizon (UMH), Interburden and Lower Mineral Horizon (LMH)) are designated as Secondary (undifferentiated) Aquifers whilst the alluvium is designated Secondary (A) Aquifer. The Chalk is classified as a Principal Aquifer. Groundwater within the chalk and LMH are in hydraulic continuity whilst the groundwater in the UMH is perched on the Interburden, this is described in more detail in section 3.
	Groundwater Abstractions	There are 7 groundwater abstractions within 2km of the Site. One of which is for potable water. The others are for agricultural and mineral process water.
	Source Protection Zones	The Site is predominantly within a Source Protection Zone 3 – Total Catchment, with Zone 2 – Outer Catchment in the south east and south west corners of the Site. The SPZ3 and SPZ2's relate to public water supply boreholes (Hatfield and Colney Heath) located 1.5km southeast and 2.2km south southeast from the Site, respectively. The Hatfield boreholes no longer provide potable water but are part of a groundwater control system related to the bromate plume described earlier.
	Groundwater Safeguard Zones	The Site is classified as an "At Risk Area" under the Groundwater Drinking Water Protected Areas meaning that raw groundwater quality in the vicinity of the site requires improvement, to avoid the need for extra treatment at drinking water treatment plants. The majority of the Site is not within a Groundwater Safeguard Zone, meaning that specific actions are not being implemented. The far eastern part of the site is within a Groundwater Safeguard Zone however, this related to the Hatfield boreholes which will be discussed further later.

2.4 Site History

A review of OS map extracts and historical aerial photographs have been summarised in Table 2-3. Map extract and aerial photographs are included in Appendix A.

Whilst the age and general type of activity and land use can often be determined from the type and layout of structures depicted on OS maps specific elements of site operations cannot normally be determined. Large scale (1:10,000) historical map extracts and available aerial photos from google earth were reviewed for selected years between 1937 and 2011.

Table 2-3
Site History Summary

Year	Site	Wider Area
1937	• The Site comprises fields and pasture. • The Nast follows its current open water and culverted route. • A Race Track occupies an area northwest of Popefield Farm.	• East: Fields and pasture. • West: Fields and pasture. • North: Astwick Manor, fields and woodland. • South: Some housing, nursery/greenhouses and fields. • The Ellenbrook is not recorded. • Home Covert is as today with a small cottage, a pond and paths crossing through the woodland.
1960	• The Site is completely within the former Hatfield Airfield with the runway extending northeast to southwest across	• East: Airfield and aircraft works to the northeast. • West: Woodland and fields.

Year	Site	Wider Area
	the centre of the Site, with part of the taxiway skirting the southern side of the development area. • Remaining areas appear to be open and undeveloped. • The Nast is shown flowing onto site at the northwest site boundary before ending on the northern side of the runway where it enters a culvert (as today).	• North: Astwick Manor, fields and woodland. • South: Housing, nursery/greenhouses and fields. • Home Covert is an area of woodland on the northwest boundary that appears to occupy the same area as today. • The Ellenbrook is not recorded.
1975	• As 1960	• As 1960
1990	• As 1975	• As 1975
1999	• As 1990 • A small area southwest of Home Covert is an aircraft parking stand with a fire training area. Further detail is shown on the historical aerial photographs.	• The majority of the aerodrome works buildings have been removed and new commercial buildings are cover about 30% of the former aerodrome works. • The outline of a small rectangular industrial area north of Home Covert is suspected to be related to aerodrome operations in the 1990's.
2001	• The Site is being used for the Band of Brothers film set and various areas have been landscaped: • The open course of the Nast has been moved slightly and the area around it shows shallow depressions. • A mock base/barracks is visible to the south of the runway. • The fire training area remains.	• The rectangular building northeast of Home Covert remains. • A few aerodrome work buildings such as hangers are still shown to the east. • To the east of the Site is a mock village, outlying farmhouses, a tree avenue, two large water features, cuts next to one of the taxiways and a raised hill from the Band of Brothers film set.
2006	• The Band of Brothers film set has been removed. • The runway hard standing has been broken up and removed. • The taxiway remains. • The open Nast channel has been reinstated to the pre 2000 route. • The fire training area has mostly been broken up with some hardstanding remaining.	• The Band of Brothers set has been removed along with the associated water features and hill. • The runway has been removed and has been largely replaced with commercial warehouse-like buildings and some residential properties. • Aircraft works buildings southeast of the aerodrome taxi-way have been demolished and are in the process of being replaced with new commercial buildings. • The rectangular building northeast of Home Covert remains. • Hatfield University buildings/campus is in place. • Ellenbrook is present in its current form. • Ellenbrook balancing lagoons are in place adjacent to the Site.
2011	• The runway has been dismantled. • The taxiway remains. • The Nast remains culverted across the Site.	• Northeast: The aerodrome buildings have been redeveloped with additional commercial buildings. • The rectangular building northeast of Home Covert remains. • The Ellenbrook is in place. • Residential property has been built east of Ellenbrook. • Hatfield University is built to the south of the residential buildings.

Year	Site	Wider Area
		• Northwest: Mineral extraction and lagoons are present along the north-western site boundary.

In summary, the Site was predominately agricultural land until it was designated as an aerodrome, which occurred after 1937. The entire site was formerly part of Hatfield Aerodrome although the associated aircraft design, testing and manufacturing aspects of the de Havilland and subsequently Hawker Siddeley and BAe facilities were all located off site to the east (beyond Ellenbrook). With the exception of the former aircraft fire training area, there is little evidence for past potentially contaminative activities having taken place on site.

It is also known that parts of Saving Private Ryan (1998) were filmed at Hatfield Aerodrome in the late 1990's and that this included larger water features; however, aerial photos are not available of this time and it is only the later Band of Brothers (2001) film set that is seen on satellite images (Google Earth).

Off site, the land was largely agricultural until the 1990s, when significant industrial development started to the east, followed by residential development.

Mineral extraction to the north of the Site has been occurring throughout the 20th century. The various phases of the Hatfield Quarry and associated landfilling operations (closed and active) run parallel with the northwest site boundary. Given that the Site is hydraulically down gradient within the chalk/LMH aquifers of all these areas there is a possibility that they could impact upon groundwater beneath the Site.

Potentially contaminative off site land uses are limited to:

- aerodrome buildings/workshops (all hydraulically down gradient);
- surrounding industrial developments (all hydraulically down gradient);
- infilled sand and gravel quarries to the northwest, north and northeast; and
- the bromate plume is deemed to be a source of potential secondary contamination, with the source area being near Sandridge.

2.5 Environmental Search Data

The EnviroInsight report, presented in Appendix B, was reviewed to gain commercially available environmental data for the Site and its immediate vicinity. A summary of the search information is provided below:

- Sites Determined as Contaminated Land – there are no sites within 500m determined as Contaminated Land under Part 2A EPA 1990;
- Discharge consents – there is one consent within 500m of the Site, which is treated effluent and 433m north west at Beech Farm;
- Integrated Pollution Prevention and Controls– none within 500m;
- Local Authority Prevention & Controls – 3 records are listed within 500m of the Site, Shell Service Station. Cemex UK Materials Ltd (cement and lime batching) and Smallford Motors;
- EA recorded pollution incidents – there are none recorded within 200m of the Site, However 3 minor incidences are recorded within 500m which are to the south of the A1057;
- Landfill sites – There is one active landfill within 1km of the site, located to the north of the site. However, this landfill has a closed status and is not receiving waste;
- Historic Landfills – There are 32 historic landfill licenses within 1.5km of the Site, however, it is noted that some of these cover the same areas but for different waste

types and/or times. The closest landfills are to the immediate north, northwest and northeast of the site. The historic landfills within 500m of the site are listed below:

- 0m north (Hatfield Quarry, which accepted industrial, commercial and household wastes, 1935-1977);
- 0m north (Hatfield Quarry, which accepted inert wastes 1977-1987);
- 1m northwest (Hatfield Quarry, which accepted industrial, commercial and household wastes 1935-1977);
- 143m southwest (Oak Farm, which accepted industrial, commercial and household wastes 1935-1977);
- 291m north (Hatfield Quarry, accepted unknown waste types 1993- 2014);and
- 451m southwest (Pollards Playing Fields, accepted unknown waste types).

- Ecological Designations – There are two areas of Ancient and Semi-Natural Woodland within a 1km radius, both are to the northwest of the Site c. 750m and c.900m. There are no National Nature Reserves, RAMSAR, Special Areas of Conservation, Special Protection Areas or Sites of Special Scientific Interest within 2km of the Site.

2.6 Previous Investigations

See notes in Section 1.6.

3.0 CONCEPTUAL MODEL & PRELIMINARY LAND QUALITY RISK ASSESSMENT

3.1 Regulatory Context and Conceptual Model

The normal procedure for assessing land dictates that potential contaminants, pathways and receptors should be considered within the context of contaminant and pollutant linkages. An evaluation of the risks associated with each linkage should drive decisions regarding the status of the land as potentially contaminated and requiring remediation, uncontaminated or requiring further investigation.

The information summarised in the previous sections has been used to identify the potential for contaminant sources, receptors and pathways present at the Site. The elements of the conceptual model built into Table 3-1 (overleaf) have been used to consider the **potential pollutant linkages (PPL)** and their significance.

3.2 Preliminary Land Quality Risk Assessment

The following conclusions have been drawn from the desk study and considered in development of the LQRA:

- the land use of the Site area has remained largely undeveloped as either agricultural land or aerodrome runway;
- there are no indicators from historic mapping that made ground other than that related to the runway, fire training area and film set is likely to be present on site as there have been no other structures present;
- the ground has been reworked in the runway and fire training areas when the majority of the made ground was broken and largely removed from areas. SLR borehole records indicate there is no made ground at their location;
- the development under consideration for the Site will be mineral extraction, not residential;
- the bromate plume is an off-site source of secondary potential contamination. Natural attenuation (e.g. dispersion) of the bromate within the groundwater could cause some bromate to spread beneath the site boundaries albeit at lesser concentrations; and
- other off-site contamination sources include the landfills to the north and west which are hydraulically up-gradient in the Chalk/LMH aquifer.

Given the proposed industrial use the most significant PPL's appear to be:

- **PPL1a**: Potential Harm to Human Health from Exposure to Contaminants within Soils via Ingestion, Dermal Contact and Inhalation.
- **PPL1b**: Potential Damage to Buildings from Exposure to Aggressive Ground.
- **PPL1c&d**: Potential impact to Controlled Waters by Contaminants in Soil / Natural Geology.
- **PPL2a**: Potential Harm to Human Health from Potential Landfill Contaminants in Groundwater.
- **PPL2b**: Potential Damage to Buildings from Exposure to Aggressive Groundwater
- **PPL2c&d**: Potential Harm to the Environment from Potential Landfill Contaminants in Groundwater.
- **PPL3a-c**: Potential Harm to Human Health and the Environment from Potential Spreading of the Bromate Plume.
- **PPL4:** Potential Risks to Health or the Environment from Unidentified Sources.

Table 3-1
Conceptual Site Model

Source / Area of Concern	Contaminant(s)	Receptors	Likelihood of PPL Forming & Comment on Consequence	Next Step in Procedure
Source 1 – Possible Made Ground on site *Made Ground is likely to be limited to the fire training area and the course of the runway. Both areas have had the majority of the Made Ground broken and dismantled (e.g. hardstanding).*	Potential remnants of asbestos, metals, organics related to fuels and solvents in made ground soils	Humans – Indoors: Future workers & visitors	Unlikely	-
		Humans – Outdoors: Future workers & visitors	**PPL 1a**: Low potential harm to human health from ingestion, inhalation and dermal contact with contaminants within the made ground (i.e. asbestos, metals, PAHs and TPH).	**PPL 1a:** Further Investigation & Assessment – see **Section4**
		Humans - Neighbours	Unlikely that any site derived contamination would impact humans working on or visiting neighbouring sites.	-
		Property – Built Environment: Future buildings	**PPL 1b:** Possible that exposure to contaminants in Made Ground could result in deterioration of buried concrete due to sulphate or acid attack. However, this is unlikely.	**PPL 1b:** Further Investigation & Assessment – see **Section4**
		Property – Scheduled Ancient Monuments	Unlikely - none on site	-
		Property - Flora / Fauna: Crops or ornamental planting	Unlikely - none on site	-
		Surface Water: Ponds and watercourses onsite. No surface water abstraction within 2km.	**PPL1c:** Possible contamination of the watercourses and ponds through surface water run-off and particulate matter.	**PPL 1c:** Further Investigation & Assessment – see **Section4**
		Groundwater: Principle bedrock aquifer and Secondary aquifer in the superficial deposits. Site is in Source Protection Zone 3/2 and is an "at risk" Groundwater Drinking Water Protected Area for the principle aquifer. Potable groundwater abstraction 2.2km.	**PPL1d:** The pathway is through contaminants potentially leaching from the soil. Impacts to the perched Secondary Aquifer are possible but impacts to the underlying Principle Aquifer are far less likely due to the presence of the Boulder Clay beneath the Secondary Aquifer.	**PPL 1d:** Further Investigation & Assessment – see **Section4**
		Ecosystems: Two areas of Ancient and semi-natural woodland c.800m north-west of the Site.	Unlikely	-

Source / Area of Concern	Contaminant(s)	Receptors	Likelihood of PPL Forming & Comment on Consequence	Next Step in Procedure
Source 2 – Possible methane, other hazardous gases and contaminated groundwater emanating from the adjacent landfill sites. *The surrounding landfills accepted a range of wastes from inert, industrial, commercial, household and special waste.*	Hazardous gasses (e.g. methane and carbon dioxide) Elevated ammoniacal nitrogen, metals and hazardous substances in groundwater	Humans – Indoors: Future workers & visitors	Gas: Unlikely – future buildings will be associated with the processing plant. Groundwater: Unlikely.	-
		Humans – Outdoors: Future workers & visitors	Gas: Unlikely given diffusion to atmosphere Groundwater: **PPL2a**: Possible contamination via ingestion and dermal contact with contaminant in groundwater	**PPL 2a:** Further Investigation & Assessment – see **Section 4**
		Humans - Neighbours	Unlikely to be significantly impacted by on site sources	-
		Property – Built Environment: Future buildings	Gas: Unlikely explosion risk from build-up of gases / vapours under / within the building due to nature of well-ventilated buildings. Groundwater**: PPL 2b:** Possible that exposure to contaminants in groundwater could result in deterioration of buried concrete due to sulphate or acid attack. However, this is unlikely.	**PPL 2b:** Further Investigation & Assessment – see **Section 4**
		Property – Scheduled Ancient Monuments	Unlikely - none on site	-
		Property - Flora / Fauna: Crops or ornamental planting	Unlikely – crops will not be grown on the Site.	-
		Surface Water: Ponds and watercourses onsite. No surface water abstraction within 2km.	Gas: Unlikely Groundwater: **PPL2c**: The watercourses are ephemeral and groundwater fed from the UMH superficial aquifer. If groundwater is impacted then contamination of surface water is possible during high groundwater levels with a potential impact upon ecology.	**PPL 2c:** Further Investigation & Assessment – see **Section 4**
		Groundwater: Principle bedrock aquifer and Secondary aquifer in the superficial deposits. Site is in Source Protection Zone 3/2 and is an "at risk" Groundwater Drinking Water Protected Area for the principle aquifer. Potable groundwater abstraction 2.2km.	Gas: Unlikely Groundwater: **PPL2d**: Groundwater in the UMH and Chalk/LMH is hydraulically down-gradient of the historic landfills so there is a potential for groundwater to be impacted on site.	**PPL 2d:** Further Investigation & Assessment – see **Section 4**
		Ecosystems: Two areas of Ancient and semi-natural woodland c.800m north-west of the Site.	Unlikely given distance	-

Source / Area of Concern	Contaminant(s)	Receptors	Likelihood of PPL Forming & Comment on Consequence	Next Step in Procedure
Source 3 – Bromate plume within the Chalk/LMH aquifer. *Whilst the source of the bromate is 3km to the northwest of the Site. The edge of the current plume within the groundwater is just within the site boundary. Remediation for the plume is occurring further down-gradient from the Site at the Hatfield boreholes owned by Affinity and natural attenuation will continue to dilute and disperse the plume, however, the possibility of contamination from the plume must be considered.*	Bromate/bromide above the UK Drinking Water Standard (DWS)	Humans – Indoors: Future workers & visitors	Unlikely	**-**
		Humans – Outdoors: Future workers & visitors	**PPL3a**: Possible contamination via ingestion and dermal contact with bromate in groundwater	**PPL 3a:** Further Investigation & Assessment – see **Section 4**
		Humans - Neighbours	Unlikely	
		Property – Built Environment: Future buildings	Unlikely	-
		Property – Scheduled Ancient Monuments	Unlikely - none on site.	-
		Property - Flora / Fauna: Crops or ornamental planting	Unlikely – crops will not be grown on site.	-
		Surface Water: Ponds and watercourses onsite. No surface water abstraction within 2km.	Unlikely – there is no bromate in the UMH nor has bromate been detected in surface water. Site operations will extend down into both the upper and lower mineral aquifers, so the potential for groundwater mixing exists with the potential for impacting surface water. Operational proposals mitigate this risk and will be a topic of the operational permit.	-
		Groundwater: Principle bedrock aquifer and Secondary aquifer in the superficial deposits. Site is in Source Protection Zone 3/2 and is an "at risk" Groundwater Drinking Water Protected Area for the principle aquifer. Potable groundwater abstraction 2.2km.	**PPL3b:** Possible contamination of the LMH and Chalk groundwater beneath the Site via the contaminated groundwater off-site. **PPL3c**: This linkage applies to the LMH and the UMH aquifers	**PPL 3b:** As for PPL 3a. **PPL3c**: As for PPL 3a
		Ecosystems: Two areas of Ancient and semi-natural woodland c.800m north-west of the Site.	Unlikely	-
Source 4 - Unidentified Contaminant Source(s) on site	Various common contaminants	Humans – Indoors: Future workers & visitors	**PPL 4**: Potential Harm to Health or the Environment from Unidentified Contaminant Sources – Exposure Mechanism Unknown.	**PPL4:** If Needed – Voluntary Remedial Action – see **Section 6**
		Humans – Outdoors: Future workers & visitors		
		Humans - Neighbours		
		Property – Built Environment: Future buildings		
		Property – Scheduled Ancient Monuments		

Source / Area of Concern	Contaminant(s)	Receptors	Likelihood of PPL Forming & Comment on Consequence	Next Step in Procedure
		Property - Flora / Fauna: Crops or ornamental planting		
		Surface Water: Ponds and watercourses onsite. No surface water abstraction within 2km.		
		Groundwater: Principle bedrock aquifer and Secondary aquifer in the superficial deposits. Site is in Source Protection Zone 3/2 and is an “at risk” Groundwater Drinking Water Protected Area for the principle aquifer. Potable groundwater abstraction 2.2km.		
		Ecosystems: Two areas of Ancient and semi-natural woodland c.800m north-west of the Site.		

4.0 SITE INVESTIGATIONS

4.1 Context and Overview

SLR site work started in July 2013 with subsequent groundwater and surface water monitoring being carried out regularly up to October 2015. Additional drilling was undertaken in May 2014 in response to findings from the initial set of boreholes and permeability testing was undertaken in January 2015. The site work included:

- borehole drilling and collection of bulk and undisturbed soil samples:
    - particle size distribution analyses of mineral horizon soil samples;
- hydraulic conductivity testing of the Interburden clay (laboratory analysis of U100 sample in a triaxial permeameter);
- 29 monitoring well installations in 20 boreholes (UMH, LMH & Chalk aquifer intervals):
    - BH101 to BH108, BH201; and
    - FT101 to FT103
- development and sampling of selected pre-existing monitoring wells (10 No.);
- groundwater and surface water level monitoring from all SLR wells and subsequently from a network of pre-existing “old” wells identified by SLR;
    - monthly (08/13 - 07/14), and quarterly (10/14 – 10/15)
- continuous groundwater level monitoring in 6 wells using transducers and data loggers (08/13 – current);
- groundwater and surface water quality sampling of SLR monitoring wells (quarterly schedule as per water level monitoring, amended to monthly if bromate was detected);
- additional water level monitoring and groundwater analysis of 10 pre-existing monitoring wells discovered during site works (added to the monitoring schedule from time of discovery);
- laboratory analysis of groundwater and surface water samples:
    - baseline – bromate/bromide, total petroleum hydrocarbons (TPHCWG), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, metals, inorganic compounds, major ions;
    - quarterly – bromate/bromide, metals, inorganic compounds, major ions; and
    - monthly – bromate/bromide from selected monitoring wells.
- tracer dye testing of the Nast and Ellenbrook; and
- purchase of additional groundwater quality data from the Environment Agency for the wider Hatfield area.

Details of the site work and sampling are described in a previous SLR report[2], whereas this report provides a brief summary of groundwater quality and assesses the data in relation to the PPL’s identified in Section 3.

4.2 Geology

Figure 8 schematically shows the geology and hydrogeology identified on site.

Figure 8
Site Geology and Hydrogeology

Drift/Solid	Depth (mbgl)	Geological Unit	Aquifer and Depth (mbgl)
Superficial Drift	0.1 – 5.7	Overburden – Clay, Sand, Gravel	0.49 -8.39
	2.2 – 11.8	Upper Mineral Horizon (UMH)	
	6.2 – 14.2	Interburden - Boulder Clay (BC)	5.39 – 13.63
	8 – 18.3	Lower Mineral Horizon (LMH)	
Solid Geology		Upper Chalk	

The boreholes installed by SLR provide the following information:

- the overburden comprises a variable mixture of clay, sand and gravel, mixed and in discrete lenses;
- the UMH comprises of slightly gravelly sand, whilst the LMH comprises sand and sandy gravel;
- the Interburden is a typical over-consolidated glacial boulder clay. Its permeability has been measured in laboratory tests at 5 x 10^{-11} m/s; and
- the LMH comprises sandy gravel and gravel, with less sand than the UMH.

The upper surface of the chalk is an erosional surface with clay like texture at its surface thought to be caused by weathering processes.

Drawing HQ 6/3 of the Environmental Statement[1] (ES) depicts a SW – NE trending geological cross section that extends beyond the site boundary across and beyond the Ellenbrook. The site boundary is shown and illustrates the two mineral zones and boulder clay Interburden separating the two horizons and dipping towards the northeast.

4.3 Hydrogeology

4.3.1 UMH Aquifer

Groundwater has been recorded in the UMH at depths below ground level between 0.495m (BH101 U) and 8.6m (BH105X U), representing groundwater elevations between 77.28 to 71.86mAOD. Groundwater flow within the UMH is west south west to north east across the application site and the hydraulic gradient ranges between 0.0004 and 0.01. The piezometric surface is illustrated on Drawing HQ 6/6 of the ES[1].

The UMH groundwater is perched upon the surface of the boulder clay Interburden so flow direction is principally controlled by the dip of this surface together with local areas of recharge and surface water discharge.

4.3.2 LMH Aquifer

Groundwater has been recorded in the LMH at depths below ground level between 5.32m (BH104 L) and 13.63m (BHB L), representing groundwater elevations between 70.256 to 64.27mAOD. Groundwater flow within the LMH and Chalk is north-west to south east across the application site; the hydraulic gradient is approximately 0.001. The piezometric surface is illustrated on Drawing HQ 6/7 of the ES[1].

The LMH aquifer is in hydraulic connection with the regional Chalk aquifer used for potable water supply and as base flow to regional river systems.

4.3.3 Groundwater Quality

Groundwater quality has been monitored on and next to the application site since August 2013 with the latest monitoring event being October 2015. The groundwater monitoring locations are shown on Drawing HQ6/5 of the ES[1].

Data and key characteristics from water quality analyses for monitoring boreholes screened within the UMH, LMH and Chalk are included within Appendix D.

Quality within the UMH, LMH and Chalk is typically good with minor occasional exceedances of the relevant standards. A summary of the quality results relevant to the identified PPL's in Section 3 is detailed below.

PPL1: Made Ground

- within the UMH the groundwater quality is typically good with a few single exceedances of certain metals across the boreholes;
- metal concentrations are typically low across the application site, however, manganese exceeds the UK Drinking Water Standard (DWS) of 0.05mg/l in the UMH, LMH and Chalk aquifers in the majority of the perimeter boreholes at least once, whilst zinc and nickel have been detected over the respective freshwater Environmental Quality Standard (EQS) and UK DWS in UMH and Chalk in boreholes BH102 (southwest) and BH106 (southeast);
- sulphate slightly exceeds the DWS of 250mg/l with 260mg/l in BH107U which is located next to an area of made ground which included crushed concrete;
- no elevated concentrations of potential contaminants of concern were detected at the boreholes around the fire training area; and
- no hazardous substances have been detected within the Site with the exception of BHA to the north east which has detected trace amounts of volatile organic compounds. This is unlikely to be related to made ground and is discussed further as part of PPL4.

PPL2: Landfill Contaminants

- ammoniacal nitrogen concentrations are generally below the DWS of 0.39mg/l across the Site. Single exceedances are recorded at BH101 (in both Chalk 2.1mg/l, and UMH 0.51mg/l) and BH102 (in both LMH 1.7mg/l and Chalk 0.76mg/l). BH103 exceeds the DWS in the LMH and Chalk. Maximum concentrations recorded are 11mg/l and 0.7mg/l respectively;
- nickel has exceeded the DWS of 0.02mg/l more than once in LMH and Chalk boreholes BH102L, BH103L and BH103C with a maximum concentration of 0.083mg/l in BH103L;
- arsenic has been detected twice above the DWS of 0.01mg/l once in BH101L and once in BH102L with a concentration of 0.012mg/l in both boreholes.

- cadmium has not been detected at concentrations exceeding the DWS; and
- it is noted that BH103 which is located to the north west is hydraulically down-gradient of some of the offsite landfills and generally exhibits higher concentrations of key determinands than in other wells.

PPL3: Bromate

- bromate has not been detected over the DWS of 0.01mg/l across the Site, however, LMH boreholes BHG L, BH101 L, BH106 L and BH104 (both L & C) have all detected bromate at trace levels at least once
- groundwater from BH106 U has detected bromate twice at trace concentrations below the DWS;
- off-site boreholes BHB, BH201, BH105 and BH108 within the LMH and Chalk (where screened) have all detected bromate at concentrations above the DWS. There have been multiple detections in all these boreholes which are situated to the northeast of the application site. The maximum recorded concentration is 0.33mg/l in BH105L which is the furthest monitored borehole from the Site; and
- bromate has been detected once in groundwater from BH108U when it marginally exceeded the DWS.

Boreholes detecting bromate are identified on Drawing 5 with all bromate concentrations recorded between 2013 and October 2015.

PPL4: Unconfirmed Sources

- BH102 to the southwest of the Site has detected nitrate in all three of the aquifers over the DWS of 50mg/l, whilst the LMH and Chalk aquifers have concentrations of ammoniacal nitrogen which has exceeded the DWS of 0.39mg/l at least once over the monitoring period;
- the only borehole to detect hazardous substances on site is BHA to the north of the Site which is screened in the UMH. The following substances have been detected: 1,1 dichloroethene 0.006mg/l (no standard), 1,1 dichloroethane 0.015mg/l (0.03mg/l DWS for 1,2 dichloroethane) and 1,1,1 trichloroethane 0.033mg/l (0.05mg/l WHO DWS guidelines) which are all below the relevant standards; and
- the following hazardous substances have been detected in the off-site boreholes:
    - trichloroethene has been detected within the LMH in BH201, BH108L and BH105L.
    - trichloroethene has also been detected within the UMH and Chalk within BH105. The maximum concentration recorded is 0.17mg/l in BH105C;
    - vinyl chloride has been detected at elevated concentrations in BH108L, BH105L and BH105C with a maximum concentration of 0.0048mg/l in BH105C; and
    - 1,2 Dichloroethene has been detected at elevated concentrations in BH105 across all three horizons with a maximum concentration of 0.22mg/l in BH105C.
- It is not possible to confirm the source of impacts in the offsite monitoring wells. However, given that the higher impacts are in the LMH and Chalk (not the UMH), it would seem to indicate a source hydraulically up gradient towards the northeast, and where the boulder clay separating the two aquifers is absent.

5.0 RESIDUAL POTENTIAL POLLUTANT LINKAGES

5.1 Land Quality Risk Assessment

The potential pollutant linkages (PPL's) identified in Section 3 have been reassessed following the conclusions of the site investigation and subsequent monitoring detailed in Section 4. Details are shown in Table 5-1 and discussed further in Section 6.

The PPL's previously identified are:

- **PPL1a**: Potential Harm to Human Health from Exposure to Contaminants within Soils via Ingestion, Dermal Contact and Inhalation.
- **PPL1b**: Potential Damage to Buildings from Exposure to Aggressive Ground.
- **PPL1c&d**: Potential impact to Controlled Waters by Contaminants in Soil / Natural Geology.
- **PPL2a**: Potential Harm to Human Health from Potential Landfill Contaminants in Groundwater.
- **PPL2b**: Potential Damage to Buildings from Exposure to Aggressive Groundwater
- **PPL2c&d**: Potential Harm to the Environment from Potential Landfill Contaminants in Groundwater.
- **PPL3a-c**: Potential Harm to Human Health and the Environment from Potential Spreading of the Bromate Plume.
- **PPL4:** Potential Risks to Health or the Environment from Unidentified Sources.

Table 5-1
Residual Risks

Source / Area of Concern	Contaminant(s)	Receptors	PPL	Investigation and Conclusion
Source 1 – Possible Made Ground *Made Ground is likely to be limited to the fire training area and the course of the runway. Both areas have had the majority of the Made Ground broken and dismantled (e.g. hardstanding).*	Various common contaminants	Humans – Outdoors: Future workers & visitors	**PPL 1a**	Manganese is commonly found in soils and rocks and due to the wide spread nature across the Site the source of the manganese on site is thought to be natural. There is nothing elevated in the UMH that suggests the reworked ground is contaminated with the exception of a single slightly elevated sulphate concentration at BH107U (260mg/l). It is known that this area formerly had crushed concrete on the surface and is the most likely cause. Sulphate can impact upon infants and the elderly if ingested at high concentrations. It is thought that any remaining sources will be removed during excavation and best work practices will protect the work force from ingestion.
		Property – Built Environment: Future buildings	**PPL 1b**	
		Surface Water: Ponds and watercourses onsite. No surface water abstraction within 2km.	**PPL1c**	
		Groundwater: Principle bedrock aquifer and Secondary aquifer in the superficial deposits. Site is in Source Protection Zone 3/2 and is an "at risk" Groundwater Drinking Water Protected Area for the principle aquifer. Potable groundwater abstraction 2.2km.	**PPL1d**	
Source 2 – Possible contaminated groundwater emanating from the adjacent landfill sites. *The surrounding landfills accepted a range of wastes from inert, industrial, commercial, household and special waste.*	Elevated ammoniacal nitrogen, metals and hazardous substances in groundwater	Humans – Outdoors: Future workers & visitors	**PPL2a**	Ammoniacal nitrogen concentrations are higher at BH103L (max recorded 11mg/l) and are also elevated in the chalk aquifer. BH103 is located down-gradient of the landfills to the immediate northwest and due to the other key determinands showing slightly higher concentrations at this borehole (but still typically below the relevant standards) it is thought this impact is due to the landfills. Due to the low concentrations it is considered to be of minor threat to future workers, property and environment, however, it is recommended that perimeter monitoring is continued to monitor trends.
		Property – Built Environment: Future buildings	**PPL 2b**	
		Surface Water: Ponds and watercourses onsite. No surface water abstraction within 2km.	**PPL2c**	
		Groundwater: Principle bedrock aquifer and Secondary aquifer in the superficial deposits. Site is in Source Protection Zone 3/2 and is an "at risk" Groundwater Drinking Water Protected Area for the principle aquifer. Potable groundwater abstraction 2.2km.	**PPL2d**	
Source 3 – Bromate plume within the Chalk/LMH aquifer. *Whilst the source of the bromate is 3km to the northwest of the Site. The edge of the dissolved plume borders the northern site boundary. Plume capture is occurring*	Bromate/bromide over the proposed UK Drinking Water Standard (DWS)	Humans – Outdoors: Future workers & visitors	**PPL3a**	The site investigation has proven that the edge of the bromate plume is close to the north eastern boundary. Although it is currently within UK DWS beneath the Site, the proposed mineral workings have been designed with practicable methods to keep the bromate plume from being pulled towards the Site or excavation area during operation and restoration and for isolating UMH groundwater from groundwater in the LMH. This will protect the future work force, public water supplies c. 2.2km to the south east of the Site and mitigate risk of
		Groundwater: Principle bedrock aquifer and Secondary aquifer in the superficial deposits. Site is in Source Protection Zone 3/2 and is an "at risk" Groundwater Drinking Water Protected Area for the principle aquifer. Potable groundwater abstraction 2.2km.	**PPL3b and PPL3c**	

Source / Area of Concern	Contaminant(s)	Receptors	PPL	Investigation and Conclusion
further down-gradient from the Site at the former Hatfield PWS boreholes owned by Affinity. Remedial action at the source is being planned and could reduce plume concentrations at the Site in the medium to long term. The potential for exposure to bromate must be considered.				impact to surface water Further information is given in **section 6**
Source 4 - Unidentified Contaminant Source(s) on site	Ammoniacal nitrogen and VOCs	Humans – Indoors: Future workers & visitors	**PPL 4**	The site investigation identified a slightly elevated concentration of nitrate in BH102 in the UMH, LMH and Chalk aquifers and occasional ammoniacal nitrogen exceedances in the LMH and Chalk. The source of these impacts is unproven but could be the nurseries to the west of the Site although it is noted that the LMH and chalk aquifers at this location are also hydraulically down-gradient of offsite landfills albeit at a distance. Trace concentrations of volatile organic compounds (VOCs) have been detected at BHA U to the north of the Site. This area has undergone previous investigation by others (see section 1.6) and we are awaiting further details before further comment can be made. The negligible concentrations detected do not exceed human health exposure criteria, plus mineral excavation will cause the rapid dispersal of VOC vapours further reducing the potential for exposure. **PPL4:** If Needed – Voluntary Remedial Action – see **section 6.**
		Humans – Outdoors: Future workers & visitors		
		Humans - Neighbours		
		Property – Built Environment: Future buildings		
		Property – Scheduled Ancient Monuments		
		Property - Flora / Fauna: Crops or ornamental planting		
		Surface Water: Ponds and watercourses onsite. No surface water abstraction within 2km.		
		Groundwater: Principle bedrock aquifer and Secondary aquifer in the superficial deposits. Site is in Source Protection Zone 3/2 and is an "at risk" Groundwater Drinking Water Protected Area for the principle aquifer. Potable groundwater abstraction 2.2km.		
		Ecosystems: Two areas of Ancient and semi-natural woodland c.800m north-west of the Site.		

6.0 POTENTIAL FUTURE REQUIREMENTS

6.1 Potential Future Voluntary Actions and Validation

6.1.1 Action to Avoid PPL 3(a-b)

Potential Harm to Human Health and the Environment from Potential Spreading of the Bromate Plume

The proposed development has been designed to minimise the potential for bromate plume expansion during mineral extraction. The safeguards include:

- the LMH will be worked wet and pumping to reduce water levels kept to minimum and only where water levels are above the base of the Interburden;
- Phases A and B, located between the plume and the Site, will be worked first, will not require lowering of water levels in the LMH and will provide a barrier to flow from the bromate and VOC impacted groundwater towards the Site during the working of other phases;
- pumped groundwater from the LMH and potentially from the UMH depending upon volumes, will be recharged to the LMH/Chalk via a recharge lagoon between the mineral extraction phases and the bromate contaminated groundwater which will lead to the creation of a hydraulic barrier to flow from the plume beyond the site boundary;
- mineral working that require lowering of the groundwater will be limited, as best practicable, to seasons where groundwater levels are lower to reduce the amount of water removed from the working area; and
- a water management plan will be agreed with the Environment Agency prior to works commencing and this will include a monitoring programme to confirm the mitigation measures described above are effective and to agree contingency actions as necessary.

The impacts of temporarily lowering groundwater levels on the bromate plume have been considered in the Water Environment Section 6 of the Environmental Statement[1] and have been found to be minor with suitable practicable mitigation measures as briefly mentioned above.

6.1.2 Action to Break PPL 4: Unidentified Sources

Whilst two areas of unknown potential contamination have been identified and assessed (PPL4: VOCs offsite and ammoniacal nitrogen), there is the potential for further undiscovered contamination to exist. Should any unidentified contamination be encountered as part of the redevelopment, the developer may be required to implement additional voluntary measures to investigate and identify/manage risks.

In practise, should anybody encounter potentially hazardous materials work should cease and the matter be referred to an appropriate environmental consultant.

Any remedial actions should be agreed with the local authority and recorded in a Land Quality Validation Report (see Section 6.2).

6.2 Land Quality / Remedial Works Validation Report

Given the site's history the potential for additional contamination is considered to be low. However, should any contamination be discovered either as a result of additional investigation or through any other means, then remedial work may be required. Any remedial works should follow a period of liaison with the local authority in which final details of the

remedial scheme would be agreed. The local authority may or may not want to be informed of progress during any remedial works, but the regulator will require a report shortly after the remedial works are complete. The Land Quality Validation Report should be submitted to the local authority and should:

- set out which organisations have been responsible for implementing and supervising the remedial works (any environmental consultant used should be suitably experienced and operate under an externally accredited quality assurance scheme e.g. ISO9001);
- present the results of any additional testing;
- demonstrate that quality assurance procedures relevant to soil sampling, storage and testing were complied with (including the use of accredited laboratories and, where possible, the use of MCERTS testing methods);
- form a record of the remedial activities (and any changes to any pre-agreed remedial design) using as-built drawings, progress photographs, etc.; and
- set out any additional remedial measures volunteered to deal with contamination (beyond that previously identified) encountered as part of the proposed development.

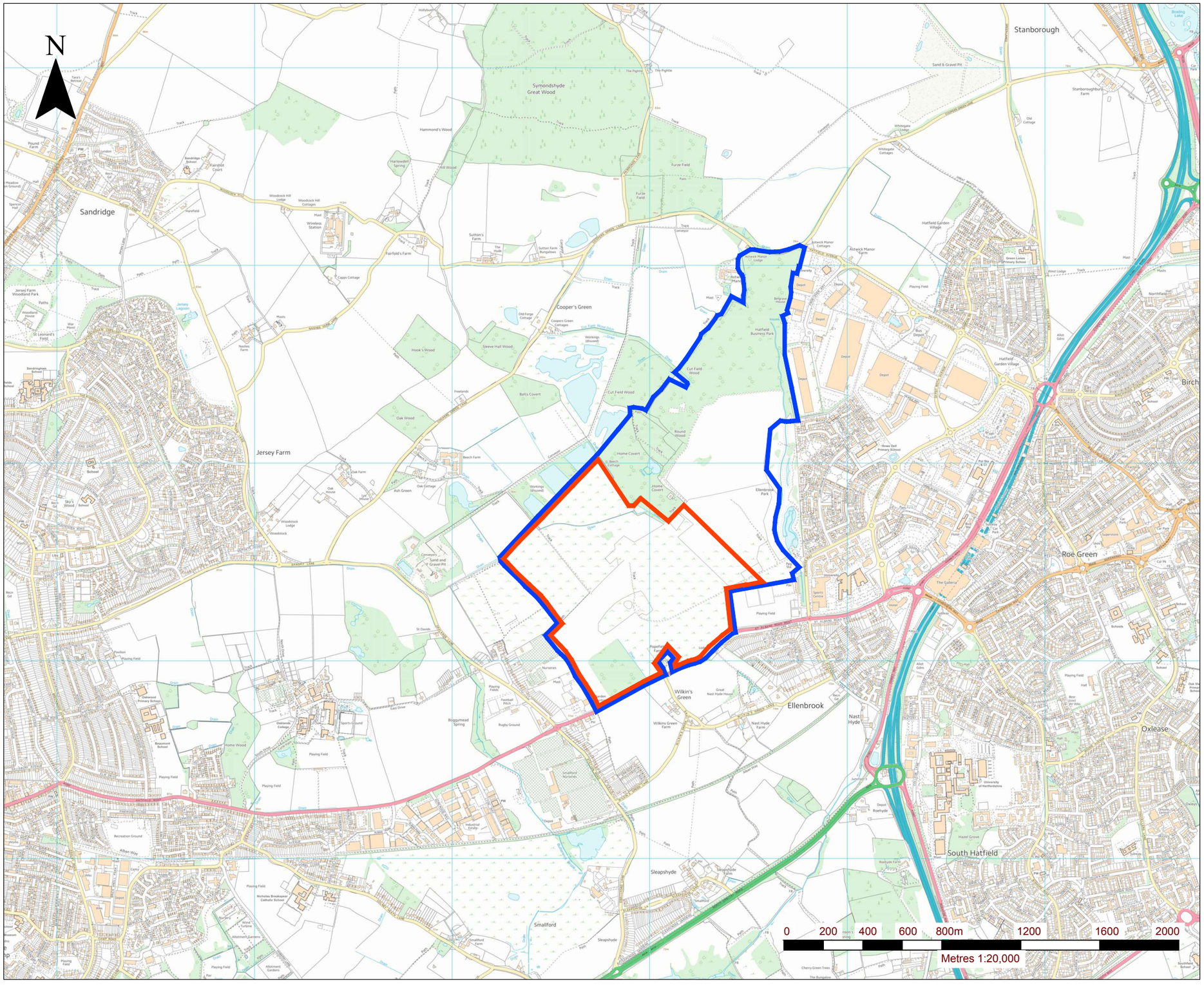
7.0 CLOSURE

This report has been prepared by SLR Consulting Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client.

Information reported herein is based on the interpretation of data collected from various sources which has been accepted in good faith as being accurate and valid.

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HATFIELD AERODROME

LAND QUALITY RISK ASSESSMENT

SITE LOCATION

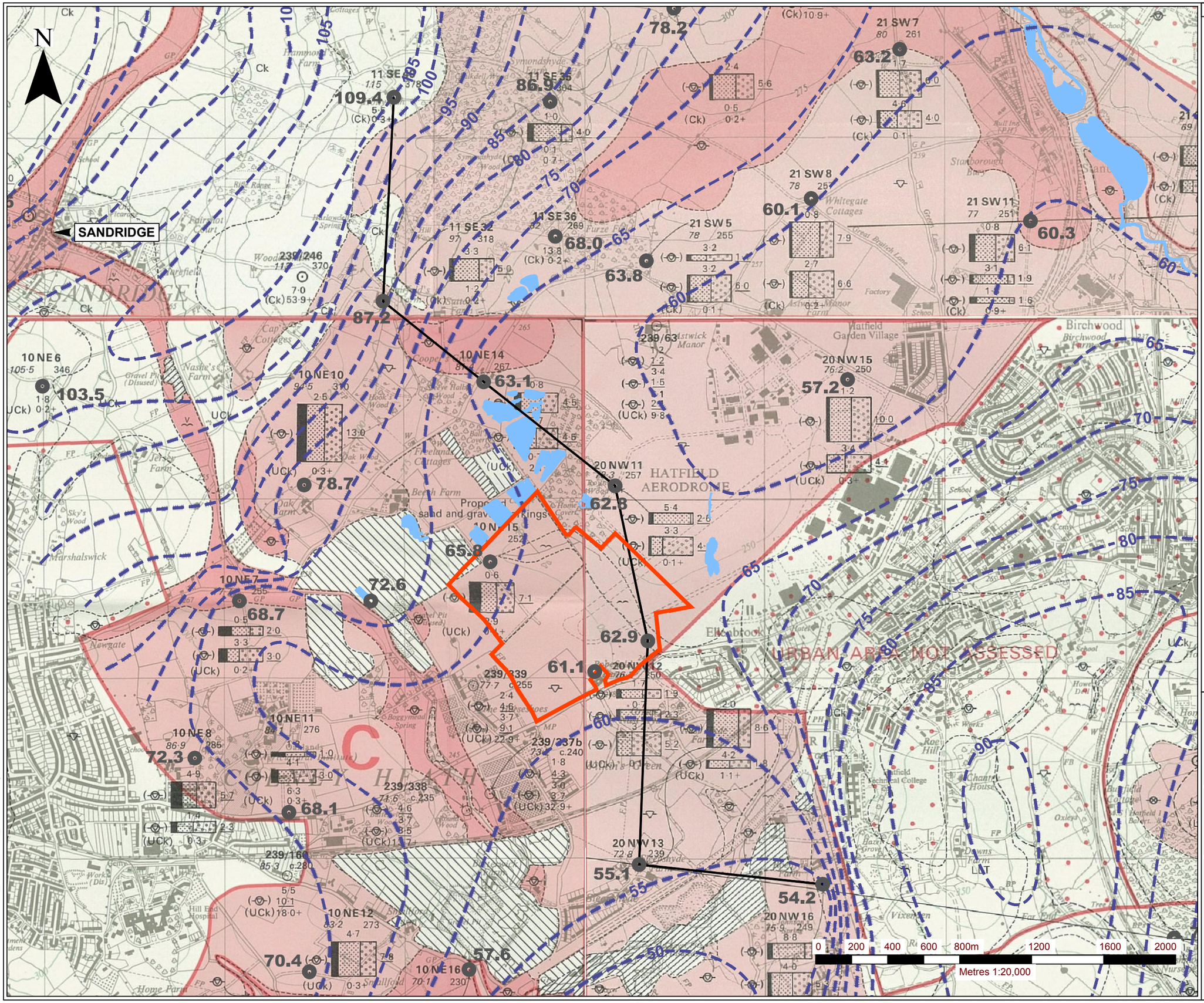
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LEGEND

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LAND QUALITY RISK ASSESSMENT

REGIONAL CHALK SURFACE AND SUBCROP WITH MINERAL DEPOSITS

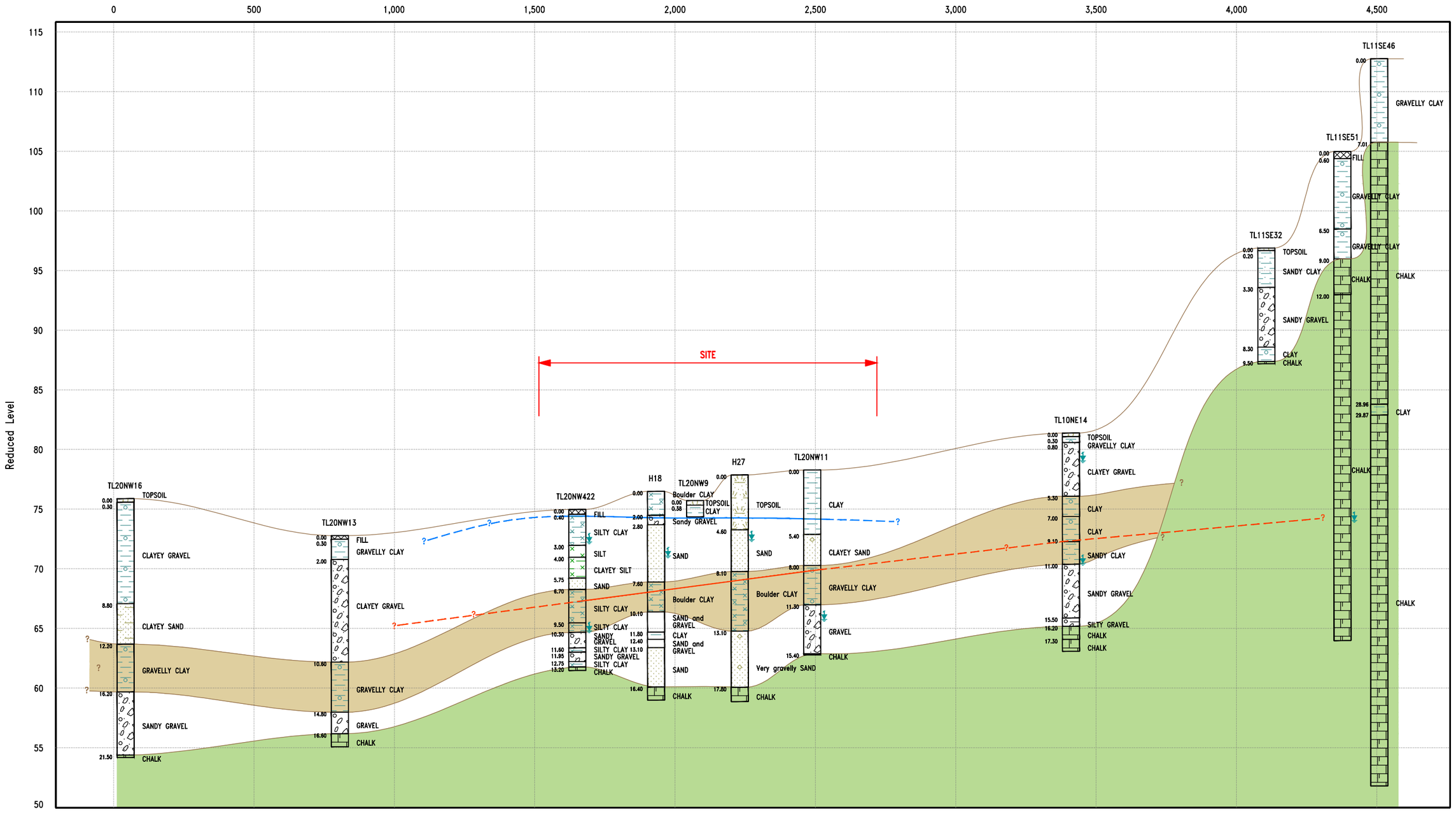
DWG No. 2

Scale: 1:20,000 @ A3

Date: JANUARY 2016

01009.00132.019.002.0_REGIONAL_CHALK.dwg

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LEGEND

- CHALK
- INTERBURDEN (BOULDER CLAY)
- GROUNDWATER LEVEL (APPROX) UPPER MINERAL HORIZON (MARCH 2014)
- GROUNDWATER LEVEL (APPROX) CHALK (MARCH 2014)

NOTES

1. GEOLOGICAL CROSS-SECTION DATA TAKEN FROM D K SYMES 1994.

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HATFIELD AERODROME

LAND QUALITY RISK ASSESSMENT

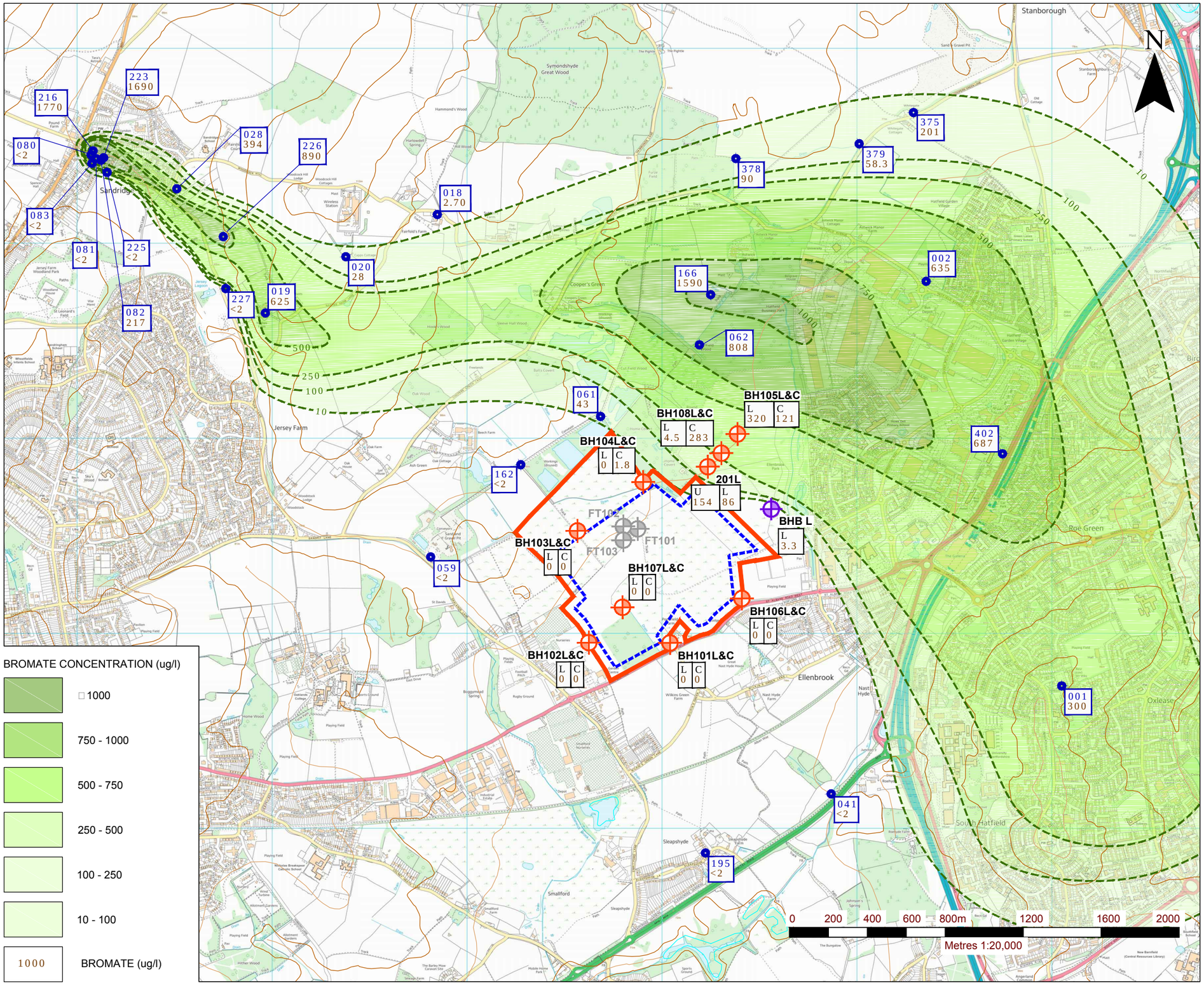
REGIONAL CROSS SECTION

DWG No. 3

Scale	Date
NTS (A3)	JANUARY 2016

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BROMATE CONCENTRATION (ug/l)

- 1000
- 750 - 1000
- 500 - 750
- 250 - 500
- 100 - 250
- 10 - 100
- 1000 BROMATE (ug/l)

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LEGEND

- SITE BOUNDARY
- PROPOSED MINERAL DEVELOPMENT SITE
- 166 WELL NUMBER (ENVIRONMENTAL AGENCY (EA) BOREHOLE)

SLR (AUGUST 2013)

- BH105DL&C DUAL MONITORING WELLS (LOWER MINERAL HORIZON AND CHALK)
- FT101 FIRE TRAINING AREA MONITORING WELL
- BHB L OLD WELLS (NON SLR) (LOWER MINERAL HORIZON)
- U UPPER MINERAL HORIZON
- L LOWER MINERAL HORIZON
- C CHALK

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LAND QUALITY RISK ASSESSMENT

REGIONAL BROMATE PLUME JULY 2014

DWG No. 4

Scale 1:20,000 @ A3

Date JANUARY 2016

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BH104			
	UMH	LMH	CHALK
AUG 13	-	-	-
NOV 13	-	-	-
FEB 14	-	-	-
MAY 14	-	-	-
JUN 14	-	-	0.0011
JUL 14	X	-	0.0018
OCT 14		0.0041	0.0039
JAN 15	-	0.0018	0.0042
APR 15	-	0.0009	0.0031
JUL 15	-	0.0019	0.0031
OCT 15	-	0.0019	0.0032

BHA	
	UMH
NOV 13	-
FEB 14	-
MAY 14	-
JUL 15	
OCT 15	-

BHJ	
	UMH
MAY 14	-
JUL 15	-
OCT 15	-

BH201		
	LMH-S	LMH-D
JUN 14	0.11	0.09
JUL 14	0.1542	0.0863
OCT 14	0.1200	0.0865
JAN 15	0.1259	0.0860
APR 15	0.1309	0.0897
JUL 15	0.1123	0.0761
OCT 15	0.122	0.077

BH108			
	UMH	LMH	CHALK
JUN 14	-	0.0073	0.26
JUL 14	X	0.0045	0.2826
OCT 14		0.0048	0.2913
JAN 15	0.0129	0.0490	0.3222
APR 15	-	0.0657	0.3226
JUL 15	-	0.0014	0.2846
OCT 15	-	0.0374	0.3135

BHD	
	UMH
FEB 14	-
MAY 14	-
JUL 14	DRY
OCT 15	DRY

BH105			
	UMH	LMH	CHALK
AUG 13	X	0.33	-
SEP 13	X	-	-
OCT 13	X	-	-
NOV 13	X	0.12	-
DEC 13	X	-	-
JAN 14	X	-	-
FEB 14	X	0.29	-
MAR	X	-	-
APR 14	X	0.22	0.19
MAY 14	X	0.29	-
JUN 14	-	0.18	0.13
JUL 14	X	0.3106	0.1205
OCT 14		0.2786	0.0243
JAN 15	-	0.2997	0.1166
APR 15	-	0.3018	0.1541
JUL 15	-	0.2654	0.1180
OCT 15	-	0.3072	0.1383

BHK	
	UMH
MAY 14	-
JUL 15	-
OCT 15	-

BHC	
	UMH
NOV 13	-
FEB 14	-
MAY 14	-
JUL 15	-
OCT 15	-

BH103			
	UMH	LMH	CHALK
AUG 13	-	-	-
NOV 13	-	-	-
FEB 14	-	-	-
MAY 14	-	-	-
JUN 14	-	-	-
OCT 14		-	-
JAN 15	-	-	-
APR 15	-	-	-
JUL 15	-	-	-
OCT 15	-	-	-

BHB	
	LMH
NOV 13	-
FEB 14	-
MAY 14	-
JUN 14	0.0072
JUL 14	0.0033
OCT 14	0.0133
JAN 15	0.0108
APR 15	0.0162
JUL 15	0.0186
OCT 15	0.015

BH107			
	UMH	LMH	CHALK
JUN 14	-	-	-
OCT 14		-	-
JAN 15	-	-	-
APR 15	-	-	-
JUL 15	-	-	-
OCT 15	-	-	-

BH106			
	UMH	LMH	CHALK
AUG 13	-	-	-
NOV 13	-	-	-
FEB 14	-	-	-
MAY 14	-	-	-
JUN 14	-	-	-
OCT 14		-	-
JAN 15	0.0021	-	-
APR 15	0.0016	0.0006	-
JUL 15	-	-	-
OCT 15	-	-	-

BHG	
	UMH
FEB 14	-
MAY 14	-
JUN 14	-
OCT 14	-
JAN 15	-
APR 15	-
JUL 15	-
OCT 15	0.0024

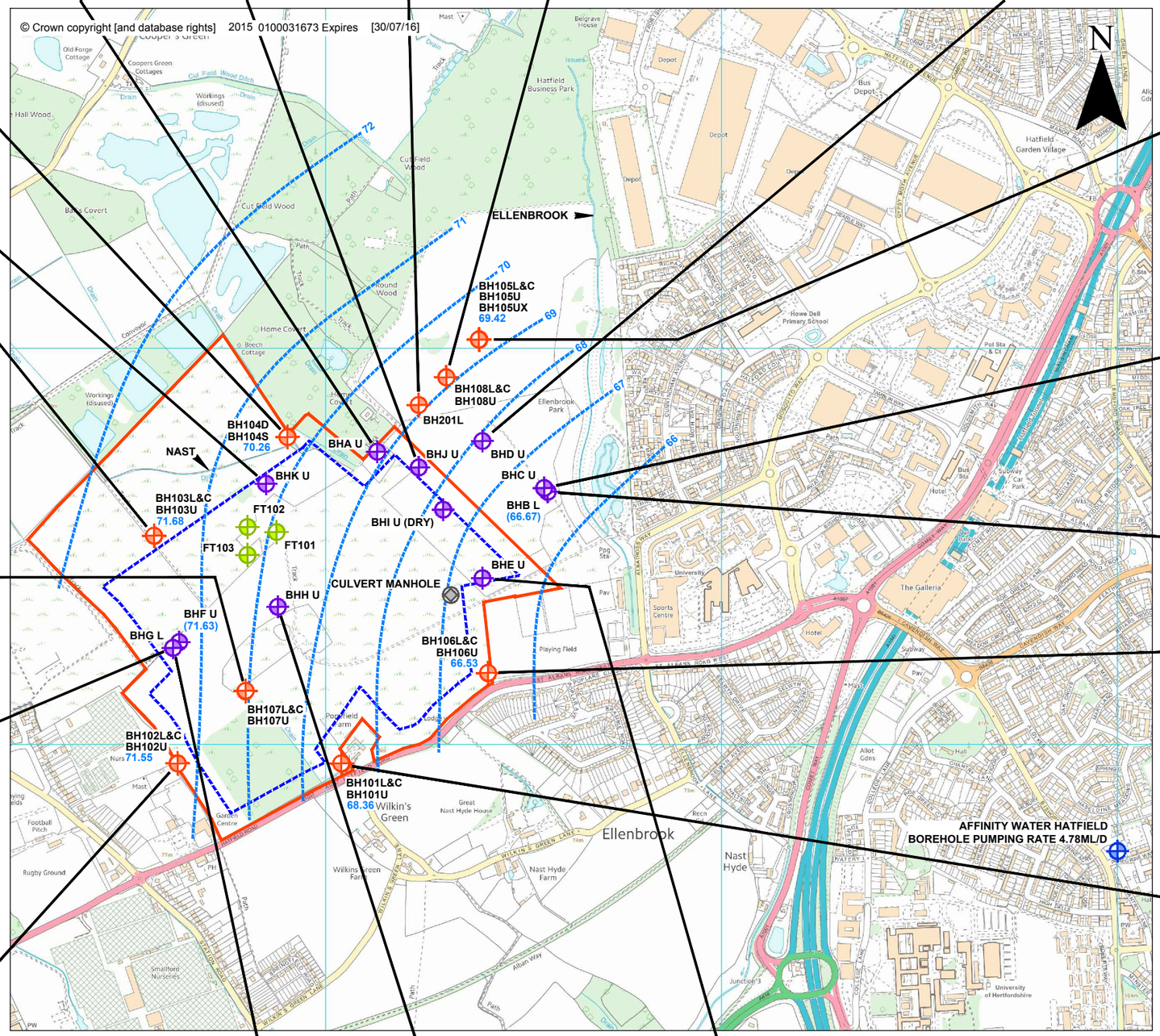
BH102			
	UMH	LMH	CHALK
AUG 13	-	-	-
NOV 13	-	-	-
FEB 14	-	-	-
MAY 14	-	-	-
JUN 14	-	-	-
OCT 14		-	-
JAN 15	-	-	-
APR 15	-	-	-
JUL 15	-	-	-
OCT 15	-	-	-

BH101			
	UMH	LMH	CHALK
AUG 13	-	-	-
NOV 13	-	-	-
FEB 14	-	-	-
MAY 14	-	-	-
JUN 14	-	0.0047	-
JUL 14	X	-	-
OCT 14		-	-
JAN 15	-	-	-
APR 15	-	-	-
JUL 15	-	-	-
OCT 15	-	-	-

BHF	
	UMH
FEB 14	-
MAY 14	-
JUL 15	-
OCT 15	-

BHH	
	UMH
FEB 14	-
MAY 14	-
JUL 15	-
OCT 15	-

BHE	
	UMH
FEB 14	-
MAY 14	-
JUL 15	-
OCT 15	-



LEGEND

- SITE BOUNDARY
- PROPOSED MINERAL DEVELOPMENT SITE WITH APPROXIMATELY 8 MILLION TONNES OF MINERAL RESERVE
- BHD — OLD WELLS U □ UPPER, L □ LOWER
- CULVERT MANHOLE
- AFFINITY WATER HATFIELD BOREHOLE

SLR BOREHOLES

- BH105D — DUAL MONITORING WELLS (LOWER MINERAL HORIZON AND CHALK)
- BH105S — SHALLOW MONITORING WELL (UPPER MINERAL HORIZON)
- FT101 — FIRE TRAINING AREA MONITORING WELL

PIEZOMETRIC SURFACE

- 70.26 — WATER ELEVATION (mAOD) IN MONITORING WELL
- 69 — PIEZOMETRIC SURFACE ELEVATION (mAOD)

CHEMISTRY TABLES

- 0.26 — BROMATE GREATER THAN 0.01mg/l
- 0.003 — BROMATE LESS THAN 0.01mg/l
- - — BROMATE NOT DETECTED ABOVE THE LABORATORY MDL
- X — NOT SAMPLED

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LAND QUALITY RISK ASSESSMENT

PIEZOMETRIC SURFACE - LMH HIGH WATER 19/01/2015 - BROMTE CONCENTRATIONS IN GROUNDWATER (AUG 2013 - 2015)

DWG No. 5

Scale 1:12,500 @ A3

Date JANUARY 2016

01009.00132.019.005.0_PIEZOMETRIC_LMH_CHEMISTRY.dwg

EmapSite

Masdar House, ,
Eversley, RG27 0RP

Groundsure Reference:	EMS-329807_444294
Your Reference:	EMS_329807_444294
Report Date	16 Oct 2015
Report Delivery Method:	Email - pdf

Groundsure Enviroinsight

Address: ,

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Enviroinsight** as requested.

If you would like further assistance regarding this report then please contact the emapsite customer services team on 0118 9736883 quoting the above report reference number.

Yours faithfully,

emapsite customer services team

Enc.
Groundsure Enviroinsight

Groundsure Enviroinsight

Address:	,
Date:	16 Oct 2015
Reference:	EMS-329807_444294
Client:	EmapSite

NW N NE

W E

SW S SE



Aerial Photograph Capture date:	29-Aug-2005
Grid Reference:	519884,208397
Site Size:	86.78ha

Report Reference: EMS-329807_444294
Client Reference: EMS_329807_444294

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Overview of Findings

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Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	13	6	9	19
1.2 Additional Information – Historical Tank Database	0	0	0	11
1.3 Additional Information – Historical Energy Features Database	0	1	1	4
1.4 Additional Information – Historical Petrol and Fuel Site Database	0	0	0	0
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	0	0	4	7
1.6 Potentially Infilled Land	12	5	12	34

Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	1	3
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	0	0	3
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	0	0
2.2 Records of COMAH and NIHHS sites	0	0	0	0
2.3 Environment Agency Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	1	2
2.3.2 National Incidents Recording System, List 1	0	0	0	0
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

Section 3: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-1500
3.1 Landfill Sites						
3.1.1 Environment Agency Registered Landfill Sites	0	0	1	0	0	Not searched
3.1.2 Environment Agency Historic Landfill Sites	2	1	1	2	8	18
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	1	1
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	0	0	2
3.2 Landfill and Other Waste Sites Findings						
3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	Not searched	Not searched
3.2.2 Environment Agency Licensed Waste Sites	0	0	0	6	11	0

Section 4: Current Land Use	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	0	1	12	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	1	0
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology	
5.1 Are there any records of Artificial Ground and Made Ground present beneath the study site?	No
5.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	Yes
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 6: Hydrogeology and Hydrology	0-500m
6.1 Are there any records of Strata Classification in the Superficial Geology within 500m of the study site?	Yes
6.2 Are there any records of Strata Classification in the Bedrock Geology within 500m of the study site?	Yes

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	2	8	9	26
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	1	0
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	5
6.6 Source Protection Zones (within 500m of the study site)	4	0	0	0	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	4	1	0	0	Not searched	Not searched

	On-site	0-50m	51-250	251-500	501-1000	1000-1500

Section 6: Hydrogeology and Hydrology	0-500m					
6.9 Is there any Environment Agency information on river quality within 1500m of the study site?	No	No	No	No	No	No
6.10 Detailed River Network entries within 500m of the site	4	0	5	7	Not searched	Not searched
6.11 Surface water features within 250m of the study site	Yes	Yes	Yes	Not searched	Not searched	Not searched

Section 7: Flooding	
7.1 Are there any Enviroment Agency Zone 2 floodplains within 250m of the study site?	Yes
7.2 Are there any Environment Agency Zone 3 floodplains within 250m of the study site	No
7.3 What is the Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site?	High
7.4 Are there any Flood Defences within 250m of the study site?	No
7.5 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
7.6 Are there any areas used for Flood Storage within 250m of the study site?	No
7.7 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Potential below Surface
7.8 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	High

Section 8: Designated Environmentally Sensitive Sites	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	0
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
8.5 Records of Ramsar sites	0	0	0	0	0	0
8.6 Records of Ancient Woodlands	0	0	0	0	2	5
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	1
8.8 Records of World Heritage Sites	0	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	3	0	1	0	4	2
8.14 Records of Green Belt land	6	0	0	0	2	4

Section 9: Natural Hazards

9.1 What is the maximum risk of natural ground subsidence?	Moderate
9.1.1 What is the maximum Shrink-Swell hazard rating identified on the study site?	Low
9.1.2 What is the maximum Landslides hazard rating identified on the study site?	Low
9.1.3 What is the maximum Soluble Rocks hazard rating identified on the study site?	Very Low
9.1.4 What is the maximum Compressible Ground hazard rating identified on the study site?	Moderate
9.1.5 What is the maximum Collapsible Rocks hazard rating identified on the study site?	Very Low
9.1.6 What is the maximum Running Sand hazard rating identified on the study site?	Low
9.2 Radon	
9.2.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
9.2.2 Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary.

Section 10: Mining

10.1 Are there any coal mining areas within 75m of the study site?	No
10.2 Are there any Non-Coal Mining areas within 50m of the study site boundary?	Yes
10.3 Are there any brine affected areas within 75m of the study site?	No

Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections:

1. Historical Industrial Sites

Provides information on past land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. Potentially Infilled Land features are also included. This search is conducted using radii of up to 500m.

2. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

3. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

4. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure gas pipelines and underground electricity transmission lines.

5. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

6. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licenses, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

7. Flooding

Provides information on river and coastal flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

8. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

9. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence and radon..

10. Mining

Provides information on areas of coal and non-coal mining and brine affected areas.

11. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

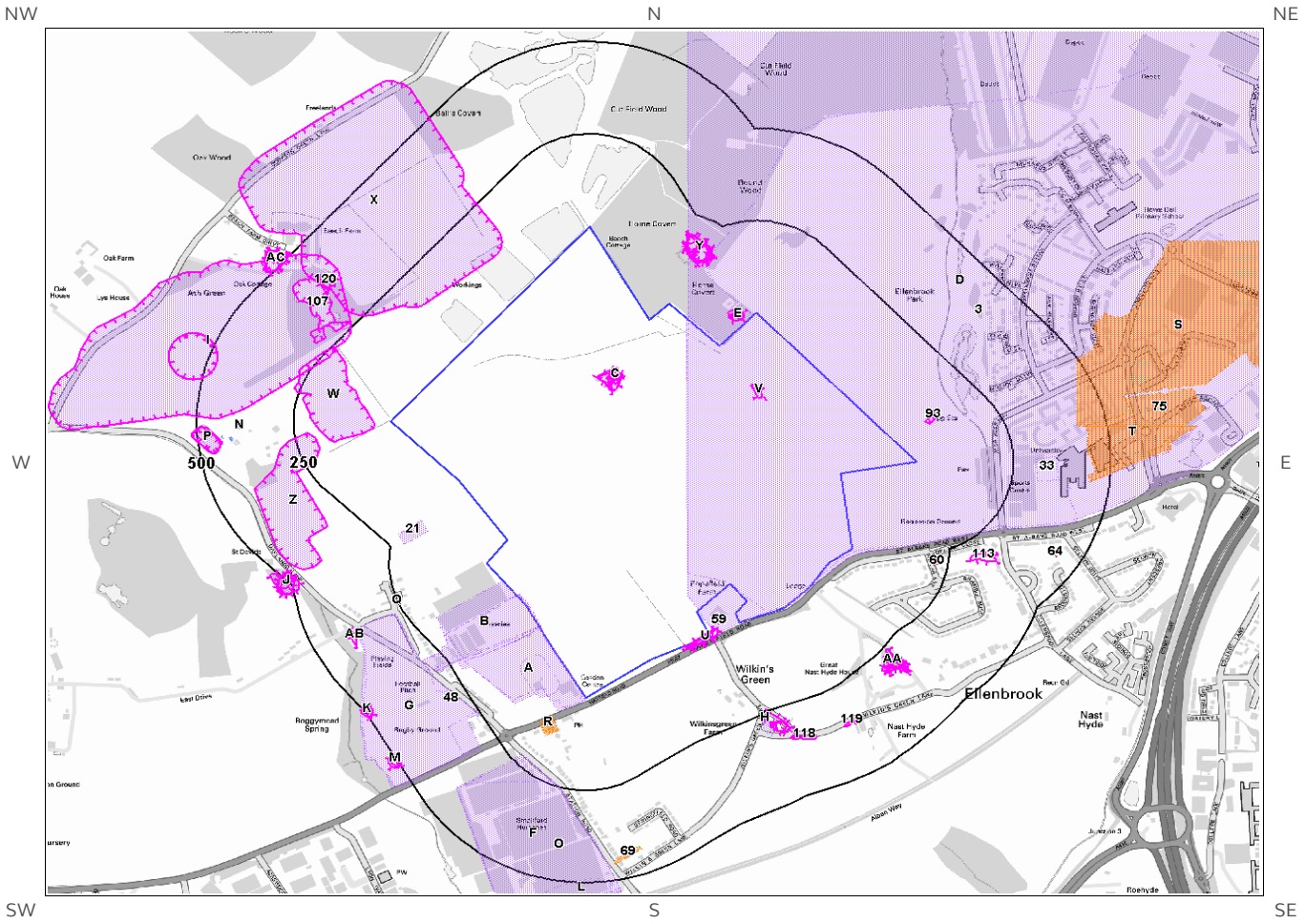
Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier “A” on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as “Not Shown”.

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Historical Land Use



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Site Outline

250
500
Search Buffers (m)

Historical 1:10,000 and 1:10,560 scale mapping

Industrial Land Use

Potentially Infilled Land

Historical 1:2,500, 1:1,250 and 1:500 scale mapping

Energy Features

Petrol Stations

Tanks

Garages

1. Historical Industrial Sites

1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 47

ID	Distance [m]	Direction	Use	Date
1A	0	On Site	Nursery	1938
2B	0	On Site	Nursery	1938
3	0	On Site	Aerodrome	1971
4C	0	On Site	Gravel Pit	1896
5A	0	On Site	Nursery	1976
6B	0	On Site	Nursery	1983
7B	0	On Site	Nursery	1976
8B	0	On Site	Nursery	1959
9C	0	On Site	Refuse Heap	1922
10C	0	On Site	Refuse Heap	1922
11D	0	On Site	Aerodrome	1988
12D	0	On Site	Aerodrome	1973
13A	0	On Site	Nursery	1983
14E	13	NW	Unspecified Pit	1938
15E	17	NW	Unspecified Pit	1971
16E	17	NW	Unspecified Pit	1973
17E	29	NW	Unspecified Pit	1988
18A	34	SW	Nursery	1959
19W	43	W	Sand and Gravel Pit	1983
20X	119	NW	Sand and Gravel Pit	1983
21	144	SW	Radio Station	1983
22Z	196	W	Gravel Pit	1959
23F	222	SW	Nurseries	1976
24F	222	SW	Nurseries	1983
25F	224	SW	Nursery	1959
26I	237	NW	Unspecified Workings	1976
27F	241	S	Nursery	1937
28F	241	S	Nursery	1938
29G	254	SW	Nursery	1938
30G	256	SW	Nursery	1959
31H	256	SE	Smithy	1879
32H	267	SE	Smithy	1896
33	307	E	Unspecified Works	1988
34AB	386	SW	Unspecified Pit	1879

35P	442	W	Unspecified Disused Pit	1976
36I	475	W	Unspecified Disused Workings	1983
37J	479	SW	Refuse Heap	1922
38J	479	SW	Refuse Heap	1938
39J	481	SW	Refuse Heap	1922
40K	481	SW	Unspecified Pit	1959
41K	483	SW	Unspecified Pit	1938
42J	484	SW	Gravel Pit	1896
43T	485	E	Aircraft Works	1988
44L	487	S	Disused Station	1983
45L	487	S	Disused Station	1976
46M	496	SW	Refuse Heap	1922
47M	497	SW	Refuse Heap	1922

1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical tanks within 500m of the search boundary: 11

ID	Distance (m)	Direction	Use	Date
48	295	SW	Unspecified Tank	1937
49N	389	W	Unspecified Tank	1996
50O	409	S	Unspecified Tank	1963
51N	409	W	Tanks	1996
52N	409	W	Tanks	1973
53O	409	S	Unspecified Tank	1962
54O	409	S	Unspecified Tank	1958
55N	411	W	Tanks	1973
56P	433	W	Unspecified Tank	1996
57P	434	W	Unspecified Tank	1958
58P	435	W	Unspecified Tank	

1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical energy features within 500m of the search boundary: 6

ID	Distance (m)	Direction	Use	Date

59	32	NE	Electricity Substation	1986
60	213	E	Electricity Substation	1974
61Q	252	SW	Electricity Substation	1994
62Q	252	SW	Electricity Substation	1994
63Q	252	SW	Electricity Transformer	1973
64	432	SE	Electricity Substation	1974

1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical petrol stations and fuel sites within 500m of the search boundary: 0

Database searched and no data found.

1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical garage and motor vehicle repair sites within 500m of the search boundary: 11

ID	Distance (m)	Direction	Use	Date
65R	98	SW	Garage	1962
66R	99	SW	Garage	1963
67R	106	SW	Garage	1994
68R	106	SW	Garage	1994
69	423	S	Garage	1994
70S	424	E	Aircraft Works	1976
71S	424	E	Aircraft Works	1988
72S	424	E	Aircraft Works	1988
73T	440	E	Aircraft Works	1988
74T	440	E	Aircraft Works	1976
75	447	E	Aircraft Works	1976

1.6 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 63

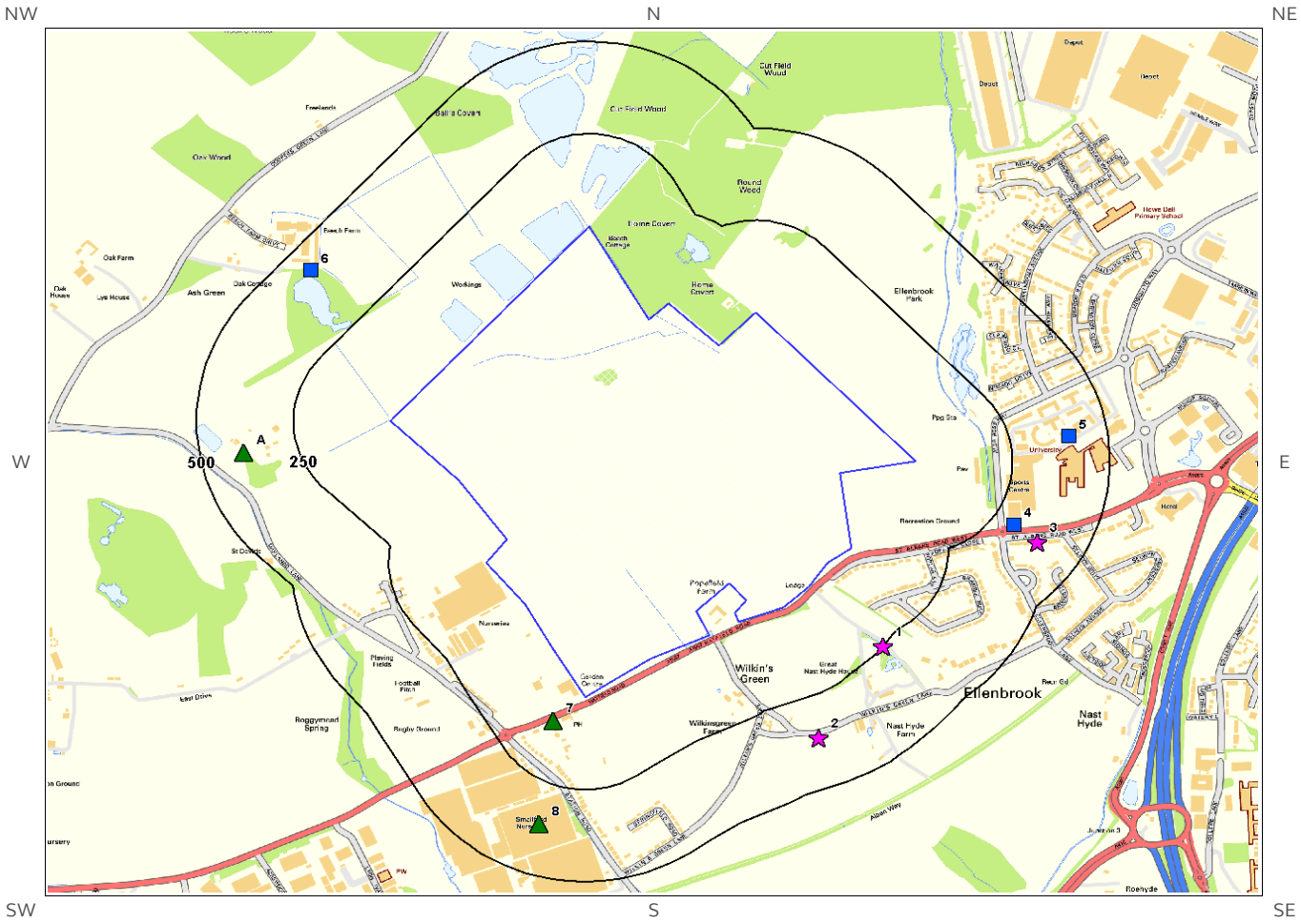
The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance(m)	Direction	Use	Date
76C	0	On Site	Ponds	1938

77C	0	On Site	Ponds	1959
78C	0	On Site	Refuse Heap	1922
79C	0	On Site	Gravel Pit	1896
80U	0	On Site	Pond	1922
81U	0	On Site	Pond	1879
82U	0	On Site	Pond	1938
83V	0	On Site	Pond	1938
84V	0	On Site	Pond	1879
85C	0	On Site	Refuse Heap	1922
86U	0	On Site	Pond	1988
87U	0	On Site	Pond	1973
88E	13	NW	Unspecified Pit	1938
89E	17	NW	Unspecified Pit	1971
90E	17	NW	Unspecified Pit	1973
91E	29	NW	Unspecified Pit	1988
92W	43	W	Sand and Gravel Pit	1983
93	95	NE	Pond	1879
94X	119	NW	Sand and Gravel Pit	1983
95Y	130	NE	Pond	1938
96Y	130	NE	Pond	1879
97Y	130	NE	Pond	1922
98Y	131	NE	Pond	1971
99Y	132	NE	Pond	1922
100Y	132	NE	Pond	1896
101Y	136	NE	Pond	1988
102Y	136	NE	Pond	1973
103Z	196	W	Gravel Pit	1959
104I	237	NW	Unspecified Workings	1976
105H	254	S	Ponds	1896
106AA	259	SE	Ponds	1879
107	262	NW	Pond	1983
108H	281	SE	Pond	1879
109AA	287	SE	Pond	1973
110AA	287	SE	Pond	1988
111AA	287	SE	Pond	1971
112H	289	S	Ponds	1922
113	291	SE	Ponds	1879
114AA	291	SE	Pond	1938
115AA	292	SE	Pond	1922
116AA	293	SE	Pond	1922
117AA	298	SE	Ponds	1896
118	335	S	Pond	1879
119	352	SE	Pond	1922
120	362	NW	Pond	1879
121AB	386	SW	Unspecified Pit	1879
122P	439	W	Pond	1983

123P	442	W	Unspecified Disused Pit	1976
124I	475	W	Unspecified Disused Workings	1983
125J	479	SW	Refuse Heap	1922
126J	479	SW	Refuse Heap	1938
127J	481	SW	Refuse Heap	1922
128K	481	SW	Unspecified Pit	1959
129K	483	SW	Unspecified Pit	1938
130J	484	SW	Gravel Pit	1896
131AC	495	NW	Pond	1896
132AC	495	NW	Pond	1922
133AC	496	NW	Pond	1938
134AC	496	NW	Pond	1879
135M	496	SW	Refuse Heap	1922
136AC	496	NW	Pond	1922
137M	497	SW	Refuse Heap	1922
138AC	499	NW	Pond	1959

2. Environmental Permits, Incidents and Registers Map



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- Site Outline
- Search Buffers (m) 250 500
- Recorded Pollution Incident
- Dangerous Substances (List 1)
- Dangerous Substances (List 2)
- Water Industry Referrals
- Licenced Discharge Consents
- Red List Discharge Consents
- RAS 3 & 4 Authorisations
- Part A(1) Authorised Processes and Historic IPC Authorisations
- Part A(2) and Part B Authorised Processes
- COMAH / NIHHS Sites
- Sites Determined as Contaminated Land
- Hazardous Substance Consents and Enforcements

2. Environmental Permits, Incidents and Registers

2.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency and Local Authorities reveal the following information:

2.1.1 Records of historic IPC Authorisations within 500m of the study site:

0

Database searched and no data found.

2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

0

Database searched and no data found.

2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

4

The following Part A(2) and Part B Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
7	107	SW	519654 207693	Address: Shell Service Station (Smallford), 608 Hatfield Road, Smallford, St Albans, Herts, AL4 0HP Process: Petrol Station Status: Current Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified
8	368	S	519618 207413	Address: Smallford Motors Station Rd, 79 Station Road, Smallford, St. Albans, AL4 0HB Process: Waste Oil Burning Process Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified
9A	389	W	518859 208421	Address: CEMEX UK Materials Ltd, Oaklands Lane, St Albans, AL4 0HT Process: Cement & Lime Batching Status: Current Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified
10A	389	W	518859 208420	Address: CEMEX UK Materials Ltd, Oaklands Lane, St Albans, AL4 HHS Process: Cement & Lime Batching Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified

2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

2.1.8 Records of Licensed Discharge Consents within 500m of the study site:

3

The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
4	305	SE	520840 208230	Address: COMET PARK DEVELOPMENT, ST ALBANS R, COMET PARK DEVELOPMENT, ST ALBAN, S ROAD EAST, HATFIELD, HERTFORDS, HIRE, - Effluent Type: TRADE DISCHARGES - SITE DRAINAGE Permit Number: CNTM.0012 Permit Version: 1	Receiving Water: Status: LAPSED UNDER SCHEDULE 23 ENVIRONMENT ACT 1995 Issue date: 20/01/1992 Effective Date: 20-Jan-1992 Revocation Date: 01/10/1996

ID	Distance (m)	Direction	NGR	Details	
5	399	E	520980 208470	Address: BRITISH AEROSPACE PREMISES, COMET W, BRITISH AEROSPACE PREMISES, COME, T WAY, HATFIELD, HERTFORDSHIRE, -, - Effluent Type: MISCELLANEOUS DISCHARGES - UNSPECIFIED Permit Number: CNTM.0982 Permit Version: 1	Receiving Water: Status: REVOKED - UNSPECIFIED Issue date: 22/07/1993 Effective Date: 22-Jul-1993 Revocation Date: 07/12/1994
6	433	NW	519030 208920	Address: BEECH FARM, COOPERS GREEN LANE, HAT, BEECH FARM, COOPERS GREEN LANE,, HATFIELD, ST ALBANS, HERTFORDSHI, RE, - Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: CTWC.3104 Permit Version: 1	Receiving Water: Status: TRANSFERRED FROM COPA 1974 Issue date: 31/01/1989 Effective Date: 31-Jan-1989 Revocation Date: -

2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

0

Database searched and no data found.

2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site:

0

Database searched and no data found.

2.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: 0

Database searched and no data found.

2.3 Environment Agency Recorded Pollution Incidents

2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

3

The following NIRS List 2 records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
1	248	SE	520500 207900	Incident Date: 08-Aug-2001 Incident Identification: 22815 Pollutant: Contaminated Water Pollutant Description: Suspended Solids	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
2	364	S	520335 207651	Incident Date: 10-Apr-2002 Incident Identification: 70477 Pollutant: Specific Waste Materials Pollutant Description: Household Waste	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
3	381	SE	520898 208181	Incident Date: 03-Jul-2002 Incident Identification: 88943 Pollutant: Sewage Materials Pollutant Description: Grey Water	Water Impact: Category 3 (Minor) Land Impact: Category 3 (Minor) Air Impact: Category 3 (Minor)

2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

0

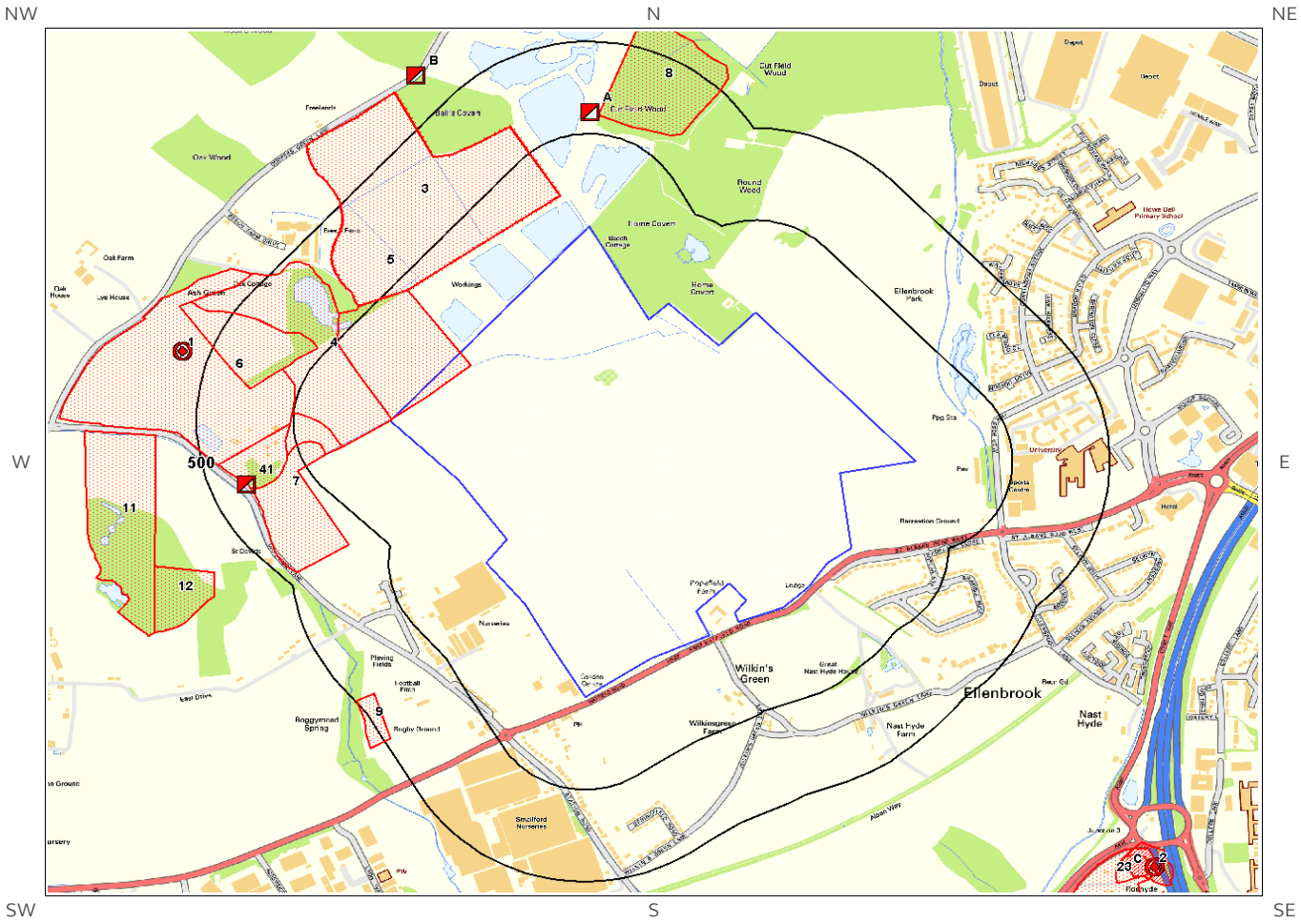
Database searched and no data found.

2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site? 0

Database searched and no data found.

3. Landfill and Other Waste Sites Map



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Site Outline

250
500
Search Buffers (m)

E.A. Active Landfill

E.A. Historic Landfill

BGS / DoE Survey Landfill

Historic and Planned Waste Sites

E.A. Licensed Waste Site

Local Authority/Historical Mapping Landfill Records

3. Landfill and Other Waste Sites

3.1 Landfill Sites

3.1.1 Records from Environment Agency landfill data within 1000m of the study site:

1

The following Environment Agency landfill records are represented as polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
3	109	NW	519300 209450	Address: Colin Whitby, Hatfield Quarry, Oaklands Lane, Smallford, St Albans, Hertfordshire, AL4 0HT Landfill Reference: 80164.0 Environmental Permitting Regulations (Waste) Reference: SAI002 Landfill Type: A6 : Landfill taking other wastes	Operator: R M C Aggregates (Greater London) Ltd Status: Closure IPPC Reference: EPR Reference:

3.1.2 Records of Environment Agency historic landfill sites within 1500m of the study site:

32

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
4	0	On Site	519000 208600	Site Address: Hatfield Quarry, Oak Farm, Oaklands Lane, St. Albans, Hertfordshire Waste Licence: Yes Site Reference: 76/2, HCC/057, 170 Waste Type: Industrial, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 27-Sep-1976 Licence Surrendered: 31-Jul-1977 Licence Hold Address: Delamere Road, Cheshunt, Waltham Cross, Hertfordshire Operator: - First Recorded: 01-Jan-1935 Last Recorded: 31-Jul-1977
5	0	On Site	519200 208900	Site Address: Hatfield Quarry, Oak Farm, Oaklands Lane, St Albans, Hertfordshire Waste Licence: Yes Site Reference: 77/31 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 01-Aug-1977 Licence Surrendered: 12-Mar-1993 Licence Hold Address: Delamere Road, Cheshunt, Waltham Cross, Hertfordshire Operator: - First Recorded: 31-Dec-1977 Last Recorded: 31-Dec-1987

ID	Distance (m)	Direction	NGR	Details	
6	1	NW	518800 208600	Site Address: Hatfield Quarry, Oak Farm, Oaklands Lane, St. Albans, Hertfordshire Waste Licence: Yes Site Reference: 76/2, HCC/057, 170 Waste Type: Industrial, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 27-Sep-1976 Licence Surrendered: 31-Jul-1977 Licence Hold Address: - Operator: St Albans Sand and Gravel Company Limited First Recorded: 01-Jan-1935 Last Recorded: 31-Jul-1977
7	143	SW	518900 208300	Site Address: Oak Farm, Oaklands Lane, St. Albans, Hertfordshire Waste Licence: Yes Site Reference: 76/2, HCC/057, 170 Waste Type: Industrial, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 27-Sep-1976 Licence Surrendered: 31-Jul-1977 Licence Hold Address: - Operator: - First Recorded: 01-Jan-1935 Last Recorded: 31-Jul-1977
8	291	N	519750 209350	Site Address: Hatfield Quarry, St Albans, Oaklands Lane, St Albans, Smallford, Hertfordshire Waste Licence: Yes Site Reference: - Waste Type: - Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 14-Oct-1993 Licence Surrendered: 06-Mar-2014 Licence Hold Address: Coldharbour Lane, Egham, Thorpe, Surrey Operator: R M C Aggregates (Greater London) Ltd First Recorded: - Last Recorded: -
9	451	SW	519100 207600	Site Address: Pollards Playing Fields, Oaklands Lane, St Albans Waste Licence: - Site Reference: 85/193 Waste Type: - Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: - Last Recorded: -
Not shown	565	S	519300 206800	Site Address: Smallford, Colney Heath, St Albans, Hertfordshire Waste Licence: - Site Reference: HCC/105 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 07-Sep-1945 Last Recorded: 08-Sep-1976
11	606	W	518500 208200	Site Address: Hatfield Quarry, Oak Farm, Oaklands Lane, St. Albans, Hertfordshire Waste Licence: Yes Site Reference: 76/2, HCC/057, 170 Waste Type: Industrial, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 27-Sep-1976 Licence Surrendered: 31-Jul-1977 Licence Hold Address: - Operator: - First Recorded: 01-Jan-1935 Last Recorded: 31-Jul-1977
12	612	SW	518600 208000	Site Address: Hatfield Quarry, Oaklands Lane, St Albans, Hertfordshire Waste Licence: - Site Reference: HCC/087 Waste Type: Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: - Last Recorded: -
Not shown	697	N	519700 209700	Site Address: Hatfield Quarry, Oak Farm, Oaklands Lane, St Albans, Hertfordshire Waste Licence: Yes Site Reference: 91/256 Waste Type: Inert, Industrial, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 26-Jul-1991 Licence Surrendered: 27-Apr-1994 Licence Hold Address: Delamere Road, Cheshunt, Waltham Cross, Hertfordshire Operator: - First Recorded: 26-Jul-1991 Last Recorded: 14-Oct-1993

ID	Distance (m)	Direction	NGR	Details	
Not shown	893	N	519800 210000	Site Address: Hatfield Quarry Phase 7, Oaklands Lane, St Albans, Hertfordshire Waste Licence: Yes Site Reference: 87/222 Waste Type: Inert, Industrial, Commercial Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 28-Oct-1987 Licence Surrendered: 12-Mar-1993 Licence Hold Address: - Operator: - First Recorded: 31-Dec-1988 Last Recorded: 01-Nov-1991
Not shown	946	S	520500 207000	Site Address: Nast Hyde Farm, South Hatfield, Hertfordshire Waste Licence: - Site Reference: HCC/074 Waste Type: Special Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 19-Aug-1955 Last Recorded: 21-Aug-1970
Not shown	963	S	519600 206700	Site Address: Smallford, Colney Heath, St Albans, Hertfordshire Waste Licence: - Site Reference: 76/1, HCC/105 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 07-Sep-1945 Last Recorded: 08-Sep-1976
Not shown	994	S	519600 206500	Site Address: Smallford, Colney Heath, St Albans, Hertfordshire Waste Licence: - Site Reference: HCC/096, HCC/105 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 07-Sep-1945 Last Recorded: 08-Sep-1976
Not shown	1019	S	519300 206600	Site Address: Smallford, Smallford, Colney Heath, St. Albans, Hertfordshire Waste Licence: - Site Reference: HCC/095, HCC/105 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 07-Sep-1945 Last Recorded: 08-Sep-1976
Not shown	1019	S	519300 206600	Site Address: Smallford, Smallford, Colney Heath, St. Albans, Hertfordshire Waste Licence: - Site Reference: HCC/076, HCC/105 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 07-Sep-1945 Last Recorded: 08-Sep-1976
Not shown	1019	S	519300 206600	Site Address: Smallford, Smallford, Colney Heath, St. Albans, Hertfordshire Waste Licence: - Site Reference: 43, HCC105 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 07-Sep-1945 Last Recorded: 08-Sep-1976
Not shown	1019	S	519300 206600	Site Address: Smallford, Smallford, Colney Heath, St. Albans, Hertfordshire Waste Licence: - Site Reference: 79, HCC/105 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 07-Sep-1945 Last Recorded: 08-Sep-1976

ID	Distance (m)	Direction	NGR	Details	
Not shown	1038	S	519800 206600	Site Address: Smallford, Smallford, Colney Heath, St. Albans, Hertfordshire Waste Licence: - Site Reference: HCC/014, HCC/096, HCC/105 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 07-Sep-1945 Last Recorded: 08-Sep-1976
23	1059	SE	521000 207000	Site Address: Roehyde Pit, Roehyde, Hatfield, Hertfordshire Waste Licence: Yes Site Reference: HCC/185, 207, 77/28 Waste Type: Inert, Industrial, Commercial, Household, Special Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 14-Jun-1977 Licence Surrendered: 02-Jul-1985 Licence Hold Address: - Operator: St Albans Sand and Gravel First Recorded: 16-Jun-1977 Last Recorded: 15-Oct-1984
24C	1095	SE	521100 207200	Site Address: Roehyde Pit, Roehyde, Hatfield, Hertfordshire Waste Licence: Yes Site Reference: 80/86, HCC/107 Waste Type: Inert, Industrial Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 07-Jan-1980 Licence Surrendered: 29-Apr-1984 Licence Hold Address: - Operator: - First Recorded: 06-Apr-1972 Last Recorded: 16-Apr-1984
Not shown	1120	S	519600 206500	Site Address: Smallford, Smallford, Colney Heath, St. Albans, Hertfordshire Waste Licence: - Site Reference: 47, HCC/105, HCC/096, HCC/041 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 07-Sep-1945 Last Recorded: 08-Sep-1976
Not shown	1157	S	520600 206700	Site Address: North Orbital Road, Colney Heath, St. Albans, Hertfordshire Waste Licence: - Site Reference: HCC/050 Waste Type: Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 16-Apr-1947 Last Recorded: 30-Nov-1966
Not shown	1237	SE	520200 206500	Site Address: Colney Heath Gravel Plant Site, Colney Heath, St. Albans, Hertfordshire Waste Licence: Yes Site Reference: 84/166 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 05-Apr-1984 Licence Surrendered: 31-Dec-1985 Licence Hold Address: Estate Office, Woolmer Green, Knebworth, Hertfordshire Operator: - First Recorded: 30-Apr-1984 Last Recorded: 31-Dec-1985
Not shown	1243	SW	518900 206700	Site Address: Smallford, Smallford, Colney Heath, St. Albans, Hertfordshire Waste Licence: - Site Reference: HCC/141 Waste Type: - Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: - Last Recorded: -
Not shown	1251	W	517800 209200	Site Address: Jersey Farm, Sandridge, Hertfordshire Waste Licence: - Site Reference: HCC102 Waste Type: Inert, Industrial, Commercial, Household, Special Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 28-Sep-1959 Last Recorded: 02-Dec-1969

ID	Distance (m)	Direction	NGR	Details	
Not shown	1278	SW	519200 206500	Site Address: Smallford, Smallford, Colney Heath, St. Albans, Hertfordshire Waste Licence: - Site Reference: HCC/164, HCC/105 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 07-Sep-1945 Last Recorded: 08-Sep-1976
Not shown	1287	SW	519100 206500	Site Address: Smallford, Colney Heath, St Albans, Hertfordshire Waste Licence: - Site Reference: HCC/164, HCC/105 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 07-Sep-1945 Last Recorded: 08-Sep-1976
Not shown	1355	S	519800 206300	Site Address: Colney Heath Pit, North Orbital Road, Colney Heath, St Albans, Hertfordshire Waste Licence: - Site Reference: HCC/018 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: - Last Recorded: -
Not shown	1360	SE	520400 206500	Site Address: Colney Heath Gravel Plant Site, Colney Heath, St. Albans, Hertfordshire Waste Licence: Yes Site Reference: 84/166 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 05-Apr-1984 Licence Surrendered: 31-Dec-1985 Licence Hold Address: Estate Office, Woolmer Green, Knebworth, Hertfordshire Operator: - First Recorded: 30-Apr-1984 Last Recorded: 31-Dec-1985
Not shown	1412	S	520100 206400	Site Address: Colney Heath Gravel Plant, Colney Heath, St. Albans, Hertfordshire Waste Licence: Yes Site Reference: 84/166 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 05-Apr-1984 Licence Surrendered: 31-Dec-1985 Licence Hold Address: Estate Office, Woolmer Green, Knebworth, Hertfordshire Operator: - First Recorded: 30-Apr-1984 Last Recorded: 31-Dec-1985
Not shown	1450	S	520200 206300	Site Address: Colney Heath Gravel Plant Site, Colney Heath, St. Albans, Hertfordshire Waste Licence: Yes Site Reference: 84/166 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 05-Apr-1984 Licence Surrendered: 31-Dec-1985 Licence Hold Address: Estate Office, Woolmer Green, Knebworth, Hertfordshire Operator: - First Recorded: 30-Apr-1984 Last Recorded: 31-Dec-1985

3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

2

The following landfill records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
1	569	W	518700.0 208700.0	Address: Hatfield Quarry, Sandpit Lane, Hatfield, Herts BGS Number: 2442.0	Risk: Risk to minor aquifer Waste Type: N/A

ID	Distance (m)	Direction	NGR	Details	
2	1164	SE	521200.0 207300.0	Address: Roehyde Barnet by Pass, Hatfield, Herts BGS Number: 2438.0	Risk: No risk to aquifer Waste Type: N/A

3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site:

2

The following landfill records are represented as points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Site Address	Source	Data Type
53C	1091	SE	521184 207308	Refuse Tip	1974 mapping	Polygon
Not shown	1350	S	519844 206329	Colney Heath Pit	Environment Agency	Polygon

3.2 Other Waste Sites

3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

0

Database searched and no data found.

3.2.2 Records of Environment Agency licensed waste sites within 1500m of the study site:

17

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
36A	309	N	519750 209350	Site Address: Colin Whitby, Hatfield Quarry, Oaklands Lane, Smallford, St Albans, Herts, AL4 0HT Type: Landfill taking Non-Biodegradeable Wastes Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SAI001 EPR reference: - Operator: RMC Aggregates (Greater London) Limited Waste Management licence No: 80163 Annual Tonnage: 0.0	Issue Date: 14/10/1993 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: "Hatfield Quarry, St Albans" Correspondence Address: RMC Aggregates (Greater London) Limited, Delamare Road, Cheshunt, Waltham Cross, Herts, EN8 9SJ

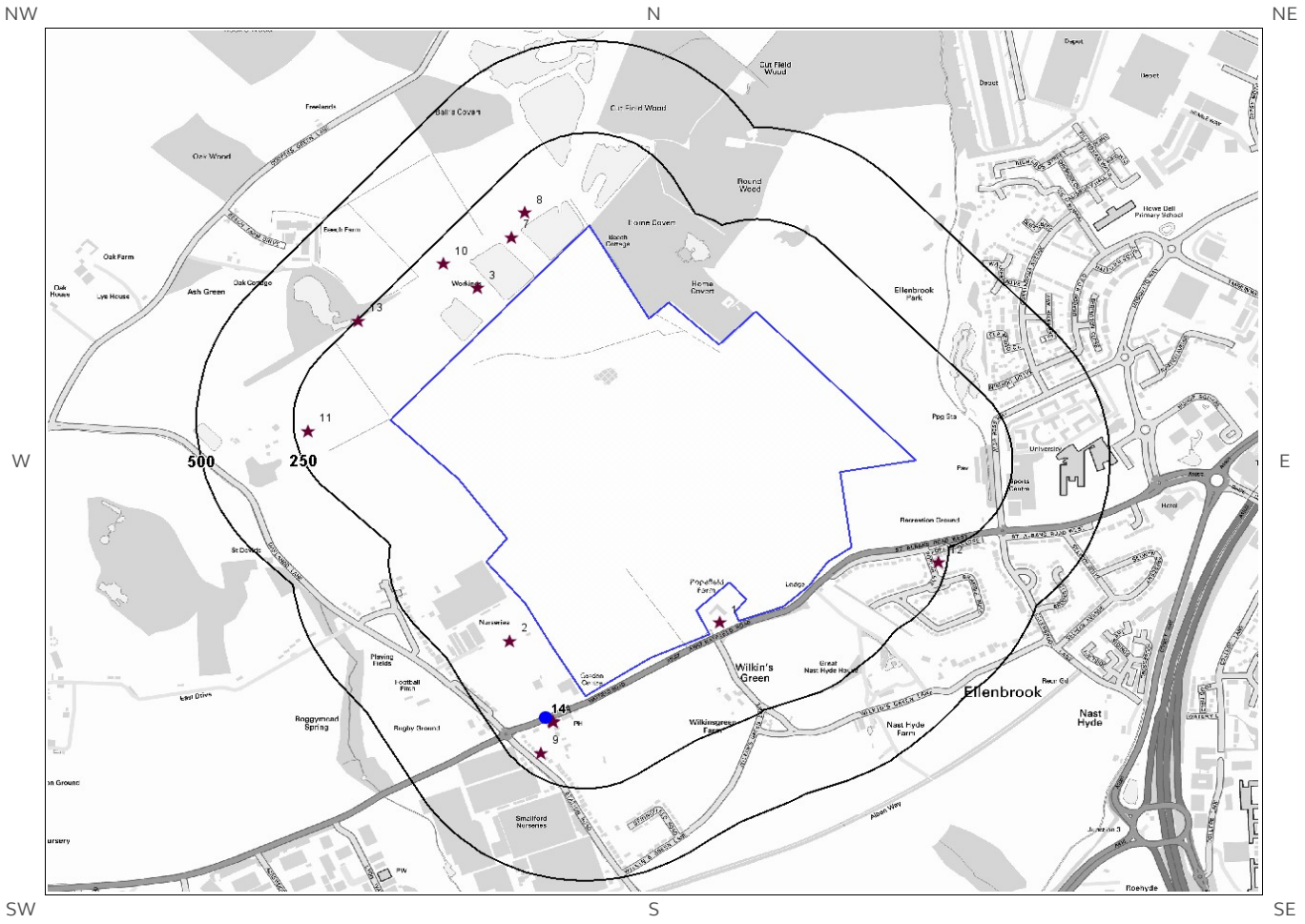
ID	Distance (m)	Direction	NGR	Details	
37A	309	N	519750 209350	Site Address: Hatfield Quarry, Oaklands Lane, Hatfield, St Albans, Hertfordshire, AL4 0HS Type: Inert LF Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CEM084 EPR reference: EA/EPR/KP3030XW/S003 Operator: Cemex U K Materials Ltd Waste Management licence No: 86433 Annual Tonnage: 0.0	Issue Date: 20/05/2010 Effective Date: - Modified: - Surrendered Date: 17/09/2014 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Sutton's Farm Landfilll Correspondence Address: -, -
38A	309	N	519750 209350	Site Address: Colin Whitby, Hatfield Quarry, Oaklands Lane, Smallford, St Albans, Herts, AL4 0HT Type: Landfill taking Non-Biodegradeable Wastes Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SAI001 EPR reference: - Operator: RMC Aggregates (Greater London) Ltd Waste Management licence No: 80163 Annual Tonnage: 0.0	Issue Date: 14/10/1993 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: Hatfield Quarry, St Albans Correspondence Address: RMC Aggregates (Greater London) Ltd, The Willows, Barnet Road, London Colney, St Albans, Herts, AL2 1BD
39A	309	N	519750 209350	Site Address: Colin Whitby, Hatfield Quarry, Oaklands Lane, Smallford, St Albans, Hertfordshire, AL4 0HT Type: Landfill taking Non-Biodegradeable Wastes Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SAI001 EPR reference: EA/EPR/LP3491NP/S002 Operator: R M C Aggregates (Greater London) Ltd Waste Management licence No: 80163 Annual Tonnage: 0.0	Issue Date: 14/10/1993 Effective Date: - Modified: - Surrendered Date: 06/03/2014 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Hatfield Quarry, St Albans Correspondence Address: -, -
40A	309	N	519750 209350	Site Address: Colin Whitby, Hatfield Quarry, Oaklands Lane, Smallford, St Albans, Herts, AL4 0HT Type: Landfill taking Non-Biodegradeable Wastes Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SAI001 EPR reference: - Operator: RMC Aggregates (Greater London) Ltd Waste Management licence No: 80163 Annual Tonnage: 0.0	Issue Date: 14/10/1993 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: "Hatfield Quarry, St Albans" Correspondence Address: RMC Aggregates (Greater London) Ltd, Delamare Road, Cheshunt, Waltham Cross, Herts, EN8 9SJ
41	410	SW	518865 208339	Site Address: Hatfield Quarry, Oaklands Lane, Smallford, St Albans, Hertfordshire, AL4 0HT Type: Management of inert or extractive waste at mine Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CEM052 EPR reference: EA/EPR/XP3893VK/A001 Operator: Cemex U K Materials Ltd Waste Management licence No: 102766 Annual Tonnage: 0.0	Issue Date: 21/06/2011 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Hatfield Quarry Correspondence Address: -, -

ID	Distance (m)	Direction	NGR	Details	
Not shown	565	S	519800 207200	Site Address: Ferro Services Ltd, Station Yard, Smallford, Hertfordshire, AL4 0HF Type: Metal Recycling Site (mixed MRS's) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: OSH001 EPR reference: EA/EPR/FP3091NH/S002 Operator: C J O'Shea (Plant Hire) Ltd Waste Management licence No: 80257 Annual Tonnage: 30000.0	Issue Date: 07/03/1996 Effective Date: - Modified: - Surrendered Date: 04/02/1999 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Station Yard, Smallford Correspondence Address: -, -
Not shown	565	S	519800 207200	Site Address: Ferro Services Ltd, Station Yard, Smallford, Herts, AL4 0HF Type: Metal Recycling Site (mixed MRS's) Size: Unknown Environmental Permitting Regulations (Waste) Licence Number: OSH001 EPR reference: - Operator: C J O'Shea (Plant Hire) Ltd Waste Management licence No: 80257 Annual Tonnage: 0.0	Issue Date: 07/03/1996 Effective Date: - Modified: - Surrendered Date: 04/02/1999 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: "Station Yard, Smallford" Correspondence Address: C J O'Shea (Plant Hire) Ltd, Station Yard, Smallford, Herts, AL4 0HF
44B	606	NW	519300 209450	Site Address: Colin Whitby, Hatfield Quarry, Oaklands Lane, Smallford, St Albans, Herts, AL4 0HT Type: Landfill taking other wastes Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SAI002 EPR reference: - Operator: RMC Aggregates (Greater London) Ltd Waste Management licence No: 80164 Annual Tonnage: 0.0	Issue Date: 16/11/1993 Effective Date: - Modified: 20/03/1997 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: Hatfield Quarry, St Albans Correspondence Address: St Albans Sand & Gravel Ltd, The Willows, Barnet Road, London Colney, St Albans, Herts, AL2 1BD
45B	606	NW	519300 209450	Site Address: Colin Whitby, Hatfield Quarry, Oaklands Lane, Smallford, St Albans, Herts, AL4 0HT Type: Landfill taking other wastes Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SAI002 EPR reference: - Operator: RMC Aggregates (Greater London) Ltd Waste Management licence No: 80164 Annual Tonnage: 0.0	Issue Date: 16/11/1993 Effective Date: - Modified: 20/03/1997 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: "Hatfield Quarry, St Albans" Correspondence Address: St Albans Sand & Gravel Ltd, Windmill Lane, Cheshunt, Waltham Cross, Herts, EN8 9AL
46B	606	NW	519300 209450	Site Address: Colin Whitby, Hatfield Quarry, Oaklands Lane, Smallford, St Albans, Hertfordshire, AL4 0HT Type: Landfill taking other wastes Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SAI002 EPR reference: EA/EPR/LP3291ND/V002 Operator: R M C Aggregates (Greater London) Ltd Waste Management licence No: 80164 Annual Tonnage: 132725.0	Issue Date: 16/11/1993 Effective Date: - Modified: 20/03/1997 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: Hatfield Quarry, St Albans Correspondence Address: -, -

ID	Distance (m)	Direction	NGR	Details	
47B	606	NW	519300 209450	Site Address: Colin Whitby, Hatfield Quarry, Oaklands Lane, Smallford, St Albans, Herts, AL4 0HT Type: Landfill taking other wastes Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SAI002 EPR reference: - Operator: RMC Aggregates (Greater London) Limited Waste Management licence No: 80164 Annual Tonnage: 0.0	Issue Date: 16/11/1993 Effective Date: - Modified: 20/03/1997 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: "Hatfield Quarry, St Albans" Correspondence Address: St Albans Sand & Gravel Ltd, Windmill Lane, Cheshunt, Waltham Cross, Herts, EN8 9AL
Not shown	677	N	519900 209700	Site Address: Hatfield Landfill Site, Oaklands Lane, St Albans, Hertfordshire, AL4 0HS Type: Biological Treatment Facility Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RMC008 EPR reference: EA/EPR/CP3397NB/A001 Operator: Cemex U K Materials Ltd Waste Management licence No: 80570 Annual Tonnage: 18000.0	Issue Date: 26/05/2005 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Hatfield Leachate Treatment Facility Correspondence Address: -, -
Not shown	922	SW	518990 207221	Site Address: John Kiff, Acrewood Way, Hatfield Road, St. Albans, Herts, AL4 0JY Type: Household, Commercial & Industrial Waste T Stn Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: LEI001 EPR reference: - Operator: Leigh Environmental Ltd Waste Management licence No: 80211 Annual Tonnage: 0.0	Issue Date: 08/03/1985 Effective Date: - Modified: 14/09/1999 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: "Acrewood Way, St. Albans" Correspondence Address: Leigh Environmental Ltd, Dundas Spur, Dundas Lane, Copnor, Portsmouth, Hants, PO3 5NY
Not shown	922	SW	518990 207221	Site Address: John Kiff, Acrewood Way, Hatfield Road, St Albans, Hertfordshire, AL4 0JY Type: Household, Commercial & Industrial Waste T Stn Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: VEO209 EPR reference: EA/EPR/BB3803TR/T001 Operator: Veolia E S (U K) Limited Waste Management licence No: 80211 Annual Tonnage: 75000.0	Issue Date: 08/03/1985 Effective Date: 13/10/2014 Modified: 14/09/1999 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred Site Name: St Albans Service Centre Correspondence Address: -, -
Not shown	922	SW	518990 207221	Site Address: John Kiff, Acrewood Way, Hatfield Road, St Albans, Hertfordshire, AL4 0JY Type: Household, Commercial & Industrial Waste T Stn Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: LEI001 EPR reference: EA/EPR/XP3791NA/V003 Operator: Onyx Leigh Environmental Ltd Waste Management licence No: 80211 Annual Tonnage: 75000.0	Issue Date: 08/03/1985 Effective Date: - Modified: 14/09/1999 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Acrewood Way, St Albans Correspondence Address: -, -

ID	Distance (m)	Direction	NGR	Details	
Not shown	975	SW	518940 207200	Site Address: Pearce House, Acrewood Way, St Albans, Hertfordshire, AL4 0JY Type: Materials Recycling Facility Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: PEA061 EPR reference: EA/EPR/FP3394SL/V002 Operator: Pearce Recycling Company Ltd Waste Management licence No: 101299 Annual Tonnage: 74999.0	Issue Date: 14/05/2010 Effective Date: - Modified: 24/07/2012 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Pearce House Correspondence Address: -, -

4. Current Land Use Map



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Site Outline

Search Buffers (m)
250
500

Current Industrial Sites

Petrol & Fuel Sites

Electricity Transmission Cables

Gas Transmission Pipelines

4. Current Land Uses

4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 13

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	38	NE	Electricity Sub Station	520082 207964	AL4	Electrical Features	Infrastructure and Facilities
2	86	SW	Pylon	519542 207914	AL4	Electrical Features	Infrastructure and Facilities
3	90	NW	Sand and Gravel Pit	519458 208871	AL4	Sand, Gravel and Clay Extraction and Merchants	Extractive Industries
4A	107	SW	Shell Smallford	519654 207693	608, Hatfield Road, Smallford, St. Albans, AL4 0HP	Petrol and Fuel Stations	Road and Rail
5A	107	SW	St Albans Recovery	519654 207693	610, Hatfield Road, Smallford, St. Albans, AL4 0HP	Vehicle Repair, Testing and Servicing	Repair and Servicing
6A	107	SW	Shell Smallford	519651 207697	608, Hatfield Road, Smallford, St. Albans, AL4 0HP	Petrol and Fuel Stations	Road and Rail
7	123	NW	Sand and Gravel Pit	519546 209009	AL4	Sand, Gravel and Clay Extraction and Merchants	Extractive Industries
8	143	NW	Conveyor	519582 209076	AL4	Conveyors	Industrial Features
9	190	SW	Engineering & Gauge Ltd	519621 207609	11, Station Road, Smallford, St. Albans, AL4 0HA	Measurement and Inspection Equipment	Industrial Products
10	198	NW	Conveyor	519372 208937	AL4	Conveyors	Industrial Features
11	216	W	Sand and Gravel Pit	519023 208483	AL4	Sand, Gravel and Clay Extraction and Merchants	Extractive Industries
12	227	E	Electricity Sub Station	520645 208126	AL10	Electrical Features	Infrastructure and Facilities
13	250	NW	Conveyor	519152 208783	AL4	Conveyors	Industrial Features

4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 1

The following petrol or fuel site records provided by Catalist are represented as points on the Current Land Use map:

ID	Distance (m)	Direction	NGR	Company	Address	LPG	Status
14	118	SW	519634 207703	Shell	Shell Smallford, 608, Hatfield Road, Hatfield Road, Smallford, St Albans, Hertfordshire, AL4 0HP	No	Open

4.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site: 0

Database searched and no data found.

4.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site: 0

Database searched and no data found.

5. Geology

5.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

5.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
LOFT	LOWESTOFT FORMATION	DIAMICTON
ALV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]

5.3 Bedrock and Solid Geology

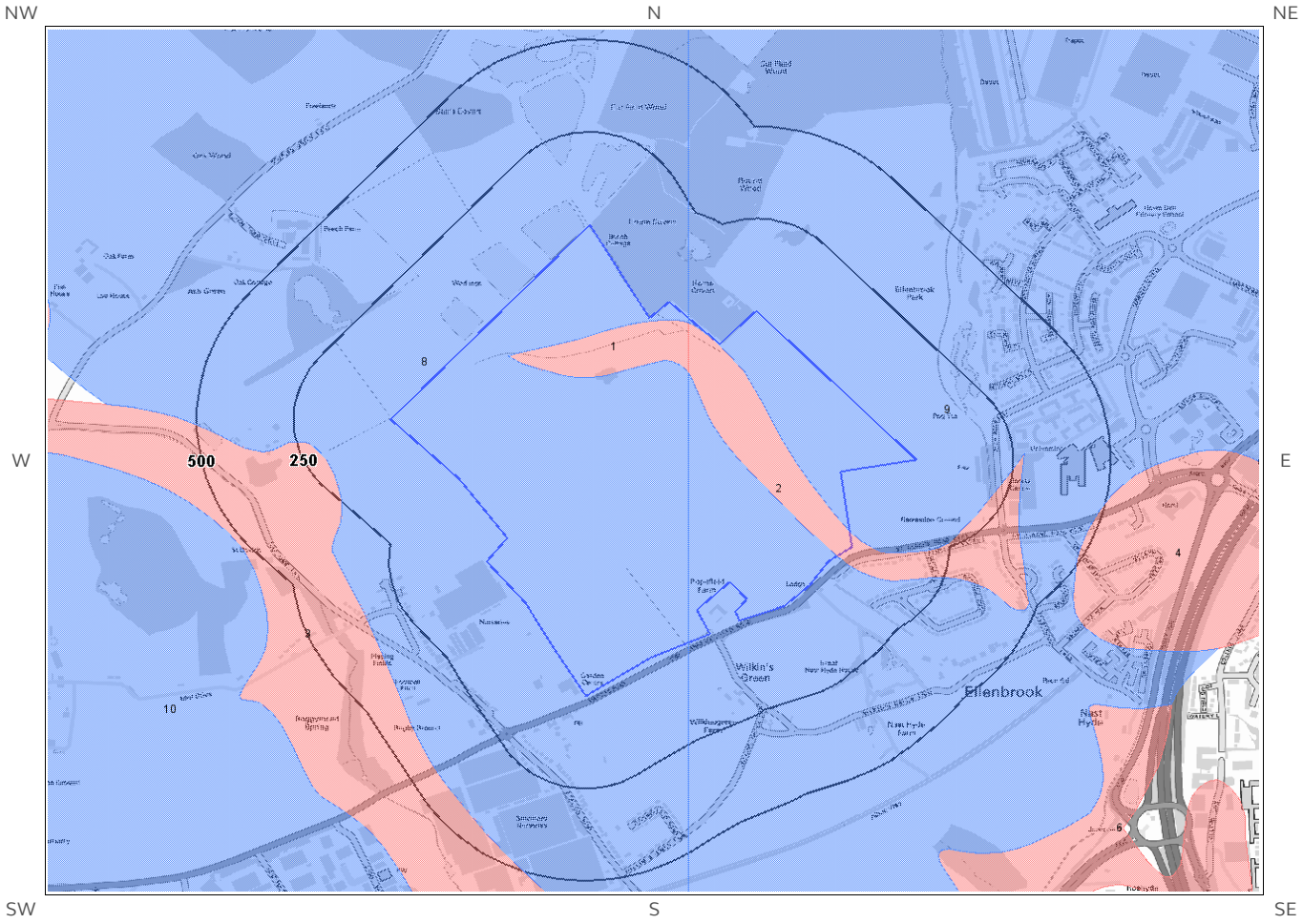
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
LESE-CHLK	LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED)	CHALK

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

6 Hydrogeology and Hydrology

6a. Aquifer Within Superficial Geology



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Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

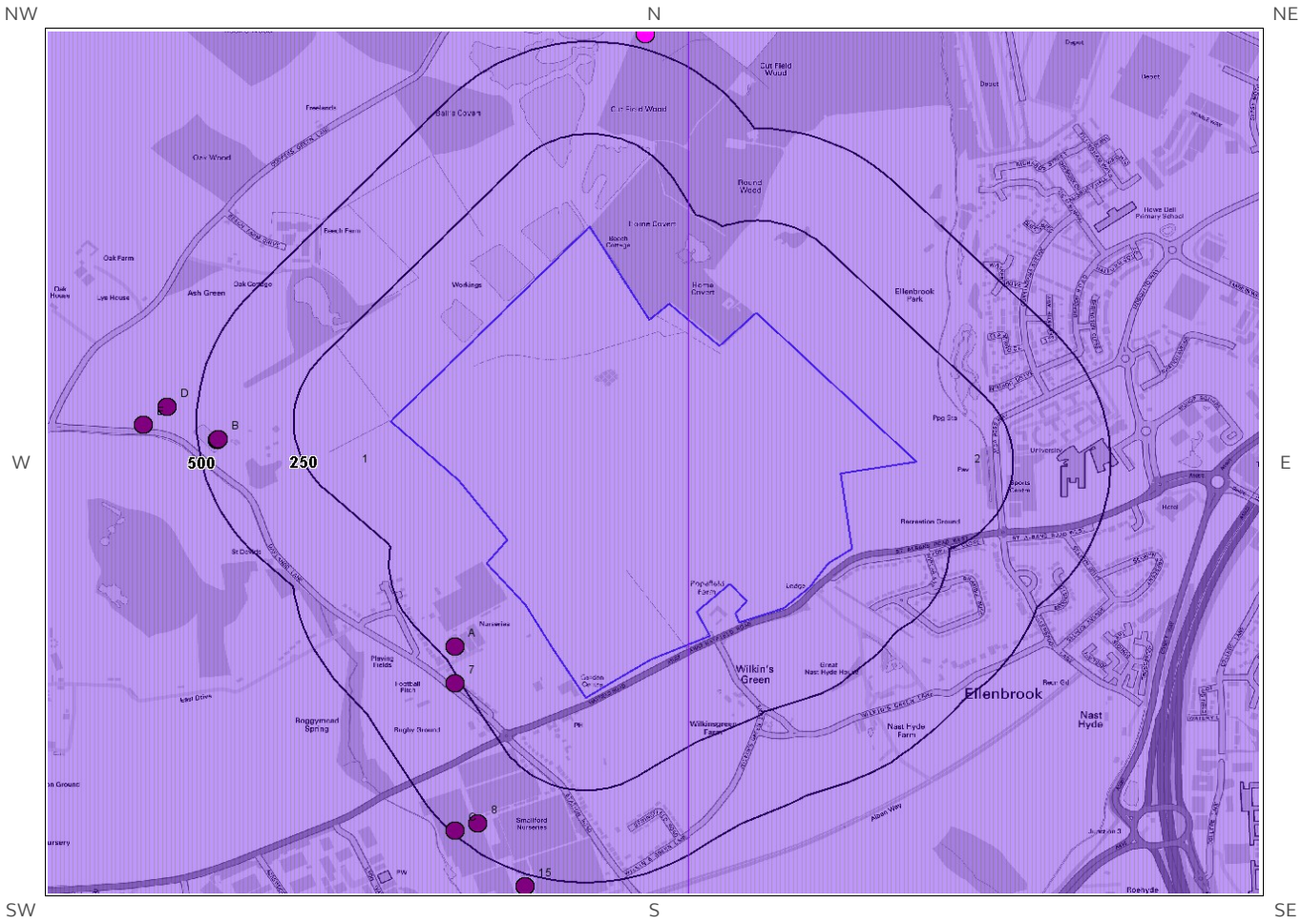
Secondary (B) Aquifer - Lower Permeability Layers

Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

6b. Aquifer Within Bedrock Geology and Abstraction Licenses



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Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

Secondary (B) Aquifer - Lower Permeability Layers

Groundwater Abstraction Licence

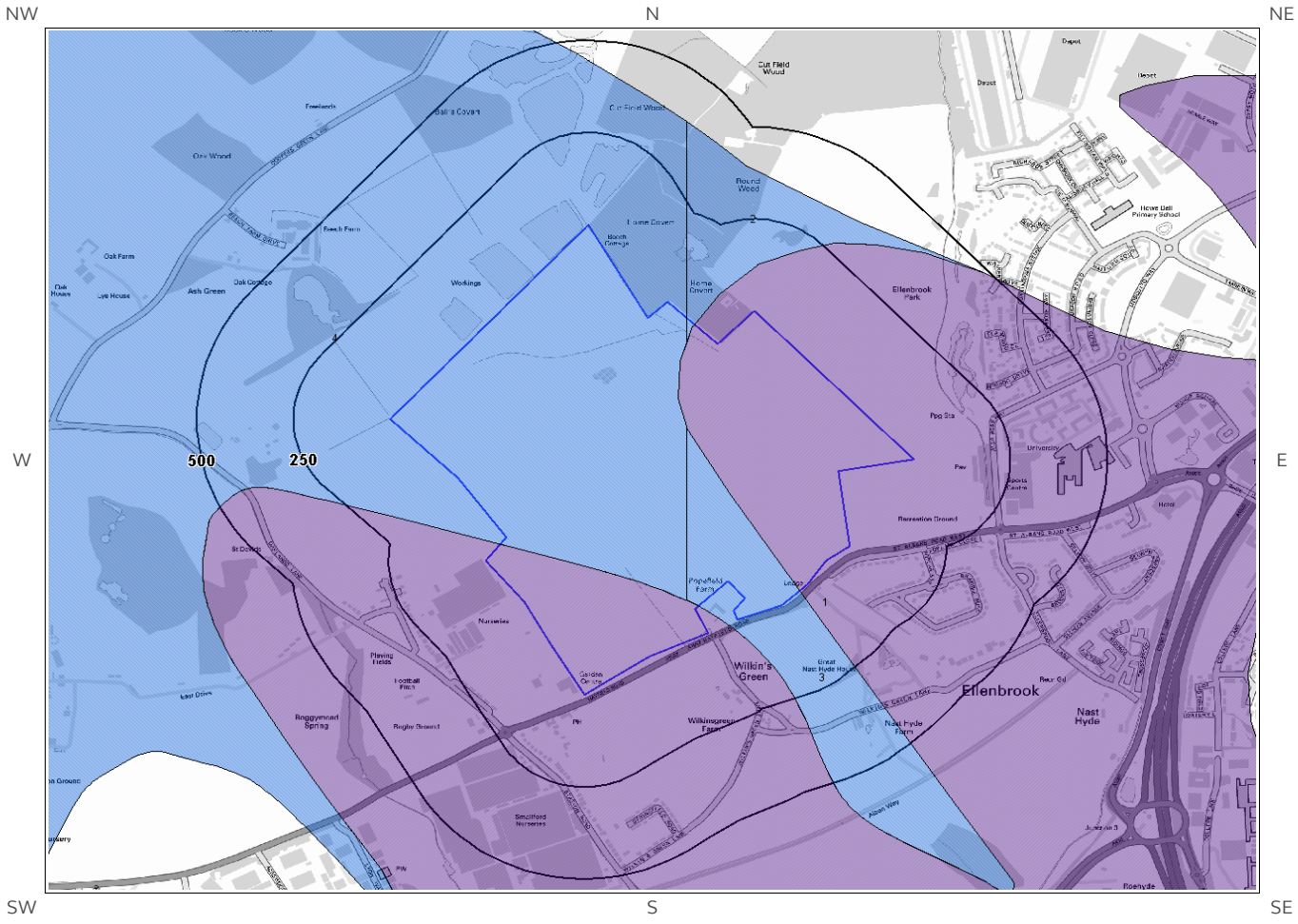
Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

Surface Water Abstraction Licence

6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses



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Site Outline

250
500
Search Buffers (m)

Source Protection Zone 1 - Inner Catchment

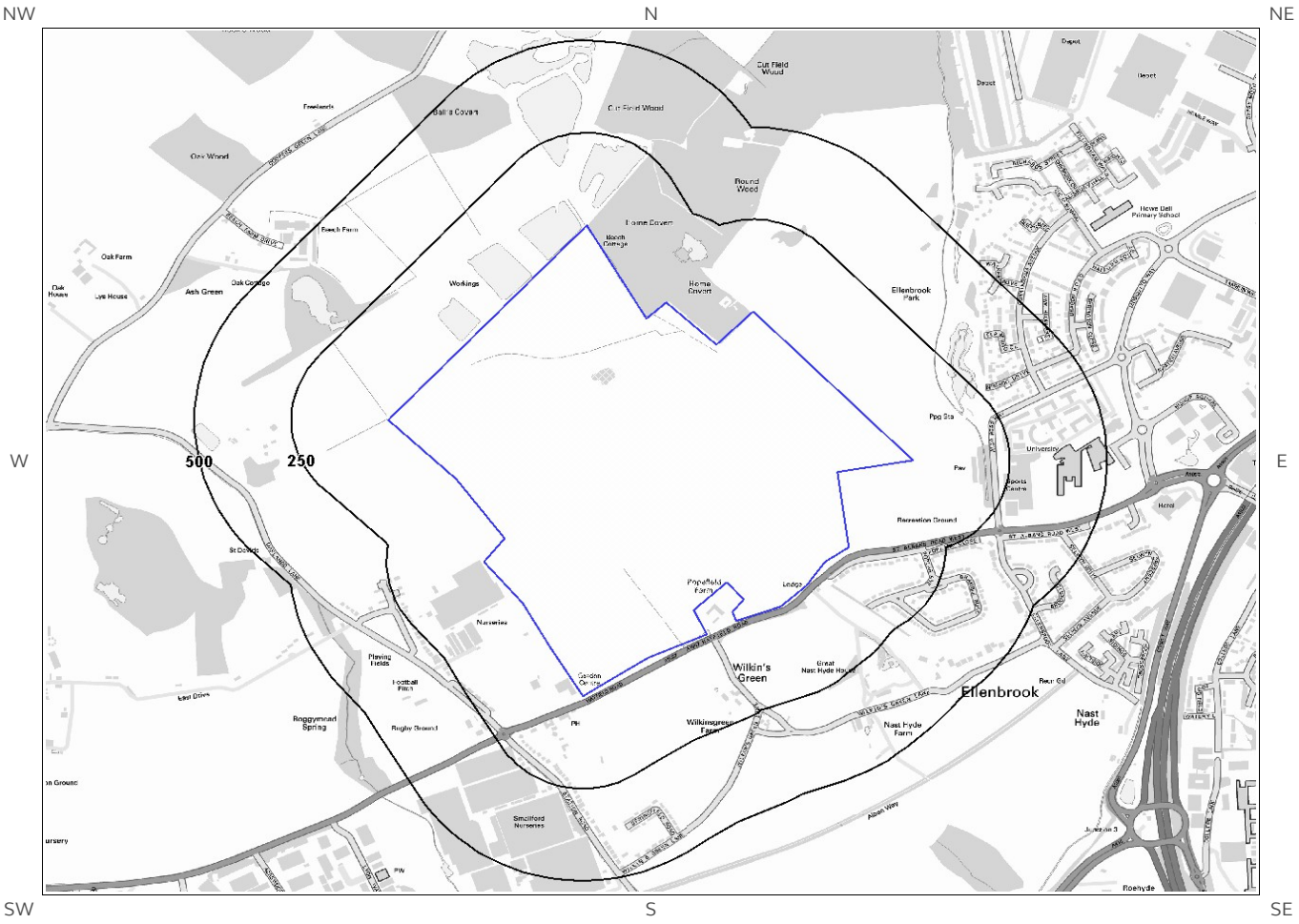
Source Protection Zone 2 - Outer Catchment

Source Protection Zone 3 - Total Catchment

Source Protection Zone 4 - Zone of Special Interest

Potable Water Abstraction Licence

6d. Hydrogeology – Source Protection Zones within confined aquifer



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Site Outline

250
500
Search Buffers (m)

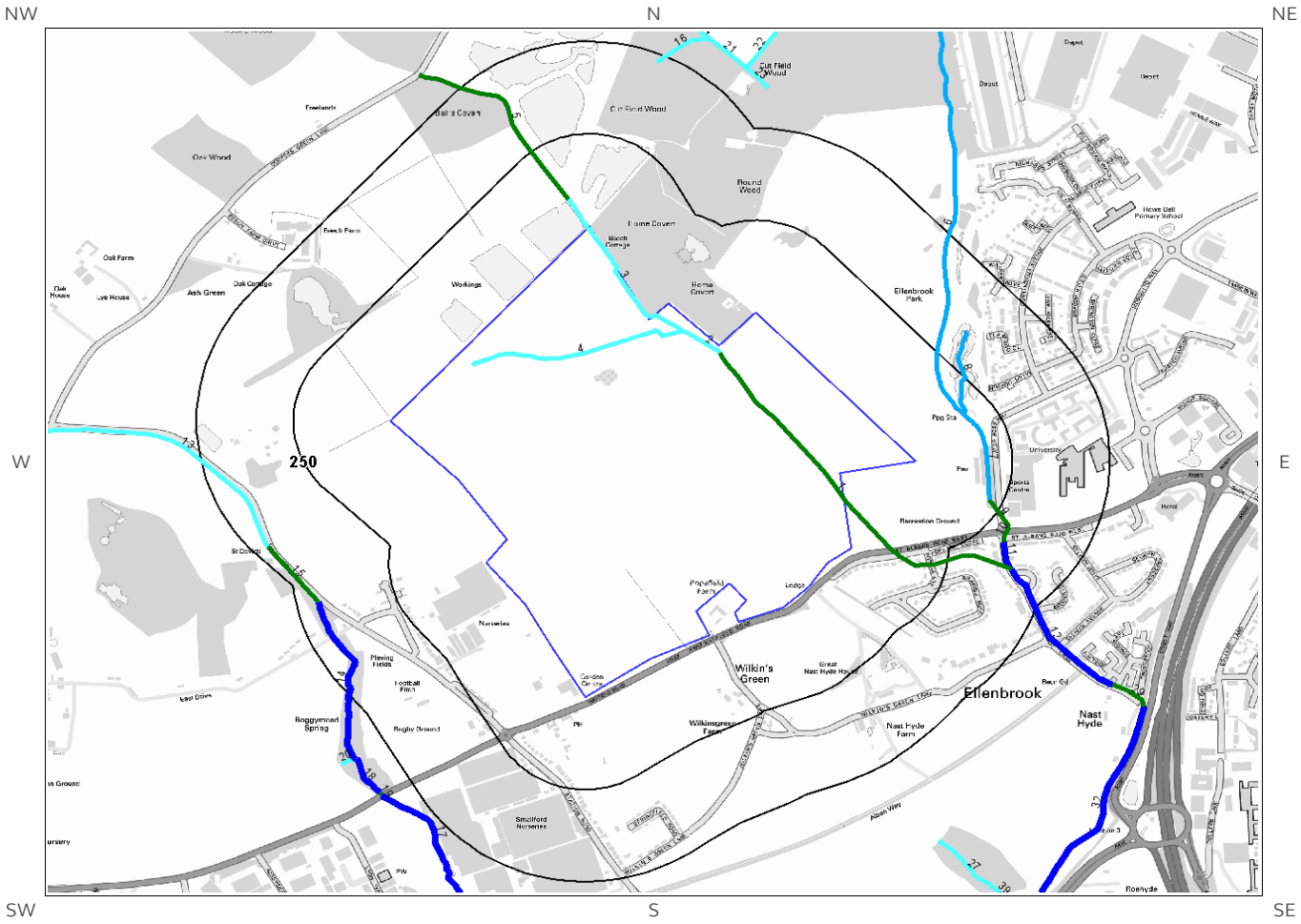
Source Protection Zone 1 - Inner Catchment

Source Protection Zone 2C - Outer Catchment within Confined Aquifer

Source Protection Zone 3C - Total Catchment within Confined Aquifer

Potable Water Abstraction Licence

6e. Hydrology – Detailed River Network and River Quality



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Site Outline

250 Search Buffers (m)
500

Primary River
Secondary River
Tertiary River
Lake/Reservoir
Underground River (inferred)
General Quality Assessment: Biology
General Quality Assessment: Chemistry

Canal
Canal Tunnel
Culvert
Multiple Channel Culvert
Underground River (Potential Sewer)
Underground River (local knowledge)

6.Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Are there records of strata classification within the superficial geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviroinsight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
8	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
9	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
3	199	SW	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
4	480	SE	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

6.2 Aquifer within Bedrock Deposits

Are there records of strata classification within the bedrock geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviroinsight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers
2	0	On Site	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers

6.3 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 2000m of the study site? Yes

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details	
5A	213	SW	519400 207900	Status: Active Licence No: 28/39/28/0477 Details: Horticultural Watering Direct Source: Thames Groundwater Point: Radio Nursery, Smallford, St Albans - Borehole Data Type: Point Name: BARBA	Annual Volume (m^3): 15000 Max Daily Volume (m^3): 72.7 Original Application No: - Original Start Date: 17/8/1999 Expiry Date: - Issue No: 102 Version Start Date: 30/7/2008 Version End Date:
6A	213	SW	519400 207900	Status: Historical Licence No: 28/39/28/0477 Details: Horticultural Watering Direct Source: Thames Groundwater Point: Borehole At Radio Nursery, Smallford Data Type: Point Name: BARBA	Annual Volume (m^3): 15000 Max Daily Volume (m^3): 72.7 Original Application No: - Original Start Date: 17/8/1999 Expiry Date: - Issue No: 101 Version Start Date: 17/8/1999 Version End Date:
7	266	SW	519400 207800	Status: Active Licence No: 28/39/28/0206 Details: Spray Irrigation - Spray Irrigation Definition Order Direct Source: Thames Groundwater Point: Borehole At The Nurseries, Colney Heath Data Type: Point Name: BARKER	Annual Volume (m^3): 6819 Max Daily Volume (m^3): 45.5 Original Application No: - Original Start Date: 14/11/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/4/2008 Version End Date:
8	439	SW	519460 207420	Status: Active Licence No: 28/39/28/0023 Details: Horticultural Watering Direct Source: Thames Groundwater Point: Point 'b' At Smallford Nurseries, St. Albans Data Type: Point Name: GLINWELL PLC	Annual Volume (m^3): 90290 Max Daily Volume (m^3): 527.4 Original Application No: - Original Start Date: 13/12/1965 Expiry Date: - Issue No: 101 Version Start Date: 25/7/2002 Version End Date:
9B	449	W	518791 208462	Status: Active Licence No: 28/39/28/0598/R01 Details: Process Water Direct Source: Thames Groundwater Point: Hatfield Quarry- Wet Pit Data Type: Point Name: CEMEX UK MATERIALS LIMITED	Annual Volume (m^3): 610000 Max Daily Volume (m^3): 2561 Original Application No: NPS/WR/012701 Original Start Date: 1/4/2014 Expiry Date: 31/3/2026 Issue No: 1 Version Start Date: 1/4/2014 Version End Date:
10B	449	W	518791 208462	Status: Active Licence No: 28/39/28/0598/R01 Details: Mineral Washing Direct Source: Thames Groundwater Point: Hatfield Quarry- Wet Pit Data Type: Point Name: CEMEX UK MATERIALS LIMITED	Annual Volume (m^3): 610000 Max Daily Volume (m^3): 2561 Original Application No: NPS/WR/012701 Original Start Date: 1/4/2014 Expiry Date: 31/3/2026 Issue No: 1 Version Start Date: 1/4/2014 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
11B	450	W	518790 208460	Status: Historical Licence No: 28/39/28/0598 Details: Mineral Washing Direct Source: Thames Groundwater Point: Hatfield Quarry- Wet Pit Data Type: Point Name: CEMEX UK MATERIALS LIMITED	Annual Volume (m^3): 610000 Max Daily Volume (m^3): 2561 Original Application No: WRA/N/1392 Original Start Date: 21/11/2005 Expiry Date: 31/3/2014 Issue No: 1 Version Start Date: 21/11/2005 Version End Date:
12B	450	W	518790 208460	Status: Historical Licence No: 28/39/28/0598 Details: Process Water Direct Source: Thames Groundwater Point: Hatfield Quarry- Wet Pit Data Type: Point Name: CEMEX UK MATERIALS LIMITED	Annual Volume (m^3): 610000 Max Daily Volume (m^3): 2561 Original Application No: WRA/N/1392 Original Start Date: 21/11/2005 Expiry Date: 31/3/2014 Issue No: 1 Version Start Date: 21/11/2005 Version End Date:
13C	494	SW	519400 207400	Status: Historical Licence No: 28/39/28/0023 Details: Spray Irrigation - Spray Irrigation Definition Order Direct Source: Thames Groundwater Point: Borehole 'b' At Smallford Nurseries, St. Albans Data Type: Point Name: GLINWELL LIMITED	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 13/12/1965 Expiry Date: - Issue No: 100 Version Start Date: 14/12/1977 Version End Date:
14C	494	SW	519400 207400	Status: Historical Licence No: 28/39/28/0023 Details: Horticultural Watering Direct Source: Thames Groundwater Point: Borehole 'b' At Smallford Nurseries, St. Albans Data Type: Point Name: GLINWELL LIMITED	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 13/12/1965 Expiry Date: - Issue No: 100 Version Start Date: 14/12/1977 Version End Date:
15	535	S	519580 207250	Status: Active Licence No: 28/39/28/0023 Details: Horticultural Watering Direct Source: Thames Groundwater Point: Point 'a' At Smallford Nurseries, St. Albans Data Type: Point Name: GLINWELL PLC	Annual Volume (m^3): 90290 Max Daily Volume (m^3): 527.4 Original Application No: - Original Start Date: 13/12/1965 Expiry Date: - Issue No: 101 Version Start Date: 25/7/2002 Version End Date:
16D	578	W	518660 208550	Status: Historical Licence No: 28/39/28/0554 Details: Mineral Washing Direct Source: Thames Groundwater Point: Hatfield Quarry, St Albans - Wet Pit Data Type: Point Name: RMC AGGREGATES (GREATER LONDON) LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 16/9/1999 Expiry Date: 30/6/2005 Issue No: 2 Version Start Date: 20/3/2003 Version End Date:
17D	578	W	518660 208550	Status: Historical Licence No: 28/39/28/0554 Details: Process water Direct Source: Thames Groundwater Point: Hatfield Quarry, St Albans - Wet Pit Data Type: Point Name: RMC AGGREGATES (GREATER LONDON) LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 16/9/1999 Expiry Date: 30/6/2005 Issue No: 2 Version Start Date: 20/3/2003 Version End Date:
18D	578	W	518660 208550	Status: Historical Licence No: 28/39/28/0554 Details: Process water Direct Source: Thames Groundwater Point: Hatfield Quarry, St Albans - Wet Pit Data Type: Point Name: RMC AGGREGATES (GREATER LONDON) LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 16/9/1999 Expiry Date: 30/6/2005 Issue No: 2 Version Start Date: 20/3/2003 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
19D	578	W	518660 208550	Status: Historical Licence No: 28/39/28/0554 Details: Mineral Washing Direct Source: Thames Groundwater Point: Hatfield Quarry, St Albans - Wet Pit Data Type: Point Name: RMC AGGREGATES (GREATER LONDON) LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 16/9/1999 Expiry Date: 30/6/2005 Issue No: 2 Version Start Date: 20/3/2003 Version End Date:
Not shown	609	SW	519500 207200	Status: Historical Licence No: 28/39/28/0023 Details: Spray Irrigation - Spray Irrigation Definition Order Direct Source: Thames Groundwater Point: Borehole 'a' At Smallford Nurseries, St. Albans Data Type: Point Name: GLINWELL LIMITED	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 13/12/1965 Expiry Date: - Issue No: 100 Version Start Date: 14/12/1977 Version End Date:
Not shown	609	SW	519500 207200	Status: Historical Licence No: 28/39/28/0023 Details: Horticultural Watering Direct Source: Thames Groundwater Point: Borehole 'a' At Smallford Nurseries, St. Albans Data Type: Point Name: GLINWELL LIMITED	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 13/12/1965 Expiry Date: - Issue No: 100 Version Start Date: 14/12/1977 Version End Date:
22E	637	W	518600 208500	Status: Historical Licence No: 28/39/28/0554 Details: Process water Direct Source: Thames Groundwater Point: Wet Pit At Hatfield Quarry, St Albans Data Type: Point Name: RMC AGGREGATES (GREATER LONDON) LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: WRA/N/1078 Original Start Date: - Expiry Date: 30/06/2005 Issue No: 1 Version Start Date: 21/12/2000 Version End Date:
23E	637	W	518600 208500	Status: Historical Licence No: 28/39/28/0554 Details: Mineral Washing Direct Source: Thames Groundwater Point: Wet Pit At Hatfield Quarry, St Albans Data Type: Point Name: RMC AGGREGATES (GREATER LONDON) LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: WRA/N/1078 Original Start Date: - Expiry Date: 30/06/2005 Issue No: 1 Version Start Date: 21/12/2000 Version End Date:
Not shown	1278	NE	521100 209690	Status: Historical Licence No: 28/39/28/0015 Details: Non-Evaporative Cooling Direct Source: Thames Groundwater Point: Borehole B At Comet Way, Hatfield Data Type: Point Name: BRITISH AEROSPACE PROP'S LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/11/1965 Expiry Date: - Issue No: 100 Version Start Date: 30/3/1999 Version End Date:
Not shown	1278	NE	521100 209690	Status: Historical Licence No: 28/39/28/0015 Details: Spray Irrigation - Direct Direct Source: Thames Groundwater Point: Borehole B At Comet Way, Hatfield Data Type: Point Name: BRITISH AEROSPACE PROP'S LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/11/1965 Expiry Date: - Issue No: 100 Version Start Date: 30/3/1999 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1278	NE	521100 209690	Status: Historical Licence No: 28/39/28/0015 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Thames Groundwater Point: Borehole B At Comet Way, Hatfield Data Type: Point Name: BRITISH AEROSPACE PROP'S LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/11/1965 Expiry Date: - Issue No: 100 Version Start Date: 30/3/1999 Version End Date:
Not shown	1278	NE	521100 209690	Status: Historical Licence No: 28/39/28/0015 Details: Process water Direct Source: Thames Groundwater Point: Borehole B At Comet Way, Hatfield Data Type: Point Name: BRITISH AEROSPACE PROP'S LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/11/1965 Expiry Date: - Issue No: 100 Version Start Date: 30/3/1999 Version End Date:
Not shown	1353	S	520110 206460	Status: Historical Licence No: 28/39/28/0073 Details: Mineral Washing Direct Source: Thames Groundwater Point: Wet Pit At Colney Heath, Hertfordshire Data Type: Point Name: LAFARGE AGGREGATES LIMITED	Annual Volume (m^3): 350496.6 Max Daily Volume (m^3): 1168.32 Original Application No: - Original Start Date: 4/4/1966 Expiry Date: - Issue No: 101 Version Start Date: 1/11/2001 Version End Date:
Not shown	1353	S	520110 206460	Status: Historical Licence No: 28/39/28/0073 Details: Mineral Washing Direct Source: Thames Groundwater Point: Colney Heath, Hertfordshire-wet Pit Data Type: Point Name: LAFARGE AGGREGATES LIMITED	Annual Volume (m^3): 350496.6 Max Daily Volume (m^3): 1168.32 Original Application No: - Original Start Date: 4/4/1966 Expiry Date: - Issue No: 102 Version Start Date: 13/11/2003 Version End Date:
Not shown	1409	S	520100 206400	Status: Historical Licence No: 28/39/28/0073 Details: Mineral Washing Direct Source: Thames Groundwater Point: Wet Pit At Colney Heath, Hertfordshire Data Type: Point Name: LAFARGE REDLAND AGGREGATES LIMITED	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 4/4/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/6/1998 Version End Date:
Not shown	1489	NW	518700 210100	Status: Historical Licence No: 28/39/28/0317 Details: General Farming & Domestic Direct Source: Thames Groundwater Point: Borehole B At Sandridge Data Type: Point Name: SHERRIFF	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/5/1967 Expiry Date: - Issue No: 100 Version Start Date: 8/5/1967 Version End Date:
Not shown	1524	NE	521350 209790	Status: Historical Licence No: 28/39/28/0015 Details: Spray Irrigation - Direct Direct Source: Thames Groundwater Point: Borehole 'c' At Hatfield, Herts Data Type: Point Name: BRITISH AEROSPACE PROP'S LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/11/1965 Expiry Date: - Issue No: 100 Version Start Date: 30/3/1999 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1524	NE	521350 209790	Status: Historical Licence No: 28/39/28/0015 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Thames Groundwater Point: Borehole 'c' At Hatfield, Herts Data Type: Point Name: BRITISH AEROSPACE PROP'S LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/11/1965 Expiry Date: - Issue No: 100 Version Start Date: 30/3/1999 Version End Date:
Not shown	1524	NE	521350 209790	Status: Historical Licence No: 28/39/28/0015 Details: Process water Direct Source: Thames Groundwater Point: Borehole 'c' At Hatfield, Herts Data Type: Point Name: BRITISH AEROSPACE PROP'S LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/11/1965 Expiry Date: - Issue No: 100 Version Start Date: 30/3/1999 Version End Date:
Not shown	1524	NE	521350 209790	Status: Historical Licence No: 28/39/28/0015 Details: Non-Evaporative Cooling Direct Source: Thames Groundwater Point: Borehole 'c' At Hatfield, Herts Data Type: Point Name: BRITISH AEROSPACE PROP'S LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/11/1965 Expiry Date: - Issue No: 100 Version Start Date: 30/3/1999 Version End Date:
Not shown	1524	NE	521350 209790	Status: Active Licence No: 28/39/28/0015 Details: Make-Up Or Top Up Water Direct Source: Thames Groundwater Point: Hatfield Business Park, Hatfield, Herts -borehole Data Type: Point Name: ARLINGTON BUSINESS PARKS GP LTD	Annual Volume (m^3): 83000 Max Daily Volume (m^3): 600 Original Application No: NPS/WR/015069 Original Start Date: 8/11/1965 Expiry Date: - Issue No: 102 Version Start Date: 31/3/2014 Version End Date:
Not shown	1524	NE	521350 209790	Status: Active Licence No: 28/39/28/0015 Details: Spray Irrigation - Direct Direct Source: Thames Groundwater Point: Hatfield Business Park, Hatfield, Herts -borehole Data Type: Point Name: ARLINGTON BUSINESS PARKS GP LTD	Annual Volume (m^3): 83000 Max Daily Volume (m^3): 600 Original Application No: NPS/WR/015069 Original Start Date: 8/11/1965 Expiry Date: - Issue No: 102 Version Start Date: 31/3/2014 Version End Date:
Not shown	1576	SE	522012 207729	Status: Active Licence No: 29/38/01/0061 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Roe Green, Bishop's Rise - Borehole A Data Type: Point Name: Affinity Water Limited	Annual Volume (m^3): 3318649 Max Daily Volume (m^3): 9092.19 Original Application No: NPS/WR/011805 Original Start Date: 20/9/1966 Expiry Date: - Issue No: 102 Version Start Date: 1/5/2014 Version End Date:
Not shown	1576	SE	522012 207729	Status: Active Licence No: TH/038/0001/001 Details: General Use Relating To Secondary Category (Low Loss) Direct Source: Thames Groundwater Point: Roe Green, Bishop's Rise - Borehole A Data Type: Point Name: Affinity Water Limited	Annual Volume (m^3): 3317850 Max Daily Volume (m^3): 9090 Original Application No: NPS/WR/011805 Original Start Date: 1/4/2010 Expiry Date: 31/8/2019 Issue No: 2 Version Start Date: 1/5/2014 Version End Date:
Not shown	1577	SE	522000 207700	Status: Historical Licence No: 29/38/01/0061 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Roe Green - Bishop's Rise Data Type: Point Name: Veolia Water Central Limited	Annual Volume (m^3): 3318649 Max Daily Volume (m^3): 9092.19 Original Application No: NPS/WR/002205 Original Start Date: 20/9/1966 Expiry Date: - Issue No: 101 Version Start Date: 20/7/2009 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1577	SE	522000 207700	Status: Historical Licence No: 29/38/01/0105 Details: General Use Relating To Secondary Category (Low Loss) Direct Source: Thames Groundwater Point: Roe Green - Bishop's Rise Data Type: Point Name: Veolia Water Central Limited	Annual Volume (m^3): 3317850 Max Daily Volume (m^3): 9090 Original Application No: NPS/WR/002208 Original Start Date: 8/2/2007 Expiry Date: 31/3/2010 Issue No: 2 Version Start Date: 20/7/2009 Version End Date:
Not shown	1577	SE	522015 207731	Status: Active Licence No: TH/038/0001/001 Details: General Use Relating To Secondary Category (Low Loss) Direct Source: Thames Groundwater Point: Roe Green, Bishops Rise - Borehole B Data Type: Point Name: Affinity Water Limited	Annual Volume (m^3): 3317850 Max Daily Volume (m^3): 9090 Original Application No: NPS/WR/011805 Original Start Date: 1/4/2010 Expiry Date: 31/8/2019 Issue No: 2 Version Start Date: 1/5/2014 Version End Date:
Not shown	1584	NW	518000 209500	Status: Historical Licence No: 28/39/28/0317 Details: General Farming & Domestic Direct Source: Thames Groundwater Point: Borehole D At Sandridge Data Type: Point Name: SHERRIFF	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/5/1967 Expiry Date: - Issue No: 100 Version Start Date: 8/5/1967 Version End Date:
Not shown	1622	NW	518700 210280	Status: Historical Licence No: 28/39/28/0317 Details: General Farming & Domestic Direct Source: Thames Groundwater Point: Sandridge, St Albans- Borehole C Data Type: Point Name: SHERRIFF	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/5/1967 Expiry Date: - Issue No: 101 Version Start Date: 26/4/2004 Version End Date:
Not shown	1705	NW	517960 209640	Status: Historical Licence No: 28/39/28/0317 Details: General Farming & Domestic Direct Source: Thames Groundwater Point: Sandridge, St Albans- Borehole D Data Type: Point Name: SHERRIFF	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/5/1967 Expiry Date: - Issue No: 101 Version Start Date: 26/4/2004 Version End Date:
Not shown	1708	NW	518300 210000	Status: Historical Licence No: 28/39/28/0317 Details: General Farming & Domestic Direct Source: Thames Groundwater Point: Borehole C At Sandridge Data Type: Point Name: SHERRIFF	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/5/1967 Expiry Date: - Issue No: 100 Version Start Date: 8/5/1967 Version End Date:
Not shown	1846	NW	518300 210200	Status: Historical Licence No: 28/39/28/0443C Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Thames Groundwater Point: Borehole At Woodcock Hill (home Office) Data Type: Point Name: THE HOME OFFICE	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: - Expiry Date: - Issue No: 1 Version Start Date: 22/6/1976 Version End Date:
Not shown	1923	SW	518920 206020	Status: Historical Licence No: 28/39/28/0552 Details: General Farming & Domestic Direct Source: Thames Groundwater Point: Point 'a' At Barley Mow Lane, Tyttenhanger Green, St. Albans Data Type: Point Name: GRAND CHINA PROPERTIES LIMITED	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 22/10/1998 Expiry Date: - Issue No: 101 Version Start Date: 9/1/2002 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1950	SW	518900 206000	Status: Historical Licence No: 28/39/28/0552 Details: General Farming & Domestic Direct Source: Thames Groundwater Point: Borehole At Barley Mow Lane, Tyttenhanger Data Type: Point Name: DE ROUFFIGNAC	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: A/N/1032 Original Start Date: 22/10/1998 Expiry Date: - Issue No: 100 Version Start Date: 28/11/1998 Version End Date:

6.4 Surface Water Abstraction Licences

Are there any Surface Water Abstraction Licences within 2000m of the study site? Yes

The following Surface Water Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details	
50	538	N	519890 209560	Status: Historical Licence No: 28/39/28/0553 Details: Spray Irrigation - Direct Direct Source: Thames Surface Water - Non Tidal Point: Tributary Of River Colne At Hatfield Qaurry, St. Albans Data Type: Point Name: RMC AGGREGATES (GREATER LONDON) LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: WRA/N/1083 Original Start Date: 23/7/1999 Expiry Date: 31/7/2003 Issue No: 1 Version Start Date: 21/12/2000 Version End Date:

6.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site? Yes

The following Potable Water Abstraction Licences records are represented as points, lines and regions on the SPZ and Potable Water Abstraction Licences Map (6c):

ID	Distance (m)	Direction	NGR	Details	
Not shown	1278	NE	521100 209690	Status: Historical Licence No: 28/39/28/0015 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Thames Groundwater Point: Borehole B At Comet Way, Hatfield Data Type: Point Name: BRITISH AEROSPACE PROP'S LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/11/1965 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:
Not shown	1524	NE	521350 209790	Status: Historical Licence No: 28/39/28/0015 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Thames Groundwater Point: Borehole 'c' At Hatfield, Herts Data Type: Point Name: BRITISH AEROSPACE PROP'S LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 8/11/1965 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1576	SE	522012 207729	Status: Active Licence No: 29/38/01/0061 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Roe Green, Bishop's Rise - Borehole A Data Type: Point Name: Affinity Water Limited	Annual Volume (m^3): 3318649 Max Daily Volume (m^3): 9092.19 Original Application No: NPS/WR/011805 Original Start Date: 20/9/1966 Expiry Date: - Issue No: 102 Version Start Date: Version End Date:
Not shown	1577	SE	522000 207700	Status: Historical Licence No: 29/38/01/0061 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Roe Green - Bishop's Rise Data Type: Point Name: Veolia Water Central Limited	Annual Volume (m^3): 3318649 Max Daily Volume (m^3): 9092.19 Original Application No: NPS/WR/002205 Original Start Date: 20/9/1966 Expiry Date: - Issue No: 101 Version Start Date: Version End Date:
Not shown	1846	NW	518300 210200	Status: Historical Licence No: 28/39/28/0443C Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Thames Groundwater Point: Borehole At Woodcock Hill (home Office) Data Type: Point Name: THE HOME OFFICE	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: - Expiry Date: - Issue No: 1 Version Start Date: Version End Date:

6.6 Source Protection Zones

Are there any Source Protection Zones within 500m of the study site? Yes

The following Source Protection Zones records are represented on the SPZ and Potable Water Abstraction Map (6c):

ID	Distance (m)	Direction	Zone	Description
1	0	On Site	2	Outer catchment
2	0	On Site	3	Total catchment
3	0	On Site	3	Total catchment
4	0	On Site	3	Total catchment

6.7 Source Protection Zones within Confined Aquifer

Are there any Source Protection Zones within the Confined Aquifer within 500m of the study site? No

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

Database searched and no data found.

6.8 Groundwater Vulnerability and Soil Leaching Potential

Is there any Environment Agency information on groundwater vulnerability and soil leaching potential within 500m of the study site? Yes

Distance (m)	Direction	Classification	Soil Vulnerability Category	Description
0	On Site	Major Aquifer/Intermediate Leaching Potential	I1	Soils which can possibly transmit a wide range of pollutants.
0	On Site	Major Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
0	On Site	Major Aquifer/Intermediate Leaching Potential	I1	Soils which can possibly transmit a wide range of pollutants.
0	On Site	Major Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
6	NE	Major Aquifer/Low Leaching Potential	L	Soils in which pollutants are unlikely to penetrate the soil layer because either water movement is largely horizontal, or they have the ability to attenuate diffuse pollutants.

6.9 River Quality

Is there any Environment Agency information on river quality within 1500m of the study site? No

6.9.1 Biological Quality:

Database searched and no data found.

Database searched and no data found.

6.10 Detailed River Network

Are there any Detailed River Network entries within 500m of the study site? Yes

The following Detailed River Network records are represented on the Hydrology Map (6e):

ID	Distance (m)	Direction	Details	
1	0	On Site	River Name: Nast Welsh River Name: - Alternative Name: -	River Type: Culvert Main River Status: Currently Undefined
2	0	On Site	River Name: Nast Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
3	0	On Site	River Name: Nast Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
4	0	On Site	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
5	89	NW	River Name: Nast Welsh River Name: - Alternative Name: -	River Type: Culvert Main River Status: Currently Undefined
6	178	NE	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
7	179	NE	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
8	179	NE	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
9	216	SE	River Name: - Welsh River Name: - Alternative Name: -	River Type: Culvert Main River Status: Currently Undefined
10	299	SE	River Name: Ellen Brook Welsh River Name: - Alternative Name: -	River Type: Culvert Main River Status: Currently Undefined
11	315	SE	River Name: Ellen Brook Welsh River Name: - Alternative Name: -	River Type: Primary River Main River Status: Currently Undefined
12	380	SE	River Name: Ellen Brook Welsh River Name: - Alternative Name: -	River Type: Primary River Main River Status: Currently Undefined
13	428	SW	River Name: Butterwick Brook Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
14	430	SW	River Name: Butterwick Brook Welsh River Name: - Alternative Name: -	River Type: Primary River Main River Status: Currently Undefined

ID	Distance (m)	Direction	Details	
15	443	W	River Name: Butterwick Brook Welsh River Name: - Alternative Name: -	River Type: Culvert Main River Status: Currently Undefined
16	476	N	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined

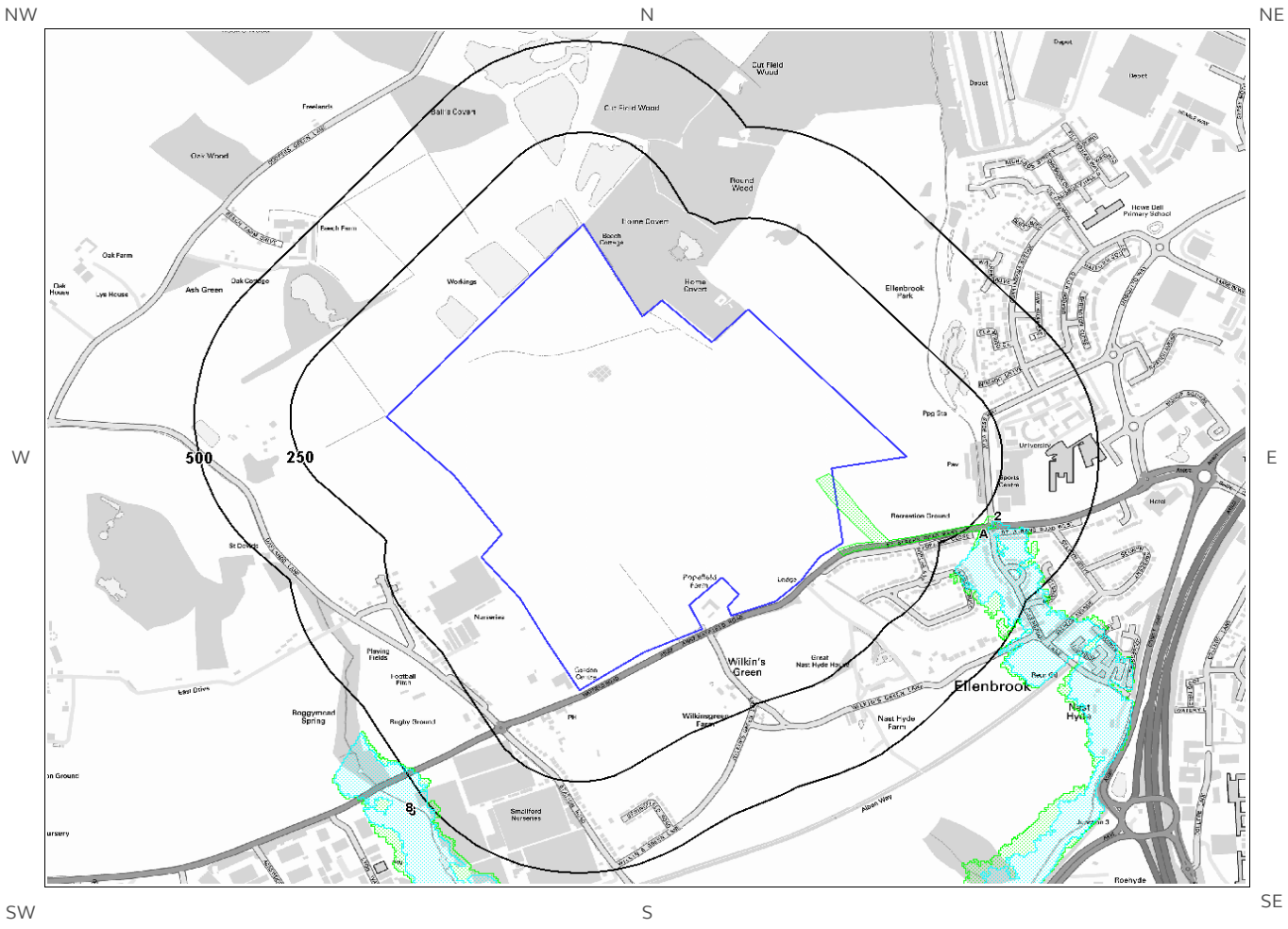
6.11 Surface Water Features

Are there any surface water features within 250m of the study site? Yes

The following surface water records are not represented on mapping:

Distance (m)	Direction
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
1	SE
5	SE
7	NW
9	NW
9	NW
16	NW
16	NW
17	SE
18	SE
29	SE
51	N
115	N
118	N
122	NE
124	NE
150	N
164	NE
172	SE
177	NE
177	NW
178	NE
182	E
182	NW
196	NE
222	SW
223	NW
224	NE
229	NE
235	NW

7a. Environment Agency Flood Map for Planning (from rivers and the sea)



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Site Outline

100
250
Search Buffers (m)

Zone 2 Floodplain

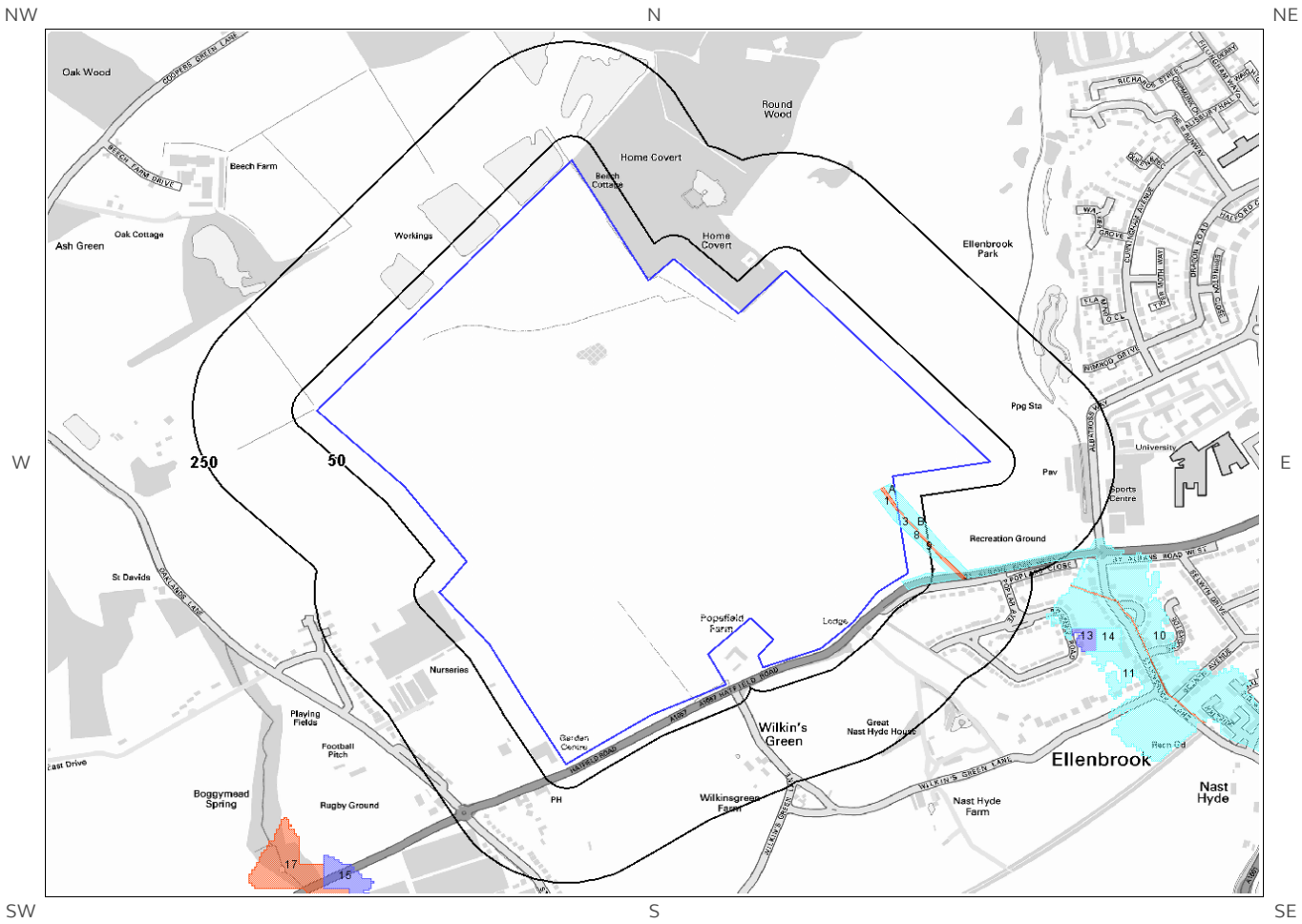
Zone 3 Floodplain

Flood Defences

Area used for Flood Storage

Area Benefiting from Flood Defences

7b. Environment Agency Risk of Flooding from Rivers and the Sea (RoFRaS) Map



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Site Outline

100
250
Search Buffers (m)

RoFRaS Rating

- Very Low
- Low
- Medium
- High

7 Flooding

7.1 River and Coastal Zone 2 Flooding

Is the site within 250m of an Environment Agency Zone 2 floodplain? Yes

Environment Agency Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 7a – Flood Map for Planning:

ID	Distance (m)	Direction	Update	Type
1	0	On Site	02-Oct-2015	Zone 2 - (Fluvial / Tidal Models)

7.2 River and Coastal Zone 3 Flooding

Is the site within 250m of an Environment Agency Zone 3 floodplain? No

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 7a – Flood Map for Planning.

7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating

What is the highest risk of flooding onsite? High

The Environment Agency RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a High (1 in 30 or greater) chance of flooding in any given year.

Any relevant data within 250m is represented on the RoFRaS Flood map. Data to 50m is reported in the table below.

ID	Distance (m)	Direction	RoFRas flood Risk
1	0.0	On Site	Low
2A	0.0	On Site	Low
3	0.0	On Site	Low
4B	0.0	On Site	Low
5A	0.0	On Site	Low
6B	0.0	On Site	High

7	6.0	SE	Low
8	12.0	E	Low
9	36.0	E	Low

7.4 Flood Defences

Are there any Flood Defences within 250m of the study site? No

Database searched and no data found.

7.5 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? No

7.6 Areas benefiting from Flood Storage

Are there any areas used for Flood Storage within 250m of the study site? No

7.7 Groundwater Flooding Susceptibility Areas

7.7.1 Are there any British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site? Yes

Does this relate to Clearwater Flooding or Superficial Deposits Flooding? Clearwater Flooding

Notes: Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

7.7.2 What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions?

Potential below Surface

Where potential for groundwater flooding of property situated below ground level is indicated, this means that given the geological conditions there may be a groundwater flooding hazard to basements and other below surface infrastructure. Unless other relevant information, e.g. records of previous flooding, suggests groundwater flooding has occurred before in this area you need take no further action in relation to groundwater flooding hazard. If there are records of previous incidences of groundwater flooding, then is recommended that other information e.g. rainfall history, property type, and land drainage information in addition to previous records of flooding be investigated in order to establish relative, but not absolute, risk of groundwater flooding.

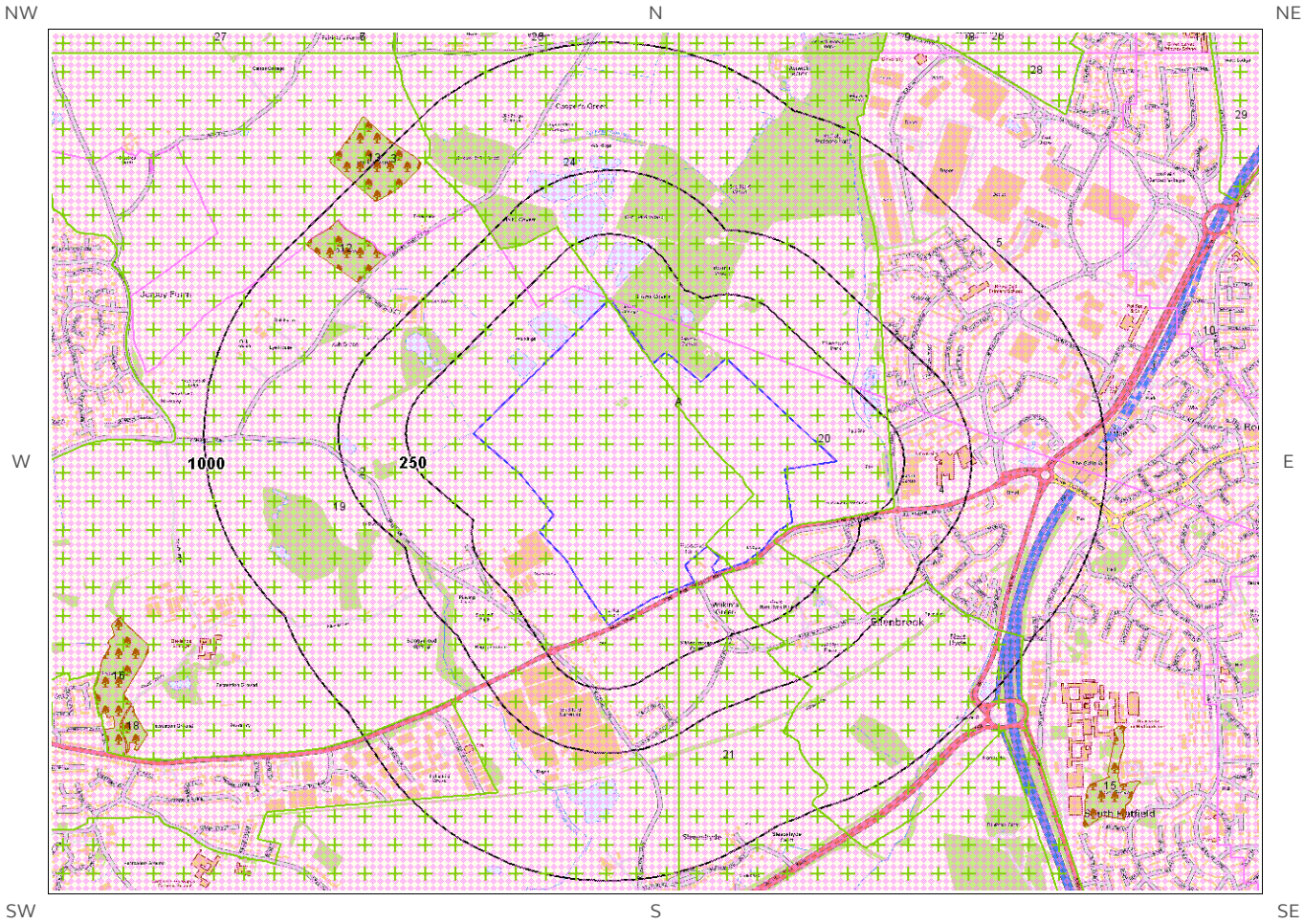
7.8 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result?	High

Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

8. Designated Environmentally Sensitive Sites Map



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Site Outline

100
250
Search Buffers (m)

AONB
National Park
SSSI
Special Protection Areas
Nitrate Vulnerable Zones
Green Belt
Environmentally Sensitive Areas
Special Areas of Conservation
World Heritage Sites
Nitrate Sensitive Areas
Ancient Woodland
National Nature Reserve
Local Nature Reserves
Ramsar Sites

8. Designated Environmentally Sensitive Sites

Presence of Designated Environmentally Sensitive Sites within 2000m of the study site? Yes

8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:

0

Database searched and no data found.

8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:

0

Database searched and no data found.

8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:

0

Database searched and no data found.

8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:

0

Database searched and no data found.

8.5 Records of Ramsar sites within 2000m of the study site:

0

Database searched and no data found.

8.6 Records of Ancient Woodland within 2000m of the study site:

7

The following records of Designated Ancient Woodland provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	Ancient Woodland Name	Data Source
12	716	NW	UNKNOWN	Ancient and Semi-Natural Woodland
13	865	NW	UNKNOWN	Ancient and Semi-Natural Woodland
Not shown	1411	N	UNKNOWN	Ancient Replanted Woodland
15	1443	SE	UNKNOWN	Ancient and Semi-Natural Woodland
16	1465	SW	UNKNOWN	Ancient and Semi-Natural Woodland
Not shown	1571	NW	UNKNOWN	Ancient and Semi-Natural Woodland
18	1655	SW	UNKNOWN	Ancient and Semi-Natural Woodland

8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

1

The following Local Nature Reserve (LNR) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	LNR Name	Data Source
Not shown	1802	S	Colney Heath	Natural England

8.8 Records of World Heritage Sites within 2000m of the study site:

0

Database searched and no data found.

8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

0

Database searched and no data found.

8.11 Records of National Parks (NP) within 2000m of the study site:

0

Database searched and no data found.

8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

10

The following Nitrate Vulnerable Zone records produced by DEFRA are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	NVZ Name	Data Source
2	0	On Site	Existing	DEFRA
3	0	On Site	Existing	DEFRA
4	0	On Site	Existing	DEFRA
5	64	N	Existing	DEFRA
6	959	N	Existing	DEFRA
7	959	N	Existing	DEFRA
8	992	N	Existing	DEFRA
9	992	N	Existing	DEFRA
10	1288	NE	Existing	DEFRA
11	1920	NE	Existing	DEFRA

8.14 Records of Green Belt land within 2000m of the study site:

Green Belt data contains Ordnance Survey data © Crown copyright and database right [2015].

ID	Distance	Direction	Green Belt Name	Local Authority Name
19	0	On Site	London Area Greenbelt	St. Albans District (B)
20	0	On Site	London Area Greenbelt	Welwyn Hatfield District (B)
21	0	On Site	London Area Greenbelt	St. Albans District (B)
22A	0	On Site	London Area Greenbelt	Welwyn Hatfield District (B)
23A	0	On Site	London Area Greenbelt	St. Albans District (B)
24	0	On Site	London Area Greenbelt	Welwyn Hatfield District (B)
25	959	N	London Area Greenbelt	Welwyn Hatfield District (B)
26	992	N	London Area Greenbelt	Welwyn Hatfield District (B)
27	1250	NW	London Area Greenbelt	St. Albans District (B)
28	1478	NE	London Area Greenbelt	Welwyn Hatfield District (B)
29	1774	NE	London Area Greenbelt	Welwyn Hatfield District (B)
Not shown	1960	S	London Area Greenbelt	Hertsmere District (B)

9. Natural Hazards Findings

9.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a Groundsure GeoInsight, available from our website. The following information has been found:

9.1.1 Shrink Swell

What is the maximum Shrink-Swell*[*] hazard rating identified on the study site? Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.

9.1.2 Landslides

What is the maximum Landslide* hazard rating identified on the study site? Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property Ö no significant increase in insurance risk due to natural slope instability problems.

9.1.3 Soluble Rocks

What is the maximum Soluble Rocks* hazard rating identified on the study site? Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Significant soluble rocks are present. Problems unlikely except with considerable surface or subsurface water flow. No special actions required to avoid problems due to soluble rocks. No special ground investigation required or increased construction costs are likely. An increase in financial risk due to potential problems with soluble rocks is unlikely.

* This indicates an automatically generated 50m buffer and site.

9.1.4 Compressible Ground

What is the maximum Compressible Ground* hazard rating identified on the study site? Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Significant potential for compressibility problems. Avoid large differential loadings of ground. Do not drain or de-water ground near the property without technical advice. For new build Ö consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Extra construction costs are likely. For existing property ×°ossible increase in insurance risk from compressibility, especially if water conditions or loading of the ground change significantly.

9.1.5 Collapsible Rocks

What is the maximum Collapsible Rocks* hazard rating identified on the study site? Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

9.1.6 Running Sand

What is the maximum Running Sand** hazard rating identified on the study site? Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build Ö consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property Ö no significant increase in insurance risk due to running sand problems is likely.

9.2 Radon

9.2.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

* This indicates an automatically generated 50m buffer and site.

9.2.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary.

10. Mining

10.1 Coal Mining

Are there any coal mining areas within 75m of the study site? No

Database searched and no data found.

10.2 Non-Coal Mining

Are there any Non-Coal Mining areas within 50m of the study site boundary? Yes

The following non-coal mining information is provided by the BGS:

Distance (m)	Direction	Name	Commodity	Assessment of likelihood
0.0	On Site	Not available	Chalk	Occasional minor mining may have occurred but of restricted extent.
0.0	On Site	Not available	Chalk	Occasional minor mining may have occurred but of restricted extent.

Past underground mine workings are uncommon, localised and of limited area. The rock types present in this area are such that minor mineral veins may be present within them on which it is possible that there have been attempts to work these by underground methods and/or it is possible that small scale underground extraction of other materials may have occurred. All such occurrences are likely to be restricted in size and infrequent. It should be noted, however, that there is always the possibility of the existence of other sub-surface excavations, such as wells, cess pits, follies, air raid shelters/bunkers and other military structures etc. that could affect surface ground stability but which are outside the scope of this dataset. However, if in a coalfield area you should still consider a Coal Authority mining search for the area of interest.

10.3 Brine Affected Areas

Are there any brine affected areas within 75m of the study site? No
Guidance: No Guidance Required.

Contact Details

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sales@emapsite.com

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Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries:
enquiries@bgs.ac.uk

Environment Agency
National Customer Contact Centre, PO Box 544
Rotherham, S60 1BY
Tel: 08708 506 506
Web:**www.environment-agency.gov.uk**
Email:**enquiries@environment-agency.gov.uk**

Public Health England
Public information access office
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133-155 Waterloo Road, London, SE1 8UG
www.gov.uk/phe
Email:**enquiries@phe.gov.uk**
Main switchboard**: 020 7654 8000**

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Tel: 0345 7626 848
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Ordnance Survey
Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505

Local Authority
Authority: Welwyn Hatfield Council
Phone: 01707 357 000
Web: http://www.welhat.gov.uk/
Address: Council Offices, The Campus, Welwyn Garden City,

Gemapping PLC
Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444

Acknowledgements: Site of Special Scientific Interest, National Nature Reserve, Ramsar Site, Special Protection Area, Special Area of Conservation data is provided by, and used with the permission of, Natural England who retain the Copyright and Intellectual Property Rights for the data.
PointX © Database Right/Copyright, Thomson Directories Limited © Copyright Link Interchange Network Limited © Database Right/Copyright and Ordnance Survey © Crown Copyright and/or Database Right. All Rights Reserved. Licence Number [03421028].
This report has been prepared in accordance with the Groundsure Ltd standard Terms and Conditions of business for work of this nature.

Standard Terms and Conditions

1 Definitions

I**n these terms and conditions unless the context otherwise requires:**

"Beneficiary" means the person or entity for whose benefit the Client has obtained the Services.

"Client" means the party or parties entering into a Contract with Groundsure.

"Commercial" means any building or property which is not Residential.

"Confidential Information" means the contents of this Contract and all information received from the Client as a result of, or in connection with, this Contract other than

(i) information which the Client can prove was rightfully in its possession prior to disclosure by Groundsure and

(ii) any information which is in the public domain (other than by virtue of a breach of this Contract).

"Support Services" means Support Services provided by Groundsure including, without limitation, interpreting third party and in-house environmental data, providing environmental support advice, undertaking environmental audits and assessments, Site investigation, Site monitoring and related items.

"Contract" means the contract between Groundsure and the Client for the provision of the Services, and which shall incorporate these terms and conditions, the Order, and the relevant User Guide.

"Third Party Data Provider" means any third party providing Third Party Content to Groundsure.

"Data Reports" means reports comprising factual data with no accompanying interpretation.

"Fees" has the meaning set out in clause 5.1.

"Groundsure" means Groundsure Limited, a company registered in England and Wales under number 03421028.

"Groundsure Materials" means all materials prepared by Groundsure and provided as part of the Services, including but not limited to Third Party Content, Data Reports, Mapping, and Risk Screening Reports.

"Intellectual Property" means any patent, copyright, design rights, trade or service mark, moral rights, data protection rights, know-how or trade mark in each case whether registered or not and including applications for the same or any other rights of a similar nature anywhere in the world.

"Mapping" means a map, map data or a combination of historical maps of various ages, time periods and scales.

"Order" means an electronic, written or other order form submitted by the Client requesting Services from Groundsure in respect of a specified Site.

"Ordnance Survey" means the Secretary of State for Business, Innovation and Skills, acting through Ordnance Survey, Adanac Drive, Southampton, SO16 0AS, UK.

"Order Website" means the online platform through which Orders may be placed by the Client and accepted by Groundsure.

"Report" means a Risk Screening Report or Data Report for Commercial or Residential property.

"Residential" means any building or property used as or intended to be used as a single dwelling.

"Risk Screening Report" means a risk screening report comprising factual data with an accompanying interpretation by Groundsure.

"Services" means any Report, Mapping and/or Support Services which Groundsure has agreed to provide by accepting an Order pursuant to clause 2.6.

"Site" means the area of land in respect of which the Client has requested Groundsure to provide the Services.

"Third Party Content" means data, database information or other information which is provided to Groundsure by a Third Party Data Provider.

"User Guide" means the user guide, as amended from time to time, available upon request from Groundsure and on the website (www.Groundsure.com) and forming part of this Contract.

2 Scope of Services, terms and conditions, requests for insurance and quotations

2.1 Groundsure agrees to provide the Services in accordance with the Contract.

2.2 Groundsure shall exercise reasonable skill and care in the provision of the Services.

2.3 Subject to clause 7.3 the Client acknowledges that it has not relied on any statement or representation made by or on behalf of Groundsure which is not set out and expressly agreed in writing in the Contract and all such statements and representations are hereby excluded to the fullest extent permitted by law.

2.4 The Client acknowledges that terms and conditions appearing on a Client's order form, printed stationery or other communication, or any terms or conditions implied by custom, practice or course of dealing shall be of no effect, and that this Contract shall prevail over all others in relation to the Order.

2.5 If the Client or Beneficiary requests insurance in conjunction with or as a result of the Services, Groundsure shall use reasonable endeavours to recommend such insurance, but makes no warranty that such insurance shall be available from insurers or that it will be offered on reasonable terms. Any insurance purchased by the Client or Beneficiary shall be subject solely to the terms of the policy issued by insurers and Groundsure will have no liability therefor. In addition you acknowledge and agree that Groundsure does not act as an agent or broker for any insurance providers. The Client should take (and ensure that the Beneficiary takes) independent advice to ensure that the insurance policy requested or offered is suitable for its requirements.

2.6 Groundsure's quotations or proposals are valid for a period of 30 days only unless an alternative period of time is explicitly stipulated by Groundsure. Groundsure reserves the right to withdraw any quotation or proposal at any time before an Order is accepted by Groundsure. Groundsure's acceptance of an Order shall be binding only when made in writing and signed by Groundsure's authorised representative or when accepted through the Order Website.

3 The Client's obligations

3.1The Client shall comply with the terms of this Contract and

(i) procure that the Beneficiary or any third party relying on the Services complies with and acts as if it is bound by the Contract and

(ii) be liable to Groundsure for the acts and omissions of the Beneficiary or any third party relying on the Services as if such acts and omissions were those of the Client.

3.2 The Client shall be solely responsible for ensuring that the Services are appropriate and suitable for its and/or the Beneficiary's needs.

3.3 The Client shall supply to Groundsure as soon as practicable and without charge all requisite information (and the Client warrants that such information is accurate, complete and appropriate), including without limitation any environmental information relating to the Site and shall give such assistance as Groundsure shall reasonably require in the provision of the Services including, without limitation, access to the Site, facilities and equipment.

3.4 Where the Client's approval or decision is required to enable Groundsure to carry out work in order to provide the Services, such approval or decision shall be given or procured in reasonable time and so as not to delay or disrupt the performance of the Services.

3.5 Save as expressly permitted by this Contract the Client shall not, and shall procure that the Beneficiary shall not, re-sell, alter, add to, or amend the Groundsure Materials, or use the Groundsure Materials in a manner for which they were not intended. The Client may make the Groundsure Materials available to a third party who is considering acquiring some or all of, or providing funding in relation to, the Site, but such third party cannot rely on the same unless expressly permitted under clause 4.

3.6 The Client is responsible for maintaining the confidentiality of its user name and password if using the Order Website and the Client acknowledges that Groundsure accepts no liability of any kind for any loss or damage suffered by the Client as a consequence of using the Order Website.

4 Reliance

4.1The Client acknowledges that the Services provided by Groundsure consist of the presentation and analysis of Third Party Content and other content and that information obtained from a Third Party Data Provider cannot be guaranteed or warranted by Groundsure to be reliable.

4.2 In respect of Data Reports, Mapping and Risk Screening Reports, the following classes of person and no other are entitled to rely on their contents;

(i) the Beneficiary,

(ii) the Beneficiary's professional advisers, (iii) any person providing funding to the Beneficiary in relation to the Site (whether directly or as part of a lending syndicate),

(iv) the first purchaser or first tenant of the Site, and

(v) the professional advisers and lenders of the first purchaser or tenant of the Site.

4.3 In respect of Support Services, only the Client, Beneficiary and parties expressly named in a Report and no other parties are entitled to rely on its contents.

4.4 Save as set out in clauses 4.2 and 4.3 and unless otherwise expressly agreed in writing, no other person or entity of any kind is entitled to rely on any Services or Report issued or provided by Groundsure. Any party considering such Reports and Services does so at their own risk.

5 Fees and Disbursements

5.1Groundsure shall charge and the Client shall pay fees at the rate and

frequency specified in the written proposal, Order Website or Order acknowledgement form, plus (in the case of Support Services) all proper disbursements incurred by Groundsure. The Client shall in addition pay all value added tax or other tax payable on such fees and disbursements in relation to the provision of the Services (together "Fees").

5.2 The Client shall pay all outstanding Fees to Groundsure in full without deduction, counterclaim or set off within 30 days of the date of Groundsure's invoice or such other period as may be agreed in writing between Groundsure and the Client ("Payment Date"). Interest on late payments will accrue on a daily basis from the Payment Date until the date of payment (whether before or after judgment) at the rate of 8% per annum.

5.3 The Client shall be deemed to have agreed the amount of any invoice unless an objection is made in writing within 28 days of the date of the invoice. As soon as reasonably practicable after being notified of an objection, without prejudice to clause 5.2 a member of Groundsure's management team will contact the Client and the parties shall then use all reasonable endeavours to resolve the dispute within 15 days.

6 Intellectual Property and Confidentiality

6.1 Subject to

(i) full payment of all relevant Fees and

(ii) compliance with this Contract, the Client is granted (and is permitted to sub-licence to the Beneficiary) a royalty-free, worldwide, non-assignable and (save to the extent set out in this Contract) non-transferable licence to make use of the Groundsure Materials.

6.2 All Intellectual Property in the Groundsure Materials are and shall remain owned by Groundsure or Groundsure's licensors (including without limitation the Third Party Data Providers) the Client acknowledges, and shall procure acknowledgement by the Beneficiary of, such ownership. Nothing in this Contract purports to transfer or assign any rights to the Client or the Beneficiary in respect of such Intellectual Property.

6.3 Third Party Data Providers may enforce any breach of clauses 6.1 and 6.2 against the Client or Beneficiary.

6.4 The Client shall, and shall procure that any recipients of the Groundsure Materials shall:

(i) not remove, suppress or modify any trade mark, copyright or other proprietary marking belonging to Groundsure or any third party from the Services;

(ii) use the information obtained as part of the Services in respect of the subject Site only, and shall not store or reuse any information obtained as part of the Services provided in respect of adjacent or nearby sites;

(iii) not create any product or report which is derived directly or indirectly from the Services (save that those acting in a professional capacity to the Beneficiary may provide advice based upon the Services);

(iv) not combine the Services with or incorporate such Services into any other information data or service;

(v) not reformat or otherwise change (whether by modification, addition or enhancement), the Services (save that those acting for the Beneficiary in a professional capacity shall not be in breach of this clause 6.4(v) where such reformatting is in the normal course of providing advice based upon the Services);

(vi) where a Report and/or Mapping contains material belonging to Ordnance Survey, acknowledge and agree that such content is protected by Crown Copyright and shall not use such content for any purpose outside of receiving the Services; and

(vii) not copy in whole or in part by any means any map prints or run-on copies containing content belonging to Ordnance Survey (other than that contained within Ordnance Survey's OS Street Map) without first being in possession of a valid Paper Map Copying Licence from Ordnance Survey,

6.5 Notwithstanding clause 6.4, the Client may make reasonable use of the Groundsure Materials in order to advise the Beneficiary in a professional capacity. However, Groundsure shall have no liability in respect of any advice, opinion or report given or provided to Beneficiaries by the Client.

6.6 The Client shall procure that any person to whom the Services are made available shall notify Groundsure of any request or requirement to disclose, publish or disseminate any information contained in the Services in accordance with the Freedom of Information Act 2000, the Environmental Information Regulations 2004 or any associated legislation or regulations in force from time to time.

7.Liability: Particular Attention Should Be Paid To This Clause

7.1 This Clause 7 sets out the entire liability of Groundsure, including any liability for the acts or omissions of its employees, agents, consultants, subcontractors and Third Party Content, in respect of:

(i) any breach of contract, including any deliberate breach of the Contract by Groundsure or its employees, agents or subcontractors;

(ii) any use made of the Reports, Services, Materials or any part of them; and

(iii) any representation, statement or tortious act or omission (including negligence) arising under or in connection with the Contract.

7.2 All warranties, conditions and other terms implied by statute or common law are, to the fullest extent permitted by law, excluded from the Contract.

7.3 Nothing in the Contract limits or excludes the liability of the Supplier for death or personal injury resulting from negligence, or for any damage or liability incurred by the Client or Beneficiary as a result of fraud or fraudulent misrepresentation.

7.4 Groundsure shall not be liable for

(i) loss of profits;

(ii) loss of business;

(iii) depletion of goodwill and/or similar losses;

(iv) loss of anticipated savings;

(v) loss of goods;

(vi) loss of contract;

(vii) loss of use;

(viii) loss or corruption of data or information;

(ix) business interruption;

(x) any kind of special, indirect, consequential or pure economic loss, costs, damages, charges or expenses;

(xi) loss or damage that arise as a result of the use of all or part of the Groundsure Materials in breach of the Contract;

(xii) loss or damage arising as a result of any error, omission or inaccuracy in any part of the Groundsure Materials where such error, omission or inaccuracy is caused by any Third Party Content or any reasonable interpretation of Third Party Content;

(xiii) loss or damage to a computer, software, modem, telephone or other property; and

(xiv) loss or damage caused by a delay or loss of use of Groundsure's internet ordering service.

7.5 Groundsure's total liability in relation to or under the Contract shall be limited to £10 million for any claim or claims.

7.6 Groundsure shall procure that the Beneficiary shall be bound by limitations and exclusions of liability in favour of Groundsure which accord with those detailed in clauses 7.4 and 7.5 (subject to clause 7.3) in respect of all claims which the Beneficiary may bring against Groundsure in relation to the Services or other matters arising pursuant to the Contract.

8 Groundsure's right to suspend or terminate

8.1 If Groundsure reasonably believes that the Client or Beneficiary has not provided the information or assistance required to enable the proper provision of the Services, Groundsure shall be entitled to suspend all further performance of the Services until such time as any such deficiency has been made good.

8.2 Groundsure shall be entitled to terminate the Contract immediately on written notice in the event that:

(i) the Client fails to pay any sum due to Groundsure within 30 days of the Payment Date; or

(ii) the Client (being an individual) has a bankruptcy order made against him or (being a company) shall enter into liquidation whether compulsory or voluntary or have an administration order made against it or if a receiver shall be appointed over the whole or any part of its property assets or undertaking or if the Client is struck off the Register of Companies or dissolved; or

(iii) the Client being a company is unable to pay its debts within the meaning of Section 123 of the Insolvency Act 1986 or being an individual appears unable to pay his debts within the meaning of Section 268 of the Insolvency Act 1986 or if the Client shall enter into a composition or arrangement with the Client's creditors or shall suffer distress or execution to be levied on his goods; or

(iv) the Client or the Beneficiary breaches any term of the Contract (including, but not limited to, the obligations in clause 4) which is incapable of remedy or if remediable, is not remedied within five days of notice of the breach.

9. Client's Right to Terminate and Suspend

9.1 Subject to clause 10.1, the Client may at any time upon written notice terminate or suspend the provision of all or any of the Services.

9.2 In any event, where the Client is a consumer (and not a business) he/she hereby expressly acknowledges and agrees that:

(i) the supply of Services under this Contract (and therefore the performance of this Contract) commences immediately upon Groundsure's acceptance of the Order; and

(ii) the Reports and/or Mapping provided under this Contract are

(a) supplied to the Client's specification(s) and in any event

(b) by their nature cannot be returned.

10 Consequences of Withdrawal, Termination or Suspension

10.1 Upon termination of the Contract:

(i) Groundsure shall take steps to bring to an end the Services in an orderly manner, vacate any Site with all reasonable speed and shall deliver to the Client and/or Beneficiary any property of the Client and/or Beneficiary in Groundsure's possession or control; and

(ii) the Client shall pay to Groundsure all and any Fees payable in respect of the performance of the Services up to the date of termination or suspension. In respect of any Support Services provided, the Client shall also pay Groundsure any additional costs incurred in relation to the termination or suspension of the Contract.

11 Anti-Bribery

11.1 The Client warrants that it shall:

(i) comply with all applicable laws, statutes and regulations relating to anti-bribery and anti-corruption including but not limited to the Bribery Act 2010;

(ii) comply with such of Groundsure's anti-bribery and anti-corruption policies as are notified to the Client from time to time; and

(iii) promptly report to Groundsure any request or demand for any undue financial or other advantage of any kind received by or on behalf of the Client in connection with the performance of this Contract.

11.2 Breach of this Clause 11 shall be deemed a material breach of this Contract.

12 General

12.1 The Mapping contained in the Services is protected by Crown copyright and must not be used for any purpose other than as part of the Services or as specifically provided in the Contract.

12.2 The Client shall be permitted to make one copy only of each Report or Mapping Order. Thereafter the Client shall be entitled to make unlimited copies of the Report or Mapping Order only in accordance with an Ordnance Survey paper map copy license available through Groundsure.

12.3 Groundsure reserves the right to amend or vary this Contract. No amendment or variation to this Contract shall be valid unless signed by an authorised representative of Groundsure.

12.4 No failure on the part of Groundsure to exercise, and no delay in exercising, any right, power or provision under this Contract shall operate as a waiver thereof.

12.5 Save as expressly provided in this Contract, no person other than the persons set out therein shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of the Contract.

12.6 The Secretary of State for Business, Innovation and Skills ("BIS") or BIS' successor body, as the case may be, acting through Ordnance Survey may enforce a breach of clause 6.4(vi) and clause 6.4(vii) of these terms and conditions against the Client in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999.

12.7 Groundsure shall not be liable to the Client if the provision of the Services is delayed or prevented by one or more of the following circumstances:

(i) the Client or Beneficiary's failure to provide facilities, access or information;

(ii) fire, storm, flood, tempest or epidemic;

(iii) Acts of God or the public enemy;

(iv) riot, civil commotion or war;

(v) strikes, labour disputes or industrial action;

(vi) acts or regulations of any governmental or other agency;

(vii) suspension or delay of services at public registries by Third Party Data Providers;

(viii) changes in law; or

(ix) any other reason beyond Groundsure's reasonable control.

In the event that Groundsure is prevented from performing the Services (or any part thereof) in accordance with this clause 12.6 for a period of not less than 30 days then Groundsure shall be entitled to terminate this Contract immediately on written notice to the Client.

12.8 Any notice provided shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post, facsimile or by email to the address, facsimile number or email address of the relevant party as may have been notified by each party to the other for such purpose or in the absence of such notification the last known address.

12.9 Such notice shall be deemed to have been received on the day of delivery if delivered by hand, facsimile or email (save to the extent such day is not a working day where it shall be deemed to have been delivered on the next working day) and on the second working day after the day of posting if sent by first class post.

12.10 The Contract constitutes the entire agreement between the parties and shall supersede all previous arrangements between the parties relating to the subject matter hereof.

12.11 Each of the provisions of the Contract is severable and distinct from the others and if one or more provisions is or should become invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions shall not in any way be tainted or impaired.

12.12 This Contract shall be governed by and construed in accordance with English law and any proceedings arising out of or connected with this Contract shall be subject to the exclusive jurisdiction of the English courts.

12.13 Groundsure is an executive member of the Council of Property Search Organisation (CoPSO) and has signed up to the Search Code administered by the Property Codes Compliance Board (PCCB). All Risk Screening Reports shall be supplied in accordance with the provisions of the Search Code.

12.14 If the Client or Beneficiary has a complaint about the Services, written notice should be given to the Compliance Officer at Groundsure who will respond in a timely manner.

12.15 The Client agrees that it shall, and shall procure that each Beneficiary shall, treat in confidence all Confidential Information and shall not, and shall procure that each Beneficiary shall not (i) disclose any Confidential Information to any third party other than in accordance with the terms of this Contract; and (ii) use Confidential Information for a purpose other than the exercise of its rights and obligations under this Contract. Subject to clause 6.6, nothing shall prevent the Client or any Beneficiary from disclosing Confidential Information to the extent required by law. **© Groundsure Limited June 2013**

EmapSite

Masdar House,
Eversley, RG27 0RP

Report Reference: EMS-329807_444293

Your Reference: EMS_329807_444293

Report Date 16 Oct 2015

Report Delivery Method: Email - pdf

Groundsure Geoinsight

Address: ,

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Geoinsight** as requested.

If you would like further assistance regarding this report then please contact the emapsite customer services team on 0118 9736883 quoting the above report reference number.

Yours faithfully,

emapsite customer services team

Enc.
Groundsure Geoinsight

Groundsure Geoinsight

Address:	,
Date:	16 Oct 2015
Reference:	EMS-329807_444293
Client:	EmapSite

NW N NE



W E

SW S SE

Aerial Photograph Capture date:	29-Aug-2005
Grid Reference:	519884,208397
Site Size:	86.78ha

Groundsure
LOCATION INTELLIGENCE

emapsite™

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Overview of Findings

The Groundsure Geoinsight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Shallow Mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and Groundsure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1:Geology		
1.1 Artificial Ground	1.1.1 Is there any Artificial Ground/ Made Ground present beneath the study site?	No
	1.1.2 Are there any records relating to permeability of artificial ground within the study site* boundary?	No
1.2 Superficial Geology and Landslips	1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?	Yes
	1.2.2 Are there any records relating to permeability of superficial geology within the study site boundary?	Yes
	1.2.3 Are there any records of landslip within 500m of the study site boundary?	No
	1.2.4 Are there any records relating to permeability of landslips within the study site boundary?	No
1.3 Bedrock, Solid Geology & Faults	1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	1.3.2 Are there any records relating to permeability of bedrock within the study site boundary?	Yes
	1.3.3 Are there any records of faults within 500m of the study site boundary?	No
1.4 Radon data	1.4.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level
	1.4.2 Is the property in an area where Radon Protection Measures are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary

Section 2:Ground Workings	On-site	0-50m	51-250	251-500	501-1000
2.1 Historical Surface Ground Working Features from Small Scale Mapping	11	5	9	Not Searched	Not Searched
2.2 Historical Underground Workings from Small Scale Mapping	0	0	0	0	2
2.3 Current Ground Workings	1	0	0	4	11

Section 3: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
3.1 Historical Mining	0	0	0	0	1
3.2 Coal Mining	0	0	0	0	0
3.3 Johnson Poole and Bloomer Mining Area	0	0	0	0	0
3.4 Non-Coal Mining	2	0	0	2	6
3.5 Non-Coal Mining Cavities	0	0	0	0	0
3.6 Natural Cavities	0	0	0	0	0
3.7 Brine Extraction	0	0	0	0	0
3.8 Gypsum Extraction	0	0	0	0	0
3.9 Tin Mining	0	0	0	0	0
3.10 Clay Mining	0	0	0	0	0

Section 4: Natural Ground Subsidence	On-site
4.1 Shrink Swell Clay	Low
4.2 Landslides	Low
4.3 Ground Dissolution of Soluble Rocks	Very Low
4.4 Compressible Deposits	Moderate
4.5 Collapsible Deposits	Very Low
4.6 Running Sand	Low

Section 5: Borehole Records	On-site	0-50m	51-250
5 BGS Recorded Boreholes	11	4	12

Section 6: Estimated Background Soil Chemistry	On-site	0-50m	51-250
6 Records of Background Soil Chemistry	18	1	14

Section 7: Railways and Tunnels	On-site	0-50m	51-250	251-500
7.1 Tunnels	0	0	0	Not Searched
7.2 Historical Railway and Tunnel Features	0	0	0	Not Searched
7.3 Historical Railways	0	0	0	Not Searched
7.4 Active Railways	0	0	0	Not Searched

Section 7: Railways and Tunnels	On-site	0-50m	51-250	251-500
7.5 Railway Projects	0	0	0	0

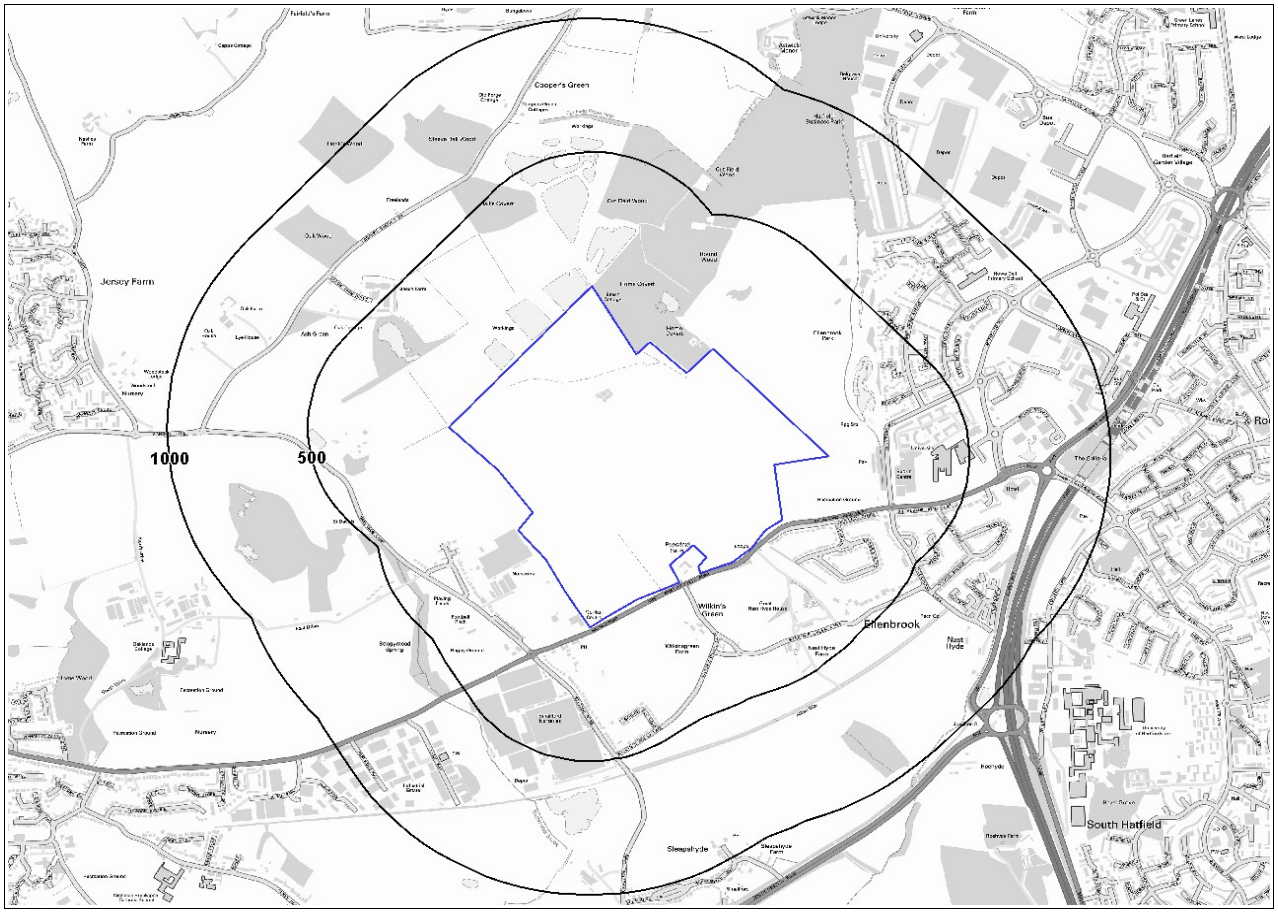
1 Geology

1.1 Artificial Ground Map

NW N NE

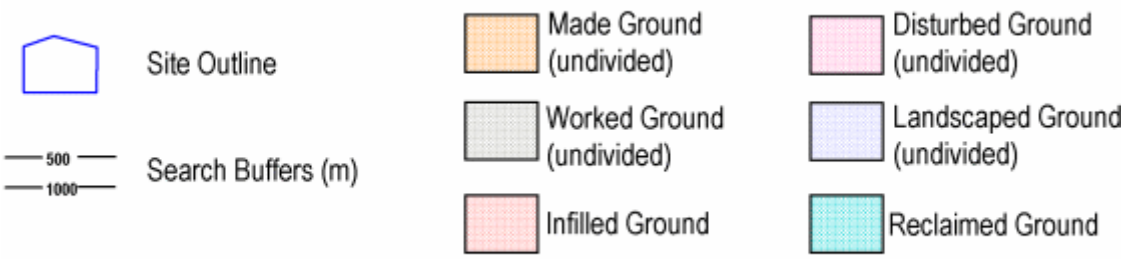
W E

SW S SE



Artificial Ground Legend

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1 Geology

1.1 Artificial Ground

1.1.1Artificial/ Made Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:239

Are there any records of Artificial/Made Ground within 500m of the study site boundary? No

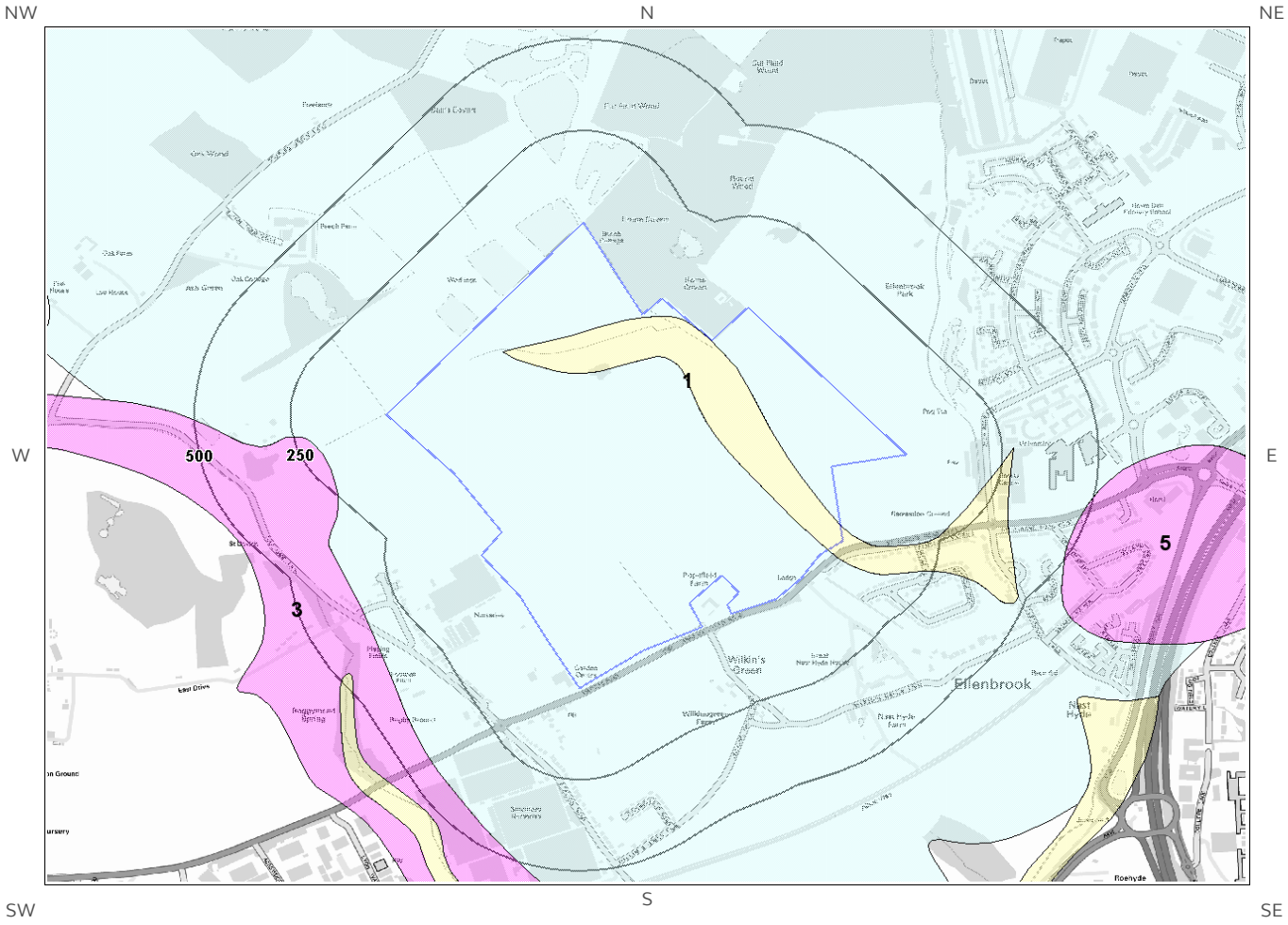
Database searched and no data found.

1.1.2 Permeability of Artificial Ground

Are there any records relating to permeability of artificial ground within the study site boundary? No

Database searched and no data found.

1.2 Superficial Deposits and Landslips Map



Superficial Deposits and Landslips Legend

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Site Outline

500
1000
Search Buffers (m)

1.2 Superficial Deposits and Landslips

1.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	LOFT	LOWESTOFT FORMATION	DIAMICTON
2	0.0	On Site	ALV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]
3	199.0	SW	KGCA	KESGRAVE CATCHMENT SUBGROUP	SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]
4A	470.0	SW	ALV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]
6A	470.0	SW	ALV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]
5	480.0	SE	KGCA	KESGRAVE CATCHMENT SUBGROUP	SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]

1.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site boundary? Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Mixed	Moderate	Low
0.0	On Site	Intergranular	High	Very Low
0.0	On Site	Intergranular	High	Very Low
0.0	On Site	Mixed	Moderate	Low

1.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary? No

Database searched and no data found.

This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.2.4 Landslip Permeability

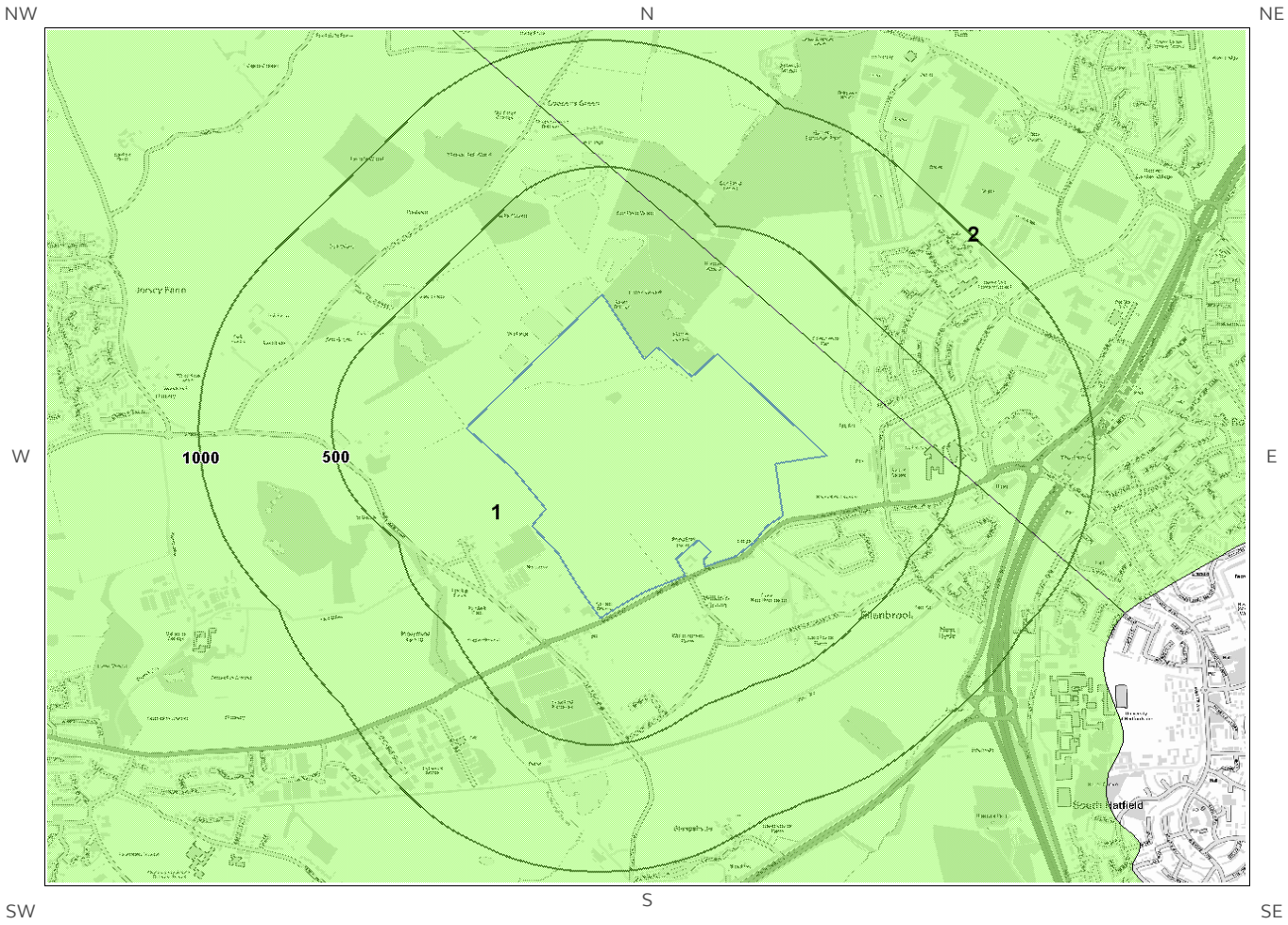
Are there any records relating to permeability of landslips within the study site* boundary? No

Database searched and no data found.

---

* This includes an automatically generated 50m buffer zone around the site

1.3 Bedrock and Faults Map



Bedrock and Faults Legend

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Site Outline

500
1000
Search Buffers (m)

1.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:239

1.3.1 Bedrock/ Solid Geology

Records of Bedrock/ Solid Geology within 500m of the study site boundary:

ID	Distance (m)	Direction	LEX Code	Description	Rock Age
1	0.0	On Site	LESE-CHLK	Lewes Nodular Chalk Formation And Seaford Chalk Formation (undifferentiated) - Chalk	Santonian / Turonian
2	273.0	NE	LESE-CHLK	Lewes Nodular Chalk Formation And Seaford Chalk Formation (undifferentiated) - Chalk	Santonian / Turonian

1.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site* boundary? Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Fracture	Very High	Very High
0.0	On Site	Fracture	Very High	Very High

1.3.3 Faults

Are there any records of Faults within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

* This includes an automatically generated 50m buffer zone around the site

1.4 Radon Data

1.4.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level

---

1.4.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary

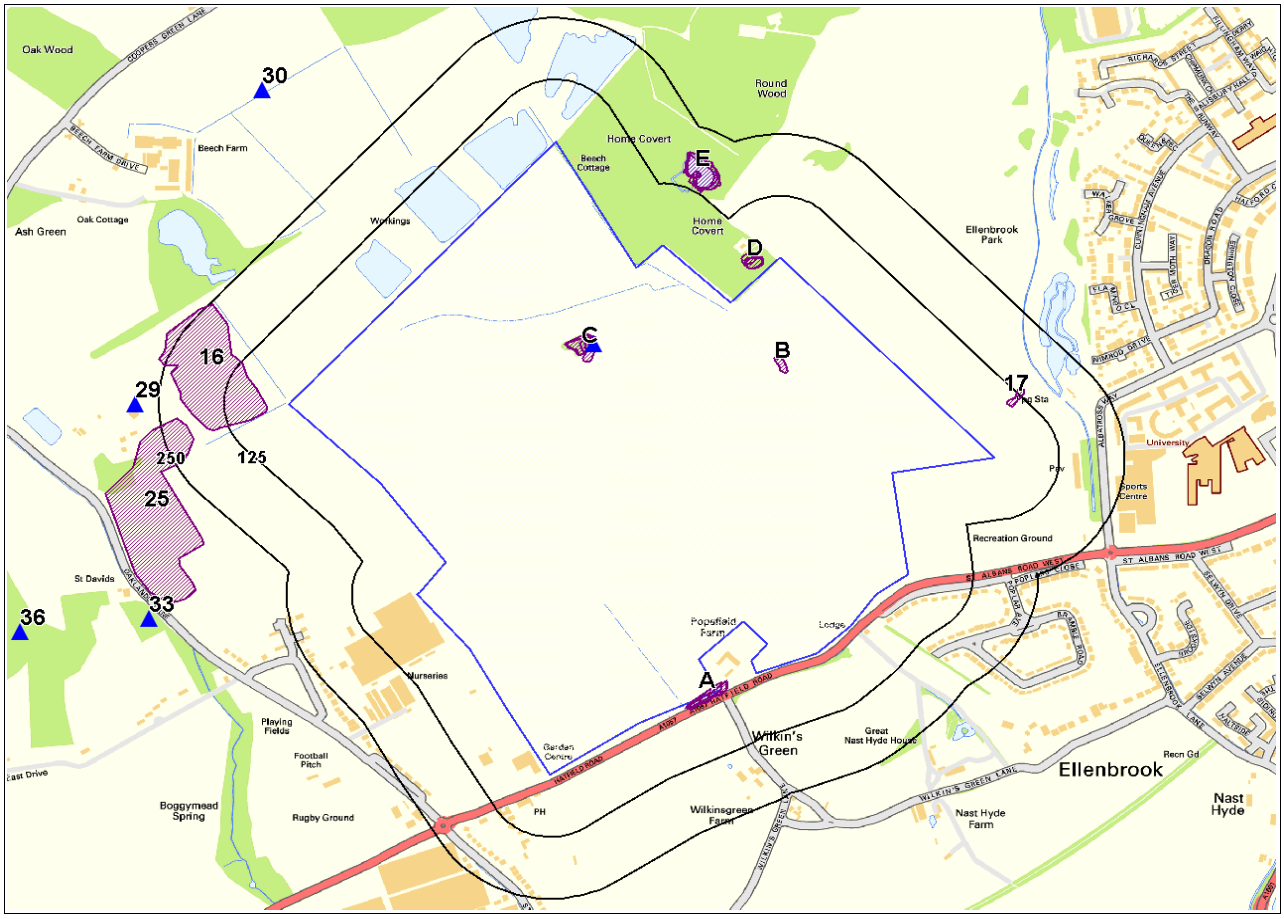
---

2 Ground Workings Map

NW N NE

W E

SW S SE



Ground Workings Legend

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Site Outline

125
250
Search Buffers (m)

Historic Surface Ground Workings

Historic Underground Workings

Current Ground Workings

2 Ground Workings

2.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on Groundsure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping.

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? Yes

The following Historical Surface Ground Working Features are provided by Groundsure:

ID	Distance (m)	Direction	NGR	Use	Date
1A	0.0	On Site	520031 207921	Pond	1988
2A	0.0	On Site	520031 207921	Pond	1973
3B	0.0	On Site	520179 208589	Pond	1938
4B	0.0	On Site	520179 208589	Pond	1879
5C	0.0	On Site	519811 208620	Refuse Heap	1922
6C	0.0	On Site	519795 208630	Ponds	1938
7C	0.0	On Site	519795 208631	Ponds	1955
8A	0.0	On Site	520038 207922	Pond	1938
9A	0.0	On Site	520038 207922	Pond	1879
10A	0.0	On Site	520041 207922	Pond	1922
11C	0.0	On Site	519814 208635	Gravel Pit	1896
12D	13.0	NW	520129 208796	Unspecified Pit	1938
13D	17.0	NW	520125 208795	Unspecified Pit	1973
14D	17.0	NW	520125 208795	Unspecified Pit	1955
15D	29.0	NW	520116 208803	Unspecified Pit	1988
16	43.0	W	519091 208585	Sand and Gravel Pit	1983
17	95.0	NE	520633 208525	Pond	1879
18E	130.0	NE	520027 208978	Pond	1879
19E	130.0	NE	520027 208978	Pond	1938
20E	131.0	NE	520028 208981	Pond	1955

ID	Distance (m)	Direction	NGR	Use	Date
21E	132.0	NE	520028 208979	Pond	1896
22E	132.0	NE	520028 208979	Pond	1922
23E	136.0	NE	520026 208982	Pond	1973
24E	136.0	NE	520026 208982	Pond	1988
25	196.0	W	518980 208295	Gravel Pit	1955

2.2 Historical Underground Working Features derived from Historical Mapping

This data is derived from the Groundsure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? Yes

The following Historical Underground Working Features are provided by Groundsure:

ID	Distance (m)	Direction	NGR	Use	Date
Not shown	866.0	E	521770 208808	Tunnel	1988
Not shown	994.0	S	519650 206668	Unspecified Workings	1976

2.3 Current Ground Workings

This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

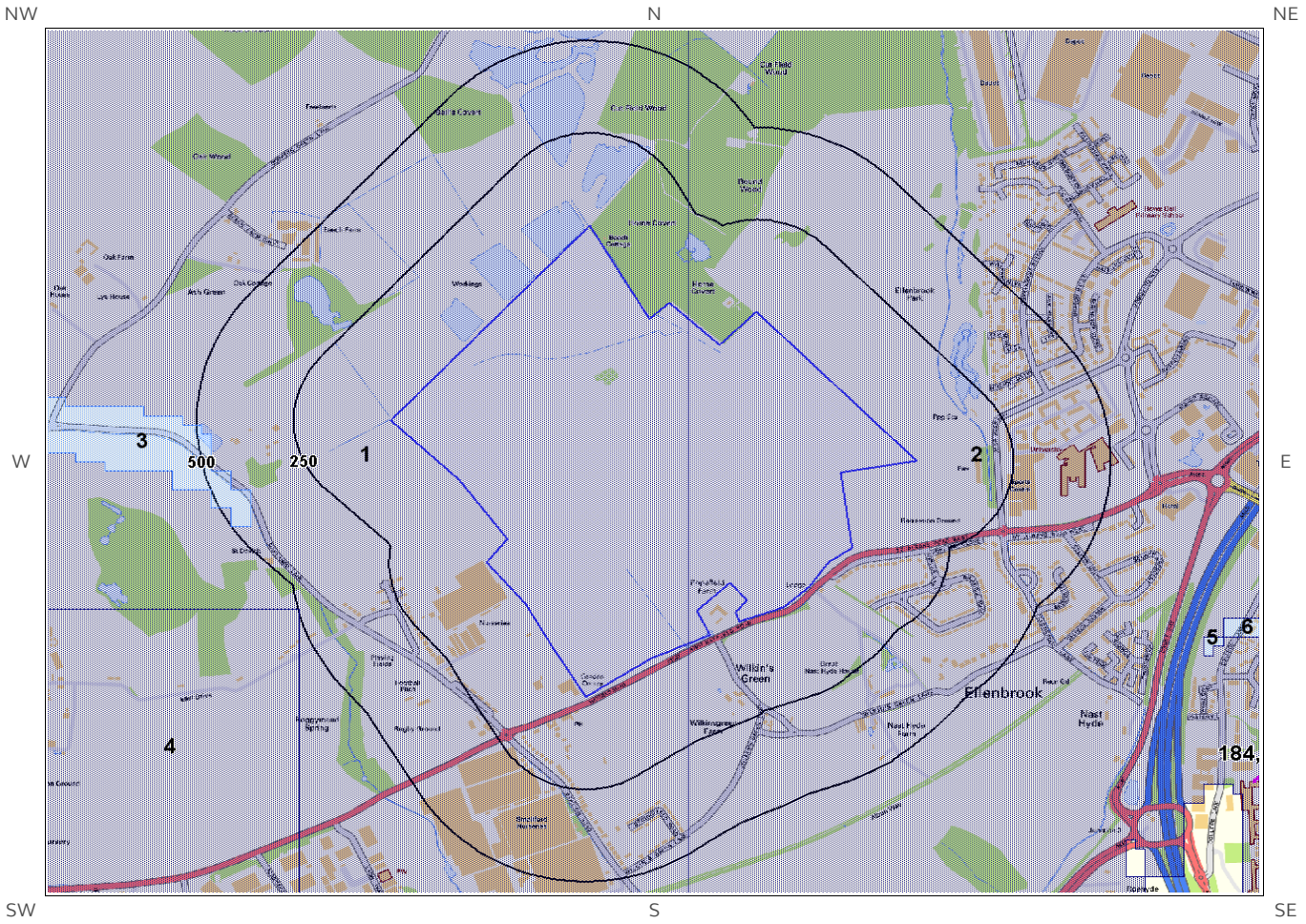
Are there any BGS Current Ground Workings within 1000m of the study site boundary? Yes

The following Current Ground Workings information is provided by British Geological Survey:

ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
28C	0.0	On Site	519819 208630	Sand & Gravel	Popefield Farm Gravel Pit	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
29	297.0	W	518940 208510	Sand & Gravel	Hatfield Quarry	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
30	478.0	NW	519184 209145	Sand & Gravel	Hatfield Quarry	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased

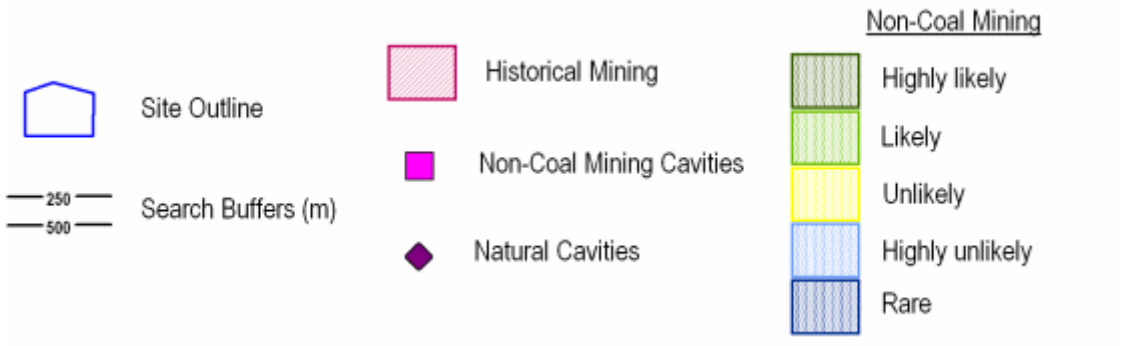
ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
Not shown	484.0	N	519618 209507	Sand & Gravel	Hatfield Quarry	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	486.0	NE	519943 209486	Sand & Gravel	Hatfield Quarry	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
33	503.0	SW	518968 208076	Sand & Gravel	Oaklands Gravel Pit	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	642.0	SW	518660 208229	Sand & Gravel	Hatfield Quarry	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	674.0	SW	518674 208141	Sand & Gravel	Oaklands Gravel Pits	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
36	693.0	SW	518720 208050	Sand & Gravel	Oaklands Gravel Pits	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	693.0	S	519778 207069	Sand & Gravel	Butterwick Farm Gravel Pit	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	755.0	S	519569 207025	Sand & Gravel	Butterwick Farm Gravel Pit	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	789.0	NE	520091 209751	Sand & Gravel	Hatfield Quarry	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	907.0	S	519740 206854	Clay & Shale	Smallford Lane Brick Works	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	919.0	SW	519221 207000	Sand & Gravel	Butterwick Farm Gravel Pit	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	940.0	N	519819 209978	Sand & Gravel	Hatfield Quarry	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	951.0	NW	519360 209910	Sand & Gravel	Hatfield	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased

3 Mining, Extraction & Natural Cavities Map



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Mining, Extraction and Natural Cavities Legend



3 Mining, Extraction & Natural Cavities

3.1 Historical Mining

This dataset is derived from Groundsure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? Yes

The following Historical Mining information is provided by Groundsure:

ID	Distance (m)	Direction	NGR	Details	Date
Not shown	994.0	S	519650 206668	Unspecified Workings	1976

3.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

3.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? No

The following information provided by JPB is not represented on mapping: Database searched and no data found.

3.4 Non-Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary? Yes

The following non-coal mining information is provided by the BGS:

ID	Distance (m)	Direction	Name	Commodity	Assessment of likelihood
1	0.0	On Site	Not available	Chalk	Occasional minor mining may have occurred but of restricted extent.
2	0.0	On Site	Not available	Chalk	Occasional minor mining may have occurred but of restricted extent.
3	407.0	SW	Not available	Chalk	Rare and localised small scale mining may have occurred.
4	498.0	W	Not available	Chalk	Occasional minor mining may have occurred but of restricted extent.
5	878.0	SE	Not available	Chalk	Rare and localised small scale mining may have occurred.
6	896.0	SE	Not available	Chalk	Rare and localised small scale mining may have occurred.
Not shown	912.0	W	Not available	Chalk	Rare and localised small scale mining may have occurred.
Not shown	959.0	N	Not available	Chalk	Occasional minor mining may have occurred but of restricted extent.
Not shown	980.0	NW	Not available	Chalk	Rare and localised small scale mining may have occurred.
Not shown	992.0	N	Not available	Chalk	Occasional minor mining may have occurred but of restricted extent.

3.5 Non-Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled “Review of mining instability in Great Britain, 1990” PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? No

Database searched and no data found.

3.6 Natural Cavities

This dataset provides information based on Peter Brett Associates natural cavities database.

Are there any Natural Cavities within 1000m of the study site boundary? No

Database searched and no data found.

3.7 Brine Extraction

This data provides information from the Coal Authority issued on behalf of the Cheshire Brine Subsidence Compensation Board.

Are there any Brine Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

3.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

3.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level.

Are there any Tin Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

3.10 Clay Mining

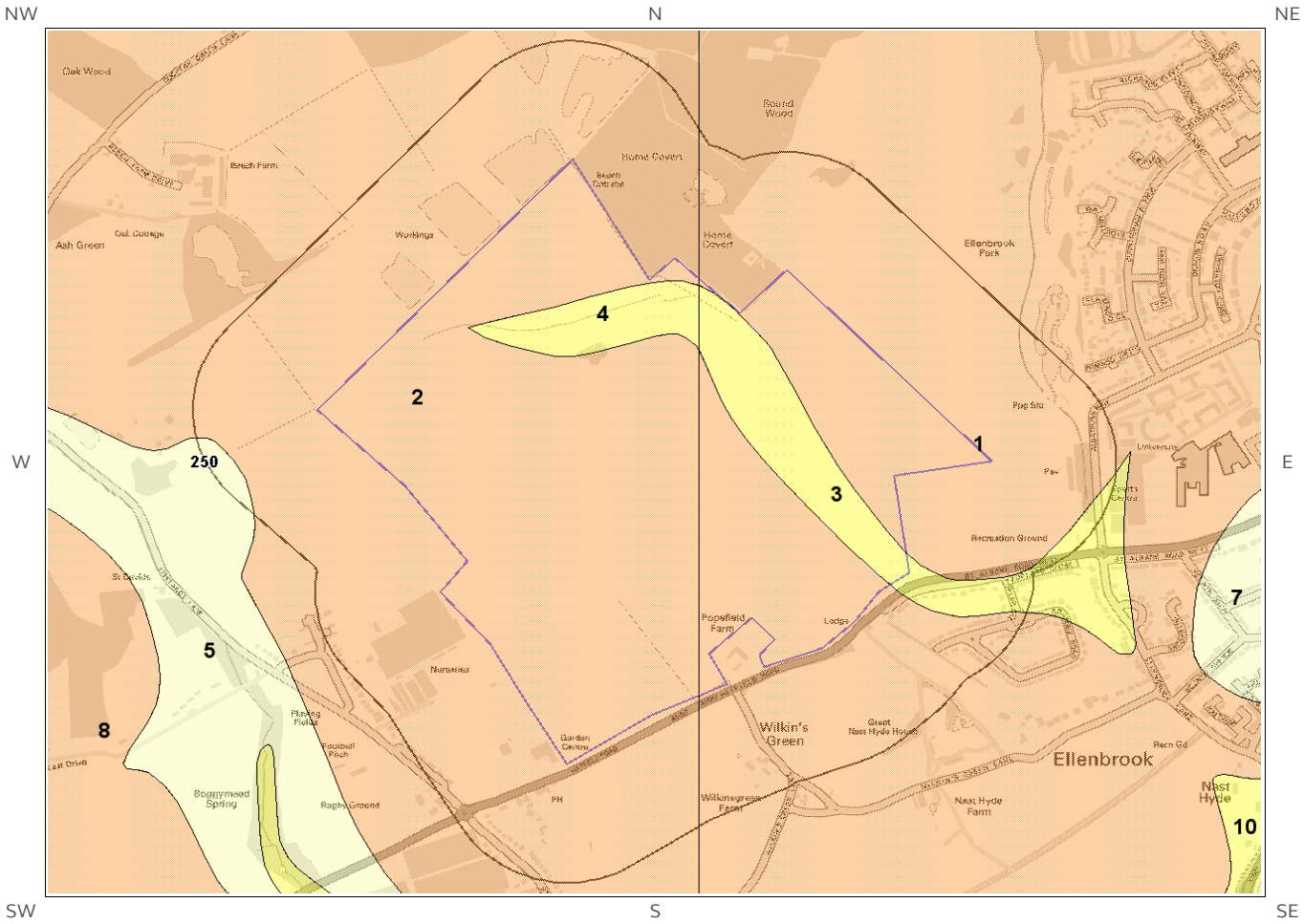
This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

4 Natural Ground Subsidence

4.1 Shrink-Swell Clay Map

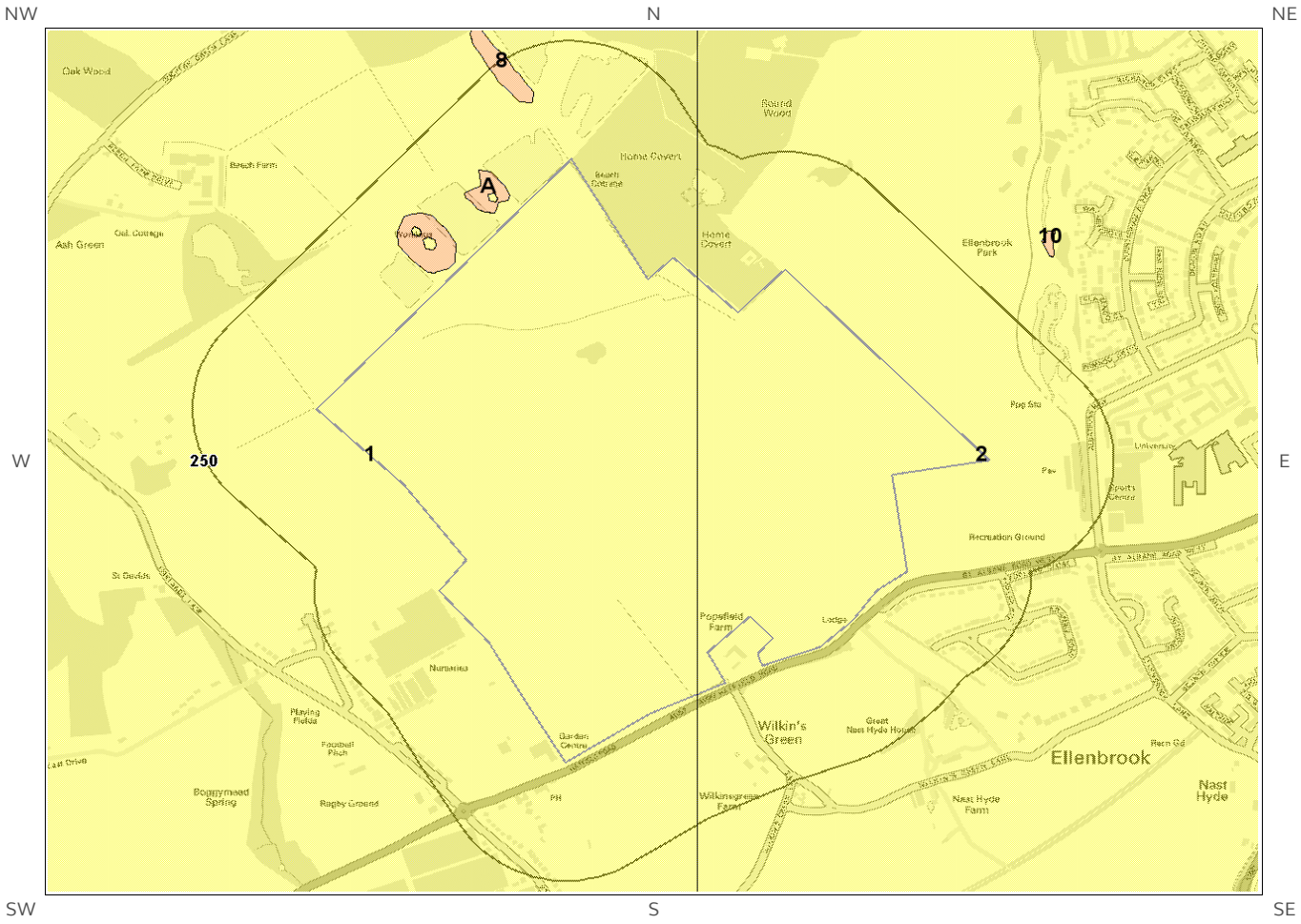


Shrink Swell Clay Legend

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4.2 Landslides Map



Landslides Legend

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Site Outline

125
250
Search Buffers (m)

No Data / Null

Negligible

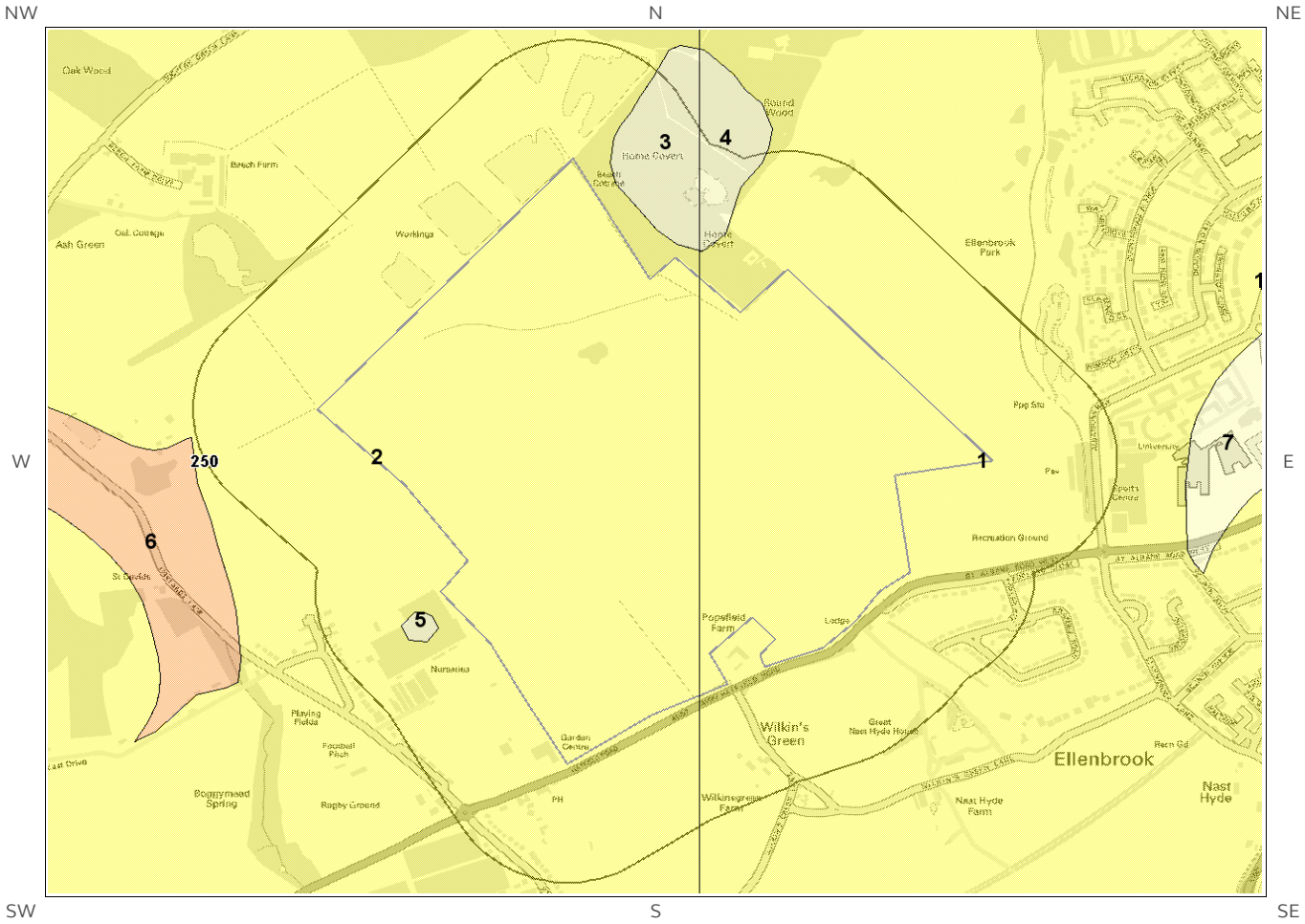
Very Low

Low

Moderate

High

4.3 Ground Dissolution Soluble Rocks Map

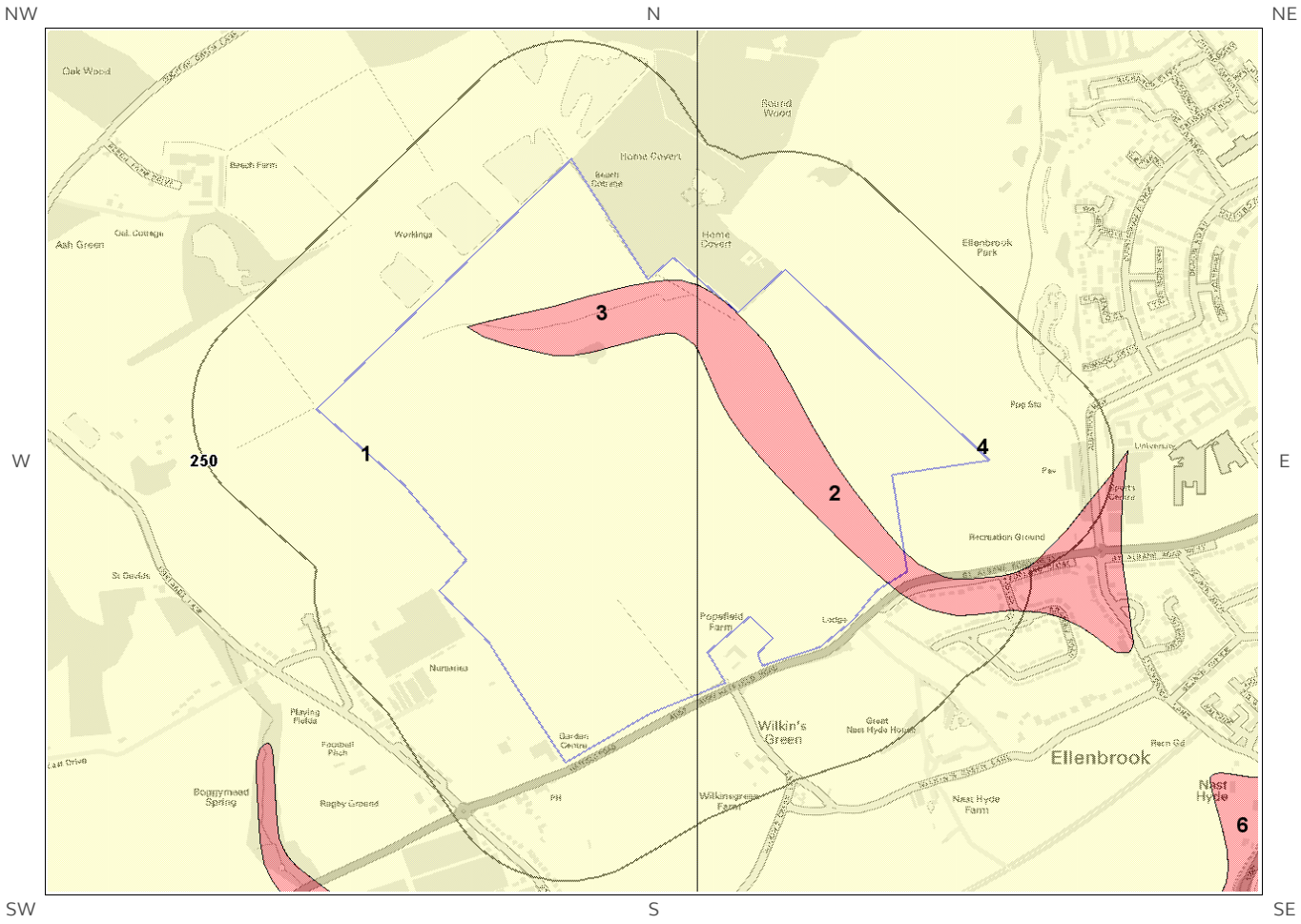


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Ground Dissolution Soluble Rocks Legend



4.4 Compressible Deposits Map



Compressible Deposits Legend

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Site Outline

125
250
Search Buffers (m)

No Data / Null

Negligible

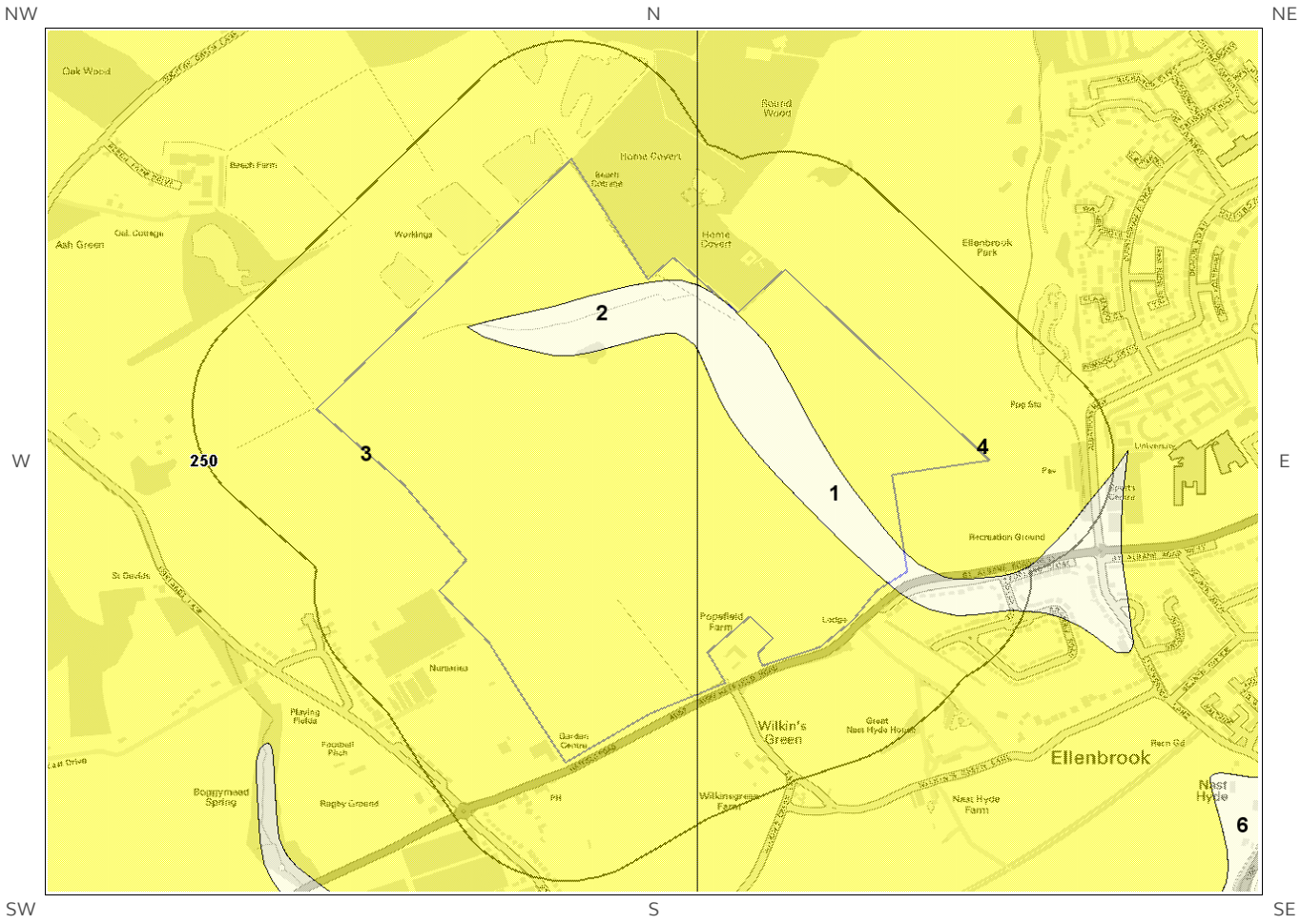
Very Low

Low

Moderate

High

4.5 Collapsible Deposits Map

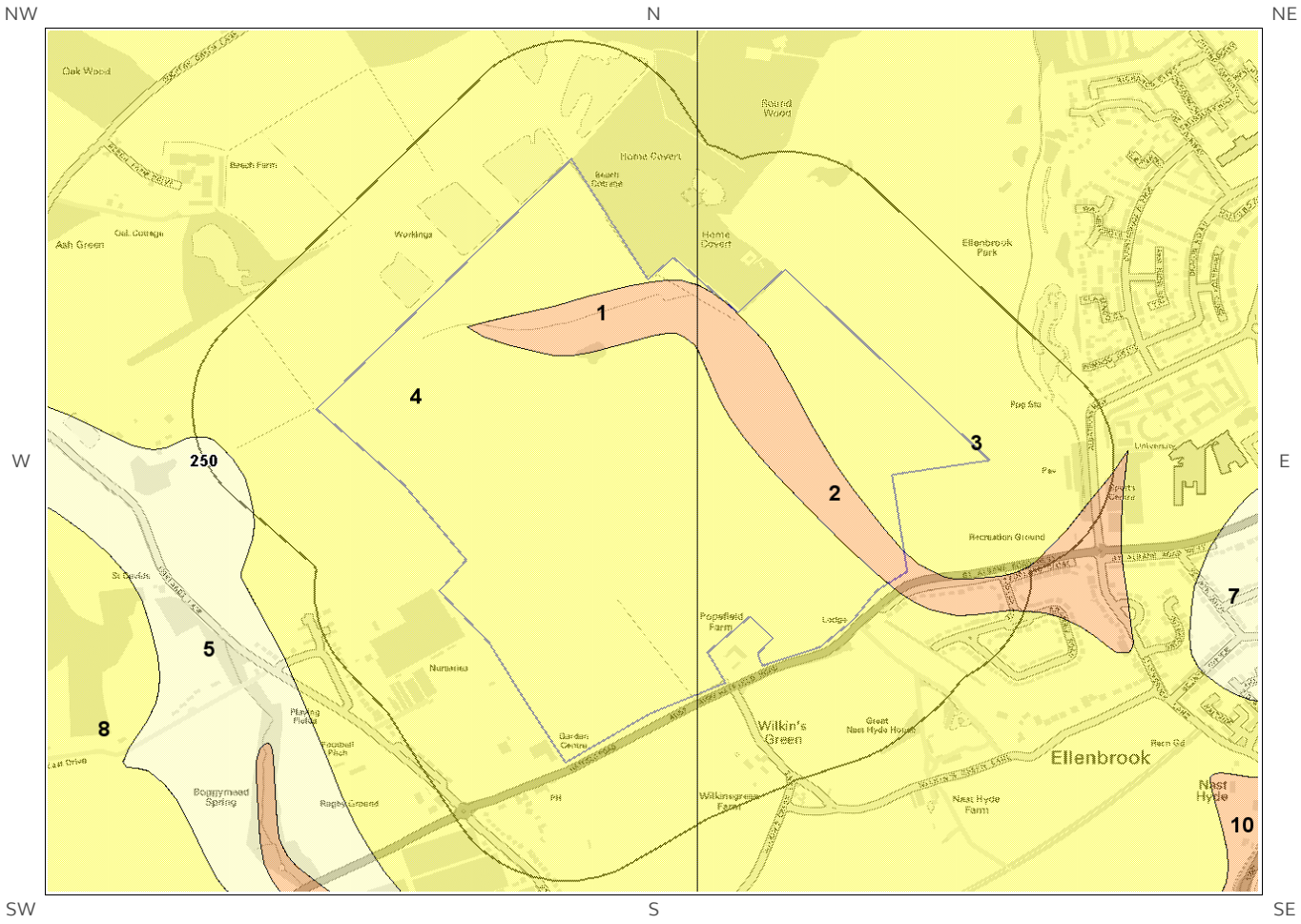


Collapsible Deposits Legend

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4.6 Running Sand Map



Running Sand Legend

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Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

4 Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS).

The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site*[*] boundary? Moderate

4.1 Shrink-Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Low	Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.
2	0.0	On Site	Low	Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.
3	0.0	On Site	Very Low	Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.
4	0.0	On Site	Very Low	Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.

4.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

* This includes an automatically generated 50m buffer zone around the site

ID	Distance (m)	Direction	Hazard Rating	Details
2	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.
3B	16.0	NW	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to the ground, such as drainage or excavations, take place. Possible increase in construction cost to reduce potential slope stability problems. For existing property, no significant increase in insurance risk due to natural slope instability problems.
4A	31.0	NW	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to the ground, such as drainage or excavations, take place. Possible increase in construction cost to reduce potential slope stability problems. For existing property, no significant increase in insurance risk due to natural slope instability problems.
5A	46.0	NW	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

4.3 Ground Dissolution of Soluble Rocks

The following Ground Dissolution information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Significant soluble rocks are present. Problems unlikely except with considerable surface or subsurface water flow. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, or increased construction costs are likely. An increase in financial risk due to potential problems with soluble rocks is unlikely.
2	0.0	On Site	Very Low	Significant soluble rocks are present. Problems unlikely except with considerable surface or subsurface water flow. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, or increased construction costs are likely. An increase in financial risk due to potential problems with soluble rocks is unlikely.
3	29.0	N	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.
4	43.0	NE	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.
5	48.0	SW	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

4.4 Compressible Deposits

The following Compressible Deposits information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for compressible ground identified. No special actions required to avoid problems due to compressible ground. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible ground.
2	0.0	On Site	Moderate	Significant potential for compressibility problems. Do not drain, load or de-water ground near the property without technical advice. For new build, consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Extra construction costs are likely. For existing property, possible increase in insurance risk from compressibility, especially if water conditions or loading of the ground change significantly.
3	0.0	On Site	Moderate	Significant potential for compressibility problems. Do not drain, load or de-water ground near the property without technical advice. For new build, consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Extra construction costs are likely. For existing property, possible increase in insurance risk from compressibility, especially if water conditions or loading of the ground change significantly.
4	0.0	On Site	Negligible	No indicators for compressible ground identified. No special actions required to avoid problems due to compressible ground. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible ground.

4.5 Collapsible Deposits

The following Collapsible Rocks information provided by the British Geological Survey:

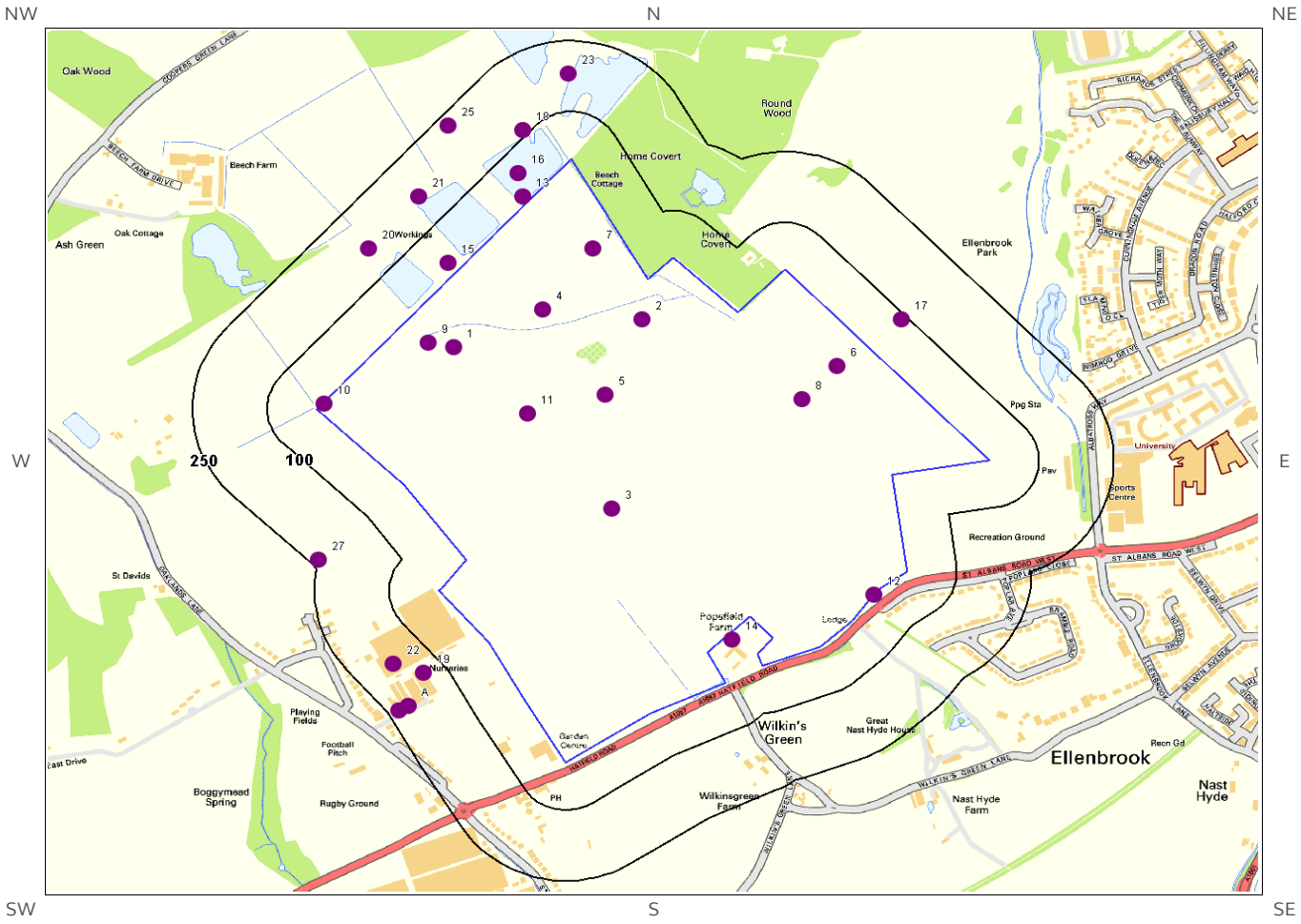
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
2	0.0	On Site	Negligible	No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
3	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
4	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

4.6 Running Sands

The following Running Sands information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Low	Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build, consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property, no significant increase in insurance risk due to running sand problems is likely.
2	0.0	On Site	Low	Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build, consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property, no significant increase in insurance risk due to running sand problems is likely.
3	0.0	On Site	Very Low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.
4	0.0	On Site	Very Low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

5 Borehole Records Map



Borehole Records Legend

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Site Outline

Borehole Locations

125
250
Search Buffers (m)

5 Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary: 27

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
1	0.0	On Site	519510 208640	TL10NE72	9.2	HATFIELD QUARRY ST.ALBANS NO.8A
2	0.0	On Site	519890 208700	TL10NE109	15.2	HATFIELD QUARRY ST.ALBANS NO.10A
3	0.0	On Site	519829 208299	TL10NE2	1.21	HATFIELD RUNWAY 12
4	0.0	On Site	519690 208720	TL10NE104	13.2	HATFIELD QUARRY ST.ALBANS NO.3A
5	0.0	On Site	519815 208539	TL10NE1	1.21	HATFIELD RUNWAY 11
6	0.0	On Site	520280 208600	TL20NW9	1.37	HATFIELD RUNWAY 9
7	0.0	On Site	519790 208850	TL10NE105	6.9	HATFIELD QUARRY ST.ALBANS NO.4A
8	0.0	On Site	520210 208530	TL20NW10	2.43	HATFIELD RUNWAY 10
9	0.0	On Site	519460 208650	TL10NE15	11.0	BEECH FARM COLNEY HEATH
10	0.0	On Site	519250 208520	TL10NE42	25.0	HATFIELD 2B
11	0.0	On Site	519660 208500	TL10NE108	16.7	HATFIELD QUARRY ST.ALBANS NO.9A
12	1.0	SE	520355 208115	TL20NW422	13.5	A1(M) ROESTOCK - STANBOROUGH 43
13	14.0	NW	519650 208960	TL10NE106	9.0	HATFIELD QUARRY ST.ALBANS NO.5A
14	14.0	SE	520070 208020	TL20NW12	15.1	POPEFIELD FARM COLNEY HEATH
15	25.0	NW	519500 208820	TL10NE103	11.6	HATFIELD QUARRY ST.ALBANS NO.2A
16	56.0	NW	519640 209010	TL10NE71	9.1	HATFIELD QUARRY ST.ALBANS NO.6A
17	88.0	NE	520410 208700	TL20NW8	3.35	HATFIELD RUNWAY 8
18	111.0	NW	519650 209100	TL10NE44	28.3	HATFIELD 4B
19	142.0	SW	519450 207950	TL10NE62	54.86	SMALLFORD
20	161.0	NW	519340 208850	TL10NE102	8.5	HATFIELD QUARRY ST.ALBANS NO.1A
21	165.0	NW	519440 208960	TL10NE43	23.6	HATFIELD 3B
22	173.0	SW	519390 207970	TL10NE36	42.67	RADIO NURSERIES SMALLFORD

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
23	179.0	N	519740 209220	TL10NE107	11.6	HATFIELD QUARRY ST.ALBANS NO.7A
24A	208.0	SW	519420 207880	TL10NE61	45.72	COLNEY HEATH NURSERIES
25	226.0	NW	519500 209110	TL10NE99	8.0	HATFIELD QUARRY ST.ALBANS NO.5
26A	231.0	SW	519400 207870	TL10NE35	45.72	CHESTER NURSERIES SMALLFORD
27	235.0	SW	519240 208190	TL10NE91	24.38	P.O.WIRELESS STATION SMALLFORD

The borehole records are available using the hyperlinks below: Please note that if the donor of the borehole record has requested the information be held as commercial-in-confidence, the additional data will be held separately by the BGS and a formal request must be made for its release.

#1: scans.bgs.ac.uk/sobi_scans/boreholes/527009
#2: scans.bgs.ac.uk/sobi_scans/boreholes/527046
#3: scans.bgs.ac.uk/sobi_scans/boreholes/526930
#4: scans.bgs.ac.uk/sobi_scans/boreholes/527041
#5: scans.bgs.ac.uk/sobi_scans/boreholes/526929
#6: scans.bgs.ac.uk/sobi_scans/boreholes/532463
#7: scans.bgs.ac.uk/sobi_scans/boreholes/527042
#8: scans.bgs.ac.uk/sobi_scans/boreholes/532464
#9: scans.bgs.ac.uk/sobi_scans/boreholes/526943
#10: scans.bgs.ac.uk/sobi_scans/boreholes/526979
#11: scans.bgs.ac.uk/sobi_scans/boreholes/527045
#12: scans.bgs.ac.uk/sobi_scans/boreholes/18059639
#13: scans.bgs.ac.uk/sobi_scans/boreholes/527043
#14: scans.bgs.ac.uk/sobi_scans/boreholes/532466
#15: scans.bgs.ac.uk/sobi_scans/boreholes/527040
#16: scans.bgs.ac.uk/sobi_scans/boreholes/527008
#17: scans.bgs.ac.uk/sobi_scans/boreholes/532462
#18: scans.bgs.ac.uk/sobi_scans/boreholes/526981
#19: scans.bgs.ac.uk/sobi_scans/boreholes/526999
#20: scans.bgs.ac.uk/sobi_scans/boreholes/527039
#21: scans.bgs.ac.uk/sobi_scans/boreholes/526980
#22: scans.bgs.ac.uk/sobi_scans/boreholes/526965
#23: scans.bgs.ac.uk/sobi_scans/boreholes/527044
#24A: scans.bgs.ac.uk/sobi_scans/boreholes/526998
#25: scans.bgs.ac.uk/sobi_scans/boreholes/527036
#26A: scans.bgs.ac.uk/sobi_scans/boreholes/526964
#27: scans.bgs.ac.uk/sobi_scans/boreholes/527028

6 Estimated Background Soil Chemistry

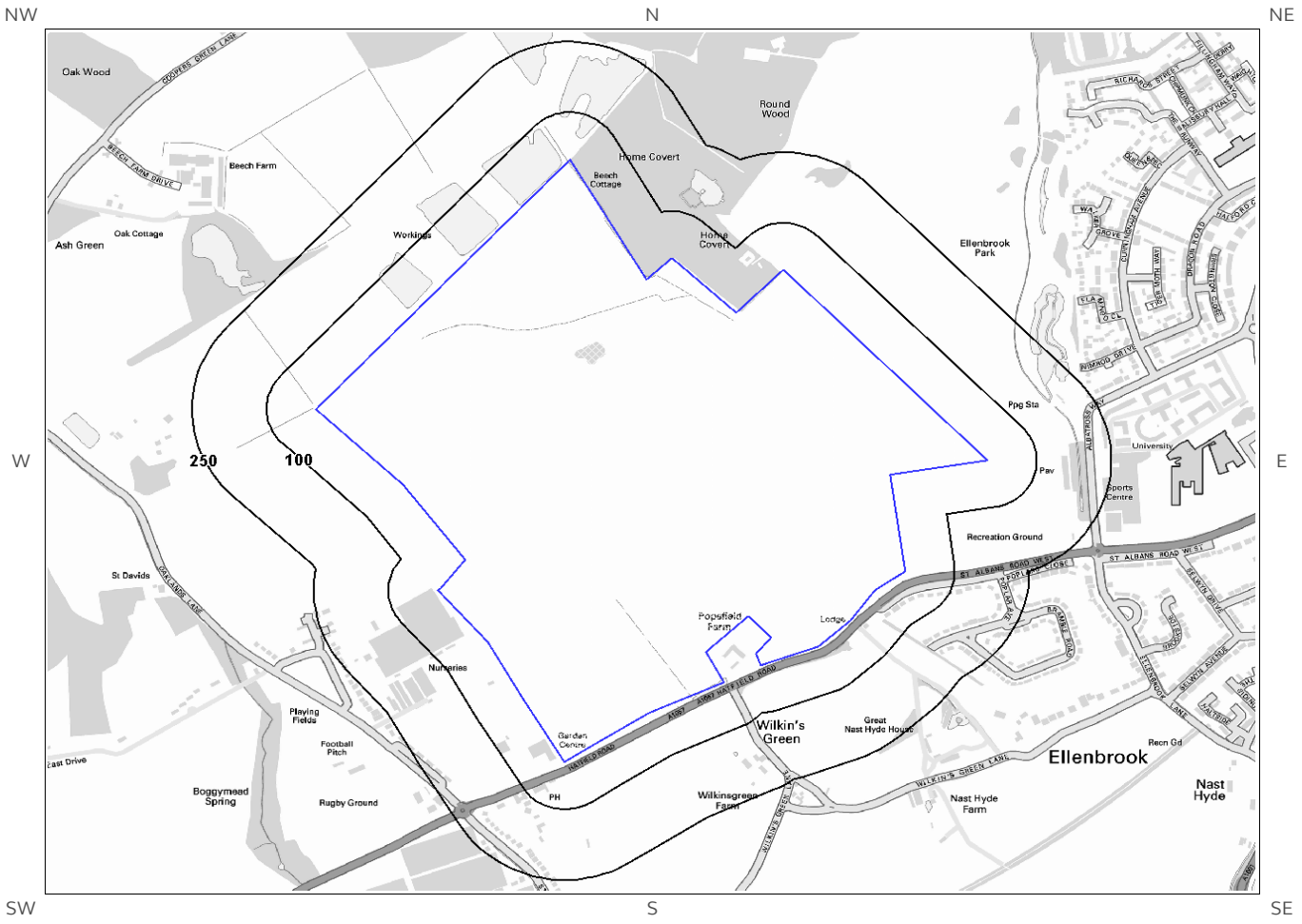
Records of background estimated soil chemistry within 250m of the study site boundary: 33

For further information on how this data is calculated and limitations upon its use, please see the Groundsure Geoinsight User Guide, available on request.

Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
9.0	NE	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
71.0	SW	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
71.0	SW	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
79.0	E	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	100 - 200 mg/kg
118.0	SE	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
150.0	NW	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
150.0	NW	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
176.0	N	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	200 - 300 mg/kg
176.0	N	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	200 - 300 mg/kg
181.0	SE	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
181.0	SE	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
199.0	SW	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
237.0	W	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
237.0	W	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
244.0	W	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg

*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.

7 Railways and Tunnels Map



Railways and Tunnels Legend

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- Site Outline
- 250 / 500 Search Buffers (m)
- Underground or Partially Underground Railway / Subway System
- Railway Tunnel (OS Mapping)
- Abandoned or Dismantled Railway (OpenStreetMap)
- Railway Track (OS Mapping)
- Railway Track (OpenStreetMap)
- High Speed 2
- Crossrail 1
- Railway and/or Tunnel Feature from Historical Mapping

7 Railways and Tunnels

7.1 Tunnels

This data is derived from OpenStreetMap and provides information on the possible locations of underground railway systems in the UK - the London Underground, the Tyne & Wear Metro and the Glasgow Subway.

Have any underground railway lines been identified within the study site boundary? No

Have any underground railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

This data is derived from Ordnance Survey mapping and provides information on the possible locations of railway tunnels forming part of the UK overground railway network.

Have any other railway tunnels been identified within the site boundary? No

Have any other railway tunnels been identified within 250m of the site boundary? No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

7.2 Historical Railway and Tunnel Features

This data is derived from Groundsure's unique Historical Land-use Database and contains features relating to tunnels, railway tracks or associated works that have been identified from historical Ordnance Survey mapping.

Have any historical railway or tunnel features been identified within the study site boundary? No

Have any historical railway or tunnel features been identified within 250m of the study site boundary? No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

7.3 Historical Railways

This data is derived from OpenStreetMap and provides information on the possible alignments of abandoned or dismantled railway lines in proximity to the study site.

Have any historical railway lines been identified within the study site boundary? No

Have any historical railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Note: multiple sections of the same track may be listed in the detail above

Any records that have been identified are represented on the Railways and Tunnels Map.

7.4 Active Railways

These datasets are derived from Ordnance Survey mapping and OpenStreetMap and provide information on the possible locations of active railway lines in proximity to the study site.

Have any active railway lines been identified within the study site boundary? No

Have any active railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Note: multiple sections of the same track may be listed in the detail above
Any records that have been identified are represented on the Railways and Tunnels Map.

7.5 Railway Projects

These datasets provide information on the location of large scale railway projects High Speed 2 and Crossrail 1 .

Is the study site within 5km of the route of the High Speed 2 rail project? No

Is the study site within 500m of the route of the Crossrail 1 rail project? No

*Further information on proximity to these routes, the project construction status and associated works can be obtained through the purchase of a **Groundsure HS2 and Crossrail 1 Report**.*

The route data has been digitised from publicly available maps by Groundsure. The route as provided relates to the Crossrail 1 project only, and does not include any details of the Crossrail 2 project, as final details of the route for Crossrail 2 are still under consultation.

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Web:**www.bgs.ac.uk**
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LE12 6HX

The Coal Authority

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Mansfield
Notts NG18 4RG
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DX 716176 Mansfield 5
www.coal.gov.uk

Public Health England

Public information access office
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133-155 Waterloo Road, London, SE1 8UG
https://www.gov.uk/government/organisations/public-health-england
Email: **enquiries@phe.gov.uk**
Main switchboard: 020 7654 8000

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Standard Terms and Conditions

1 Definitions

I**n these terms and conditions unless the context otherwise requires:**
"Beneficiary" means the person or entity for whose benefit the Client has obtained the Services.
"Client" means the party or parties entering into a Contract with Groundsure.
"Commercial" means any building or property which is not Residential.
"Confidential Information" means the contents of this Contract and all information received from the Client as a result of, or in connection with, this Contract other than
(i) information which the Client can prove was rightfully in its possession prior to disclosure by Groundsure and
(ii) any information which is in the public domain (other than by virtue of a breach of this Contract).
"Support Services" means Support Services provided by Groundsure including, without limitation, interpreting third party and in-house environmental data, providing environmental support advice, undertaking environmental audits and assessments, Site investigation, Site monitoring and related items.
"Contract" means the contract between Groundsure and the Client for the provision of the Services, and which shall incorporate these terms and conditions, the Order, and the relevant User Guide.
"Third Party Data Provider" means any third party providing Third Party Content to Groundsure.
"Data Reports" means reports comprising factual data with no accompanying interpretation.
"Fees" has the meaning set out in clause 5.1.
"Groundsure" means Groundsure Limited, a company registered in England and Wales under number 03421028.
"Groundsure Materials" means all materials prepared by Groundsure and provided as part of the Services, including but not limited to Third Party Content, Data Reports, Mapping, and Risk Screening Reports.
"Intellectual Property" means any patent, copyright, design rights, trade or service mark, moral rights, data protection rights, know-how or trade mark in each case whether registered or not and including applications for the same or any other rights of a similar nature anywhere in the world.
"Mapping" means a map, map data or a combination of historical maps of various ages, time periods and scales.
"Order" means an electronic, written or other order form submitted by the Client requesting Services from Groundsure in respect of a specified Site.
"Ordnance Survey" means the Secretary of State for Business, Innovation and Skills, acting through Ordnance Survey, Adanac Drive, Southampton, SO16 0AS, UK.
"Order Website" means the online platform through which Orders may be placed by the Client and accepted by Groundsure.
"Report" means a Risk Screening Report or Data Report for Commercial or Residential property.
"Residential" means any building or property used as or intended to be used as a single dwelling.
"Risk Screening Report" means a risk screening report comprising factual data with an accompanying interpretation by Groundsure.
"Services" means any Report, Mapping and/or Support Services which Groundsure has agreed to provide by accepting an Order pursuant to clause 2.6.
"Site" means the area of land in respect of which the Client has requested Groundsure to provide the Services.
"Third Party Content" means data, database information or other information which is provided to Groundsure by a Third Party Data Provider.
"User Guide" means the user guide, as amended from time to time, available upon request from Groundsure and on the website (www.Groundsure.com) and forming part of this Contract.

2 Scope of Services, terms and conditions, requests for insurance and quotations

2.1 Groundsure agrees to provide the Services in accordance with the Contract.
2.2 Groundsure shall exercise reasonable skill and care in the provision of the Services.
2.3 Subject to clause 7.3 the Client acknowledges that it has not relied on any statement or representation made by or on behalf of Groundsure which is not set out and expressly agreed in writing in the Contract and all such statements and representations are hereby excluded to the fullest extent permitted by law.
2.4 The Client acknowledges that terms and conditions appearing on a Client's order form, printed stationery or other communication, or any terms or conditions implied by custom, practice or course of dealing shall be of no effect, and that this Contract shall prevail over all others in relation to the Order.
2.5 If the Client or Beneficiary requests insurance in conjunction with or as a result of the Services, Groundsure shall use reasonable endeavours to recommend such insurance, but makes no warranty that such insurance shall be available from insurers or that it will be offered on reasonable terms. Any insurance purchased by the Client or Beneficiary shall be subject solely to the terms of the policy issued by insurers and Groundsure will have no liability therefor. In addition you acknowledge and agree that Groundsure does not act as an agent or broker for any insurance providers. The Client should take (and ensure that the Beneficiary takes) independent advice to ensure that the insurance policy requested or offered is suitable for its requirements.
2.6 Groundsure's quotations or proposals are valid for a period of 30 days only unless an alternative period of time is explicitly stipulated by Groundsure. Groundsure reserves the right to withdraw any quotation or proposal at any time before an Order is accepted by Groundsure. Groundsure's acceptance of an Order shall be binding only when made in writing and signed by Groundsure's authorised representative or when accepted through the Order Website.

3 The Client's obligations

3.1The Client shall comply with the terms of this Contract and
(i) procure that the Beneficiary or any third party relying on the Services complies with and acts as if it is bound by the Contract and
(ii) be liable to Groundsure for the acts and omissions of the Beneficiary or any third party relying on the Services as if such acts and omissions were those of the Client.
3.2 The Client shall be solely responsible for ensuring that the Services are appropriate and suitable for its and/or the Beneficiary's needs.
3.3 The Client shall supply to Groundsure as soon as practicable and without charge all requisite information (and the Client warrants that such information is accurate, complete and appropriate), including without limitation any environmental information relating to the Site and shall give such assistance as Groundsure shall reasonably require in the provision of the Services including, without limitation, access to the Site, facilities and equipment.
3.4 Where the Client's approval or decision is required to enable Groundsure to carry out work in order to provide the Services, such approval or decision shall be given or procured in reasonable time and so as not to delay or disrupt the performance of the Services.
3.5 Save as expressly permitted by this Contract the Client shall not, and shall procure that the Beneficiary shall not, re-sell, alter, add to, or amend the Groundsure Materials, or use the Groundsure Materials in a manner for which they were not intended. The Client may make the Groundsure Materials available to a third party who is considering acquiring some or all of, or providing funding in relation to, the Site, but such third party cannot rely on the same unless expressly permitted under clause 4.
3.6 The Client is responsible for maintaining the confidentiality of its user name and password if using the Order Website and the Client acknowledges that Groundsure accepts no liability of any kind for any loss or damage suffered by the Client as a consequence of using the Order Website.

4 Reliance

4.1The Client acknowledges that the Services provided by Groundsure consist of the presentation and analysis of Third Party Content and other content and that information obtained from a Third Party Data Provider cannot be guaranteed or warranted by Groundsure to be reliable.
4.2 In respect of Data Reports, Mapping and Risk Screening Reports, the following classes of person and no other are entitled to rely on their contents;
(i) the Beneficiary,
(ii) the Beneficiary's professional advisers, (iii) any person providing funding to the Beneficiary in relation to the Site (whether directly or as part of a lending syndicate),
(iv) the first purchaser or first tenant of the Site, and
(v) the professional advisers and lenders of the first purchaser or tenant of the Site.
4.3 In respect of Support Services, only the Client, Beneficiary and parties expressly named in a Report and no other parties are entitled to rely on its contents.
4.4 Save as set out in clauses 4.2 and 4.3 and unless otherwise expressly agreed in writing, no other person or entity of any kind is entitled to rely on any Services or Report issued or provided by Groundsure. Any party considering such Reports and Services does so at their own risk.

5 Fees and Disbursements

5.1Groundsure shall charge and the Client shall pay fees at the rate and frequency specified in the written proposal, Order Website or Order acknowledgement form, plus (in the case of Support Services) all proper disbursements incurred by Groundsure. The Client shall in addition pay all value added tax or other tax payable on such fees and disbursements in relation to the provision of the Services (together "Fees").
5.2 The Client shall pay all outstanding Fees to Groundsure in full without deduction, counterclaim or set off within 30 days of the date of Groundsure's invoice or such other period as may be agreed in writing between Groundsure and the Client ("Payment Date"). Interest on late payments will accrue on a daily basis from the Payment Date until the date of payment (whether before or after judgment) at the rate of 8% per annum.
5.3 The Client shall be deemed to have agreed the amount of any invoice unless an objection is made in writing within 28 days of the date of the invoice. As soon as reasonably practicable after being notified of an objection, without prejudice to clause 5.2 a member of Groundsure's management team will contact the Client and the parties shall then use all reasonable endeavours to resolve the dispute within 15 days.

6 Intellectual Property and Confidentiality

6.1 Subject to
(i) full payment of all relevant Fees and
(ii) compliance with this Contract, the Client is granted (and is permitted to sub-licence to the Beneficiary) a royalty-free, worldwide, non-assignable and (save to the extent set out in this Contract) non-transferable licence to make use of the Groundsure Materials.
6.2 All Intellectual Property in the Groundsure Materials are and shall remain owned by Groundsure or Groundsure's licensors (including without limitation the Third Party Data Providers) the Client acknowledges, and shall procure

acknowledgement by the Beneficiary of, such ownership. Nothing in this Contract purports to transfer or assign any rights to the Client or the Beneficiary in respect of such Intellectual Property.
6.3 Third Party Data Providers may enforce any breach of clauses 6.1 and 6.2 against the Client or Beneficiary.
6.4 The Client shall, and shall procure that any recipients of the Groundsure Materials shall:

(i) not remove, suppress or modify any trade mark, copyright or other proprietary marking belonging to Groundsure or any third party from the Services;

(ii) use the information obtained as part of the Services in respect of the subject Site only, and shall not store or reuse any information obtained as part of the Services provided in respect of adjacent or nearby sites;

(iii) not create any product or report which is derived directly or indirectly from the Services (save that those acting in a professional capacity to the Beneficiary may provide advice based upon the Services);

(iv) not combine the Services with or incorporate such Services into any other information data or service;

(v) not reformat or otherwise change (whether by modification, addition or enhancement), the Services (save that those acting for the Beneficiary in a professional capacity shall not be in breach of this clause 6.4(v) where such reformatting is in the normal course of providing advice based upon the Services);

(vi) where a Report and/or Mapping contains material belonging to Ordnance Survey, acknowledge and agree that such content is protected by Crown Copyright and shall not use such content for any purpose outside of receiving the Services; and

(vii) not copy in whole or in part by any means any map prints or run-on copies containing content belonging to Ordnance Survey (other than that contained within Ordnance Survey's OS Street Map) without first being in possession of a valid Paper Map Copying Licence from Ordnance Survey,

6.5 Notwithstanding clause 6.4, the Client may make reasonable use of the Groundsure Materials in order to advise the Beneficiary in a professional capacity. However, Groundsure shall have no liability in respect of any advice, opinion or report given or provided to Beneficiaries by the Client.
6.6 The Client shall procure that any person to whom the Services are made available shall notify Groundsure of any request or requirement to disclose, publish or disseminate any information contained in the Services in accordance with the Freedom of Information Act 2000, the Environmental Information Regulations 2004 or any associated legislation or regulations in force from time to time.

7.Liability: Particular Attention Should Be Paid To This Clause

7.1 This Clause 7 sets out the entire liability of Groundsure, including any liability for the acts or omissions of its employees, agents, consultants, subcontractors and Third Party Content, in respect of:

(i) any breach of contract, including any deliberate breach of the Contract by Groundsure or its employees, agents or subcontractors;

(ii) any use made of the Reports, Services, Materials or any part of them; and

(iii) any representation, statement or tortious act or omission (including negligence) arising under or in connection with the Contract.

7.2 All warranties, conditions and other terms implied by statute or common law are, to the fullest extent permitted by law, excluded from the Contract.
7.3 Nothing in the Contract limits or excludes the liability of the Supplier for death or personal injury resulting from negligence, or for any damage or liability incurred by the Client or Beneficiary as a result of fraud or fraudulent misrepresentation.
7.4 Groundsure shall not be liable for

(i) loss of profits;
(ii) loss of business;
(iii) depletion of goodwill and/or similar losses;
(iv) loss of anticipated savings;
(v) loss of goods;
(vi) loss of contract;
(vii) loss of use;
(viii) loss or corruption of data or information;
(ix) business interruption;
(x) any kind of special, indirect, consequential or pure economic loss, costs, damages, charges or expenses;
(xi) loss or damage that arise as a result of the use of all or part of the Groundsure Materials in breach of the Contract;
(xii) loss or damage arising as a result of any error, omission or inaccuracy in any part of the Groundsure Materials where such error, omission or inaccuracy is caused by any Third Party Content or any reasonable interpretation of Third Party Content;
(xiii) loss or damage to a computer, software, modem, telephone or other property; and
(xiv) loss or damage caused by a delay or loss of use of Groundsure's internet ordering service.

7.5 Groundsure's total liability in relation to or under the Contract shall be limited to £10 million for any claim or claims.
7.6 Groundsure shall procure that the Beneficiary shall be bound by limitations and exclusions of liability in favour of Groundsure which accord with those detailed in clauses 7.4 and 7.5 (subject to clause 7.3) in respect of all claims which the Beneficiary may bring against Groundsure in relation to the Services or other matters arising pursuant to the Contract.

8 Groundsure's right to suspend or terminate

8.1 If Groundsure reasonably believes that the Client or Beneficiary has not provided the information or assistance required to enable the proper provision of the Services, Groundsure shall be entitled to suspend all further performance of the Services until such time as any such deficiency has been made good.
8.2 Groundsure shall be entitled to terminate the Contract immediately on written notice in the event that:

(i) the Client fails to pay any sum due to Groundsure within 30 days of the Payment Date; or

(ii) the Client (being an individual) has a bankruptcy order made against him or (being a company) shall enter into liquidation whether compulsory or voluntary or have an administration order made against it or if a receiver shall be appointed over the whole or any part of its property assets or undertaking or if the Client is struck off the Register of Companies or dissolved; or

(iii) the Client being a company is unable to pay its debts within the meaning of Section 123 of the Insolvency Act 1986 or being an individual appears unable to pay his debts within the meaning of Section 268 of the Insolvency Act 1986 or if the Client shall enter into a composition or arrangement with the Client's creditors or shall suffer distress or execution to be levied on his goods; or

(iv) the Client or the Beneficiary breaches any term of the Contract (including, but not limited to, the obligations in clause 4) which is incapable of remedy or if remediable, is not remedied within five days of notice of the breach.

9. Client's Right to Terminate and Suspend

9.1 Subject to clause 10.1, the Client may at any time upon written notice terminate or suspend the provision of all or any of the Services.
9.2 In any event, where the Client is a consumer (and not a business) he/she hereby expressly acknowledges and agrees that:

(i) the supply of Services under this Contract (and therefore the performance of this Contract) commences immediately upon Groundsure's acceptance of the Order; and

(ii) the Reports and/or Mapping provided under this Contract are

(a) supplied to the Client's specification(s) and in any event
(b) by their nature cannot be returned.

10 Consequences of Withdrawal, Termination or Suspension

10.1 Upon termination of the Contract:

(i) Groundsure shall take steps to bring to an end the Services in an orderly manner, vacate any Site with all reasonable speed and shall deliver to the Client and/or Beneficiary any property of the Client and/or Beneficiary in Groundsure's possession or control; and

(ii) the Client shall pay to Groundsure all and any Fees payable in respect of the performance of the Services up to the date of termination or suspension. In respect of any Support Services provided, the Client shall also pay Groundsure any additional costs incurred in relation to the termination or suspension of the Contract.

11 Anti-Bribery

11.1 The Client warrants that it shall:

(i) comply with all applicable laws, statutes and regulations relating to anti-bribery and anti-corruption including but not limited to the Bribery Act 2010;

(ii) comply with such of Groundsure's anti-bribery and anti-corruption policies as are notified to the Client from time to time; and

(iii) promptly report to Groundsure any request or demand for any undue financial or other advantage of any kind received by or on behalf of the Client in connection with the performance of this Contract.

11.2 Breach of this Clause 11 shall be deemed a material breach of this Contract.

12 General

12.1 The Mapping contained in the Services is protected by Crown copyright and must not be used for any purpose other than as part of the Services or as specifically provided in the Contract.
12.2 The Client shall be permitted to make one copy only of each Report or Mapping Order. Thereafter the Client shall be entitled to make unlimited copies of the Report or Mapping Order only in accordance with an Ordnance Survey paper map copy license available through Groundsure.
12.3 Groundsure reserves the right to amend or vary this Contract. No amendment or variation to this Contract shall be valid unless signed by an authorised representative of Groundsure.
12.4 No failure on the part of Groundsure to exercise, and no delay in exercising, any right, power or provision under this Contract shall operate as a waiver thereof.
12.5 Save as expressly provided in this Contract, no person other than the persons set out therein shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of the Contract.
12.6 The Secretary of State for Business, Innovation and Skills ("BIS") or BIS' successor body, as the case may be, acting through Ordnance Survey may enforce a breach of clause 6.4(vi) and clause 6.4(vii) of these terms and conditions against the Client in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999.
12.7 Groundsure shall not be liable to the Client if the provision of the Services is delayed or prevented by one or more of the following circumstances:

(i) the Client or Beneficiary's failure to provide facilities, access or information;
(ii) fire, storm, flood, tempest or epidemic;
(iii) Acts of God or the public enemy;
(iv) riot, civil commotion or war;
(v) strikes, labour disputes or industrial action;
(vi) acts or regulations of any governmental or other agency;
(vii) suspension or delay of services at public registries by Third Party Data Providers;
(viii) changes in law; or
(ix) any other reason beyond Groundsure's reasonable control.

In the event that Groundsure is prevented from performing the Services (or any part thereof) in accordance with this clause 12.6 for a period of not less than 30 days then Groundsure shall be entitled to terminate this Contract immediately on written notice to the Client.

12.8 Any notice provided shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post, facsimile or by email to the address, facsimile number or email address of the relevant party as may have been notified by each party to the other for such purpose or in the absence of such notification the last known address.

12.9 Such notice shall be deemed to have been received on the day of delivery if delivered by hand, facsimile or email (save to the extent such day is not a working day where it shall be deemed to have been delivered on the next working day) and on the second working day after the day of posting if sent by first class post.

12.10 The Contract constitutes the entire agreement between the parties and shall supersede all previous arrangements between the parties relating to the subject matter hereof.

12.11 Each of the provisions of the Contract is severable and distinct from the others and if one or more provisions is or should become invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions shall not in any way be tainted or impaired.

12.12 This Contract shall be governed by and construed in accordance with English law and any proceedings arising out of or connected with this Contract shall be subject to the exclusive jurisdiction of the English courts.

12.13 Groundsure is an executive member of the Council of Property Search Organisation (CoPSO) and has signed up to the Search Code administered by the Property Codes Compliance Board (PCCB). All Risk Screening Reports shall be supplied in accordance with the provisions of the Search Code.

12.14 If the Client or Beneficiary has a complaint about the Services, written notice should be given to the Compliance Officer at Groundsure who will respond in a timely manner.

12.15 The Client agrees that it shall, and shall procure that each Beneficiary shall, treat in confidence all Confidential Information and shall not, and shall procure that each Beneficiary shall not (i) disclose any Confidential Information to any third party other than in accordance with the terms of this Contract; and (ii) use Confidential Information for a purpose other than the exercise of its rights and obligations under this Contract. Subject to clause 6.6, nothing shall prevent the Client or any Beneficiary from disclosing Confidential Information to the extent
required by law

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Borehole Number		DWS/Freshwater EQS	BH101																			
Screened Stratum			UMH										LMH									
Sampling Technique											Bailer			Bailer								Bailer
Date			28/08/13	25/11/13	04/02/14	07/05/14	04/06/14	28/10/14	23/01/15	28/04/15	21/07/15	18/10/15	04/09/13	25/11/13	04/02/14	07/05/14	04/06/14	02/07/14	28/10/14	23/01/15	28/04/15	21/07/15	18/10/15
-	Bromide	-	0.099	0.130	<0.05	0.150	0.203		0.080	0.077	0.105	0.113	0.120	<0.05	<0.05	0.006	0.172	0.170	0.106	0.153	0.104	0.127	0.267
	Bromate	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	0.0047	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Field Readings	Dissolved Oxygen (ppm)	-	0.6	1.0	2.4	1.4	0.9	3.3	3.9	4.1	2.3	-	5.7	-	5.3	4.3	3.3	3.1	7.2	5.9	8.8	3.2	-
	Electric Conductivity (ms/cm^5)	-	458	172	139	310	252	306	207	231	236	-	382	-	140	457	376	156	493	237	335	489	-
	pH	-	6.2	5.3	6.3	5.3	5.8	6.9	7.1	7.4	6.2	-	7.1	-	7.0	5.9	5.4	5.7	6.9	7.2	7.1	6.7	-
	ORP	-	80	247	159	119	202	138	222	137	210	-	45	-	102	122	298	228	137	219	178	216	-
Metals	Arsenic	0.01	<0.0009	0.0058	<0.0009	<0.0009	-	-	-	-	-	<0.0009	0.0069	0.0098	<0.0009	0.012	-	-	-	-	-	-	<0.0009
	Boron	1.0	0.025	0.04	0.029	0.034	-	-	-	-	-	0.044	0.039	0.038	0.027	0.023	-	-	-	-	-	-	0.08
	Cadmium	0.005	<0.00003	0.00013	0.000087	<0.00003	-	-	-	-	-	0.00023	<0.00003	0.00014	0.000033	<0.00003	-	-	-	-	-	-	0.00011
	Total Chromium	0.05	<0.0002	<0.0002	<0.0002	<0.0002	-	-	-	-	-	<0.0002	<0.0002	0.0022	<0.0002	<0.0002	-	-	-	-	-	-	0.0024
	Copper	2	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	0.0077	0.011	0.0031	<0.003	-	-	-	-	-	-	<0.003
	Total Iron	0.2	<0.0047	<0.0047	<0.0047	<0.0047	-	-	-	-	-	<0.0047	0.014	1.0	0.02	<0.0047	-	-	-	-	-	-	<0.0047
	Lead	0.01	<0.0004	0.0031	0.0015	<0.0004	-	-	-	-	-	0.0019	<0.0004	0.0093	0.0033	0.0031	-	-	-	-	-	-	0.0047
	Nickel	0.02	0.011	0.0087	0.0083	0.0043	-	-	-	-	-	0.0068	0.0047	0.0069	0.0016	0.00077	-	-	-	-	-	-	0.0024
	Selenium	0.01	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	-	<0.0012
	Vanadium	-	0.00068	<0.0006	0.0012	0.0015	-	-	-	-	-	<0.0006	0.0011	0.0052	0.001	<0.0006	-	-	-	-	-	-	<0.0006
	Zinc	0.05	0.0065	0.0081	0.0069	0.0032	-	-	-	-	-	0.0054	0.029	0.013	0.0072	0.0023	-	-	-	-	-	-	0.0023
	Mercury	0.001	0.000034	-	-	-	-	-	-	-	-	<0.0005	<0.00001	-	-	-	-	-	-	-	-	-	<0.0005
	Antimony	0.005	<0.002	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-
	Barium	-	0.027	-	-	-	-	-	-	-	-	-	0.039	-	-	-	-	-	-	-	-	-	-
	Beryllium	-	<0.0005	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-
	Cobalt	0.1	0.0055	-	-	-	-	-	-	-	-	-	0.0097	-	-	-	-	-	-	-	-	-	-
	Manganese	0.05	0.65	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-
	Molybdenum	-	<0.0002	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-	-	-
	Gold	-	<0.001	-	-	-	-	-	-	-	-	-	0.01		-	-	-	-	-	-	-	-	-
	Tellurium	-	<0.005	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-
	Thorium	-	<0.01	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-
	Titanium	-	<0.005	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-
	Uranium	-	<0.005	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-
Major Ions	Sodium	200	21	12	9.9	11	-	-	-	-	-	-	28	51	9.2	13	-	-	-	-	-	-	-
	Potassium	-	3.3	5.8	2.1	4.6	-	-	-	-	-	-	3.7	3.5	3.8	2	-	-	-	-	-	-	-
	Calcium	-	33	34	39	29	-	-	-	-	-	-	58	54	49	50	-	-	-	-	-	-	-
	Magnesium	-	5.6	5.2	6.7	4.6	-	-	-	-	-	-	4.9	5.4	3.3	6	-	-	-	-	-	-	-
	Chloride	250	11	17	11	9	-	-	-	-	-	24	16	16	8.2	10	-	-	-	-	-	-	30
	Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1	-	-	-	-	-	-	-	<1.0	<1.0	<1	-	-	-	-	-	-	-
	Bicarbonate Alkalinity as CaCO3	-	-	84	65	75	-	-	-	-	-	-	-	180	130	110	-	-	-	-	-	-	-
	Sulphate	250	53	45	66	28	-	-	-	-	-	57	44	72	32	58	-	-	-	-	-	-	55
-	Nitrate as NO_3	50	3.6	7.1	12	2.8	-	-	-	-	-	7.1	3.3	7.5	3.7	8.9	-	-	-	-	-	-	22
	Nitrite as NO_2	0.5	0.089	<0.02	<0.02	<0.02	-	-	-	-	-	-	0.066	<0.02	<0.02	<0.02	-	-	-	-	-	-	-
	Total Cyanide	0.05	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-
	Ammoniacal Nitrogen as NH_4	0.39	0.11	0.51	<0.03	<0.03	-	-	-	-	-	0.05	0.084	<0.03	<0.03	<0.03	-	-	-	-	-	-	0.05
	Total Alkalinity as CaCO3	-	-	84	65	75	-	-	-	-	-	-	-	180	130	110	-	-	-	-	-	-	-
	Total Organic Carbon	-	<2.0	4.6	2.4	5.8	-	-	-	-	-	-	4.8	7.1	7.6	5.1	-	-	-	-	-	-	-
	Total Suspended Solids	-	61	20	31	22	-	-	-	-	-	-	27	2000	34	60	-	-	-	-	-	-	-
	Organic Nitrogen	-	0.76	580	1.8	1.1	-	-	-	-	-	-	6.9	210	2.0	3.5	-	-	-	-	-	-	-
	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	-
	Chemical Oxygen Demand	-	<7.0	-	-	-	-	-	-	-	-	-	28	-	-	-	-	-	-	-	-	-	-

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit

	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

Borehole Number		DWS/Freshwater EQS	BH101											BH102									
Screened Stratum			CHALK											UMH									
Sampling Technique			Bailer								Bailer												Bailer
Date			28/08/13	25/11/13	04/02/14	07/05/14	04/06/14	02/07/14	28/10/14	23/01/15	28/04/15	21/07/15	16/10/15	28/08/13	25/11/13	03/02/14	07/05/14	04/06/14	28/10/14	23/01/15	28/04/15	21/07/15	07/10/15
-	Bromide	-	0.120	0.110	0.098	0.066	0.158	0.150	0.148	0.064	0.142	0.136	0.145	0.096	0.079	0.074	0.072	0.147		0.114	0.086	0.065	0.061
	Bromate	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005
Field Readings	Dissolved Oxygen (ppm)	-	1.6	-	4.5	3.5	3.6	5.0	6.4	4.5	7.1	4.6	-	6.0	5.1	6.6	5.0	5.0	6.3	4.1	10.2	4.8	1.0
	Electric Conductivity (ms/cm^2)	-	395	-	250	807	632	303	613	437	437	496	-	233	392	342	990	675	615	443	492	495	387
	pH	-	7.1	-	7.1	6.4	5.8	5.9	6.8	7.1	7.1	6.9	-	6.9	6.6	6.9	6.4	6.2	6.5	6.9	7.1	6.5	6.7
	ORP	-	-11	-	146	132	202	135	135	211	198	201	-	22	118	109	95	154	145	226	224	221	-28
Metals	Arsenic	0.01	<0.0009	0.0088	0.0019	0.0031	-	-	-	-	-	-	<0.0009	<0.0009	0.0072	<0.0009	<0.009	-	-	-	-	-	<0.0025
	Boron	1.0	0.028	0.03	0.028	0.031	-	-	-	-	-	-	0.037	0.045	0.045	0.029	0.038	-	-	-	-	-	0.054
	Cadmium	0.005	<0.00003	<0.00003	<0.00003	0.000079	-	-	-	-	-	-	0.00012	<0.00003	<0.00003	<0.00003	0.000079	-	-	-	-	-	<0.0005
	Total Chromium	0.05	<0.0002	<0.0002	<0.0002	0.00057	-	-	-	-	-	-	0.0063	<0.0002	0.00031	0.00048	<0.0002	-	-	-	-	-	0.0071
	Copper	2	<0.003	<0.003	<0.003	<0.03	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.007
	Total Iron	0.2	<0.0047	<0.0047	0.0062	<0.0047	-	-	-	-	-	-	<0.0047	<0.0047	0.013	0.015	0.33	-	-	-	-	-	-
	Lead	0.01	<0.0004	0.0062	0.0043	0.0067	-	-	-	-	-	-	0.0057	0.00082	0.0033	0.004	0.0032	-	-	-	-	-	<0.005
	Nickel	0.02	0.00043	0.0017	0.00027	<0.0002	-	-	-	-	-	-	<0.0002	0.0098	0.011	0.075	0.0081	-	-	-	-	-	0.009
	Selenium	0.01	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	<0.003
	Vanadium	-	0.00075	0.0015	0.0016	0.0008	-	-	-	-	-	-	<0.0006	0.00064	<0.0006	0.001	0.0015	-	-	-	-	-	-
	Zinc	0.05	0.0027	0.013	0.0051	<0.0015	-	-	-	-	-	-	0.0024	0.012	0.12	0.2	0.016	-	-	-	-	-	0.009
	Mercury	0.001	0.000019	-	-	-	-	-	-	-	-	-	<0.0005	0.000097	-	-	-	-	-	-	-	-	<0.001
	Antimony	0.005	<0.002	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-
	Barium	-	0.04	-	-	-	-	-	-	-	-	-	-	0.035	-	-	-	-	-	-	-	-	-
	Beryllium	-	<0.0005	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-
	Cobalt	0.1	<0.0001	-	-	-	-	-	-	-	-	-	-	0.0062	-	-	-	-	-	-	-	-	-
	Manganese	0.05	0.24	-	-	-	-	-	-	-	-	-	-	0.062	-	-	-	-	-	-	-	-	-
	Molybdenum	-	<0.0002	-	-	-	-	-	-	-	-	-	-	0.00024	-	-	-	-	-	-	-	-	-
	Gold	-	<0.001	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Tellurium	-	<0.005	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Thorium	-	<0.01	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-
	Titanium	-	<0.005	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Uranium	-	<0.005	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
Major Ions	Sodium	200	25	18	8.1	9.7	-	-	-	-	-	-	-	23	12	24	24	-	-	-	-	-	-
	Potassium	-	1.7	1.8	2.1	1.1	-	-	-	-	-	-	-	3.2	3.3	2.9	2.8	-	-	-	-	-	-
	Calcium	-	96	92	100	120	-	-	-	-	-	-	-	120	110	110	110	-	-	-	-	-	-
	Magnesium	-	3.8	4.6	2.9	2.7	-	-	-	-	-	-	-	16	12	14	16	-	-	-	-	-	-
	Chloride	250	26	21	22	28	-	-	-	-	-	-	28	42	31	37	61	-	-	-	-	-	31
	Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1	-	-	-	-	-	-	-	-	<1.0	<1.0	<1	-	-	-	-	-	-
	Bicarbonate Alkalinity as CaCO3	-	-	300	280	240	-	-	-	-	-	-	-	-	180	170	150	-	-	-	-	-	-
	Sulphate	250	15	27	12	9.3	-	-	-	-	-	-	18	85	88	120	110	-	-	-	-	-	69
-	Nitrate as NO_3	50	17	14	20	28	-	-	-	-	-	-	26	53	58	53	62	-	-	-	-	-	89
	Nitrite as NO_2	0.5	0.79	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	0.43	<0.02	<0.02	<0.02	-	-	-	-	-	-
	Total Cyanide	0.05	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-
	Ammoniacal Nitrogen as NH_4	0.39	<0.03	2.1	<0.03	<0.03	-	-	-	-	-	-	<0.03	<0.03	0.085	<0.03	0.05	-	-	-	-	-	0.05
	Total Alkalinity as CaCO3	-	-	300	280	240	-	-	-	-	-	-	-	-	180	170	150	-	-	-	-	-	-
	Total Organic Carbon	-	<2.0	5.2	2.3	<2	-	-	-	-	-	-	-	<2.0	4.7	<2.0	3.7	-	-	-	-	-	-
	Total Suspended Solids	-	140	280	160	250	-	-	-	-	-	-	-	250	23	31	34	-	-	-	-	-	-
	Organic Nitrogen	-	0.7	11	2.1	2.5	-	-	-	-	-	-	-	2.9	77	2.2	1.8	-	-	-	-	-	-
	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	-	-	-	-	-
	Chemical Oxygen Demand	-	<7.0	-	-	-	-	-	-	-	-	-	-	<7.0	-	-	-	-	-	-	-	-	-

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit

	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

Borehole Number		DWS/Freshwater EQS	BH102																		
Screened Stratum			LMH										CHALK								
Sampling Technique			Bailer			Bailer	Bailer				Bailer									Bailer	
Date			04/09/13	25/11/13	03/02/14	08/05/14	04/06/14	28/10/14	23/01/15	28/04/15	21/07/15	07/10/15	28/08/13	25/11/13	03/02/14	08/05/14	04/06/14	28/10/14	23/01/15	28/04/15	21/07/15	07/10/15
-	Bromide	-	0.090	0.100	0.062	0.130	0.130	0.117	0.091	0.118	0.120	0.097	0.055	0.100	0.100	0.076	0.142	0.069	0.083	0.083	0.076	0.075
	Bromate	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Field Readings	Dissolved Oxygen (ppm)	-	-	1.2	3.8	-	-	-	5.2	9.6	3.9	-	3.3	1.4	1.5	1.6	1.1	4.4	4.4	6.4	5.4	-
	Electric Conductivity (ms/cm^2)	-	-	551	354	-	-	-	560	224	594	-	449	465	371	483	851	9	525	503	563	-
	pH	-	-	6.8	6.9	-	-	-	7.0	6.9	6.4	7.0	7.5	7.6	7.0	6.3	6.9	6.4	7.0	7.3	6.9	7.3
	ORP	-	-	127	102	-	-	-	226	229	215	-	4	119	175	136	214	168	217	208	226	-
Metals	Arsenic	0.01	0.0026	0.012	<0.0009	<0.0009	-	-	-	-	-	<0.0025	<0.0009	0.0086	<0.0009	<0.0009	-	-	-	-	-	<0.0025
	Boron	1.0	0.046	0.047	0.035	0.035	-	-	-	-	-	0.048	0.026	0.04	0.049	0.047	-	-	-	-	-	0.033
	Cadmium	0.005	<0.00003	<0.00003	<0.00003	<0.00003	-	-	-	-	-	<0.0005	<0.00003	<0.00003	<0.00003	<0.00003	-	-	-	-	-	<0.0005
	Total Chromium	0.05	<0.0002	<0.0002	0.00052	0.00085	-	-	-	-	-	0.0027	<0.0002	<0.0002	<0.0002	0.0013	-	-	-	-	-	0.0061
	Copper	2	0.0068	<0.003	<0.003	<0.003	-	-	-	-	-	<0.007	<0.003	0.0031	<0.003	<0.003	-	-	-	-	-	<0.007
	Total Iron	0.2	<0.0047	0.04	0.025	0.0074	-	-	-	-	-	-	<0.0047	<0.0047	0.029	0.075	-	-	-	-	-	-
	Lead	0.01	<0.0004	0.0055	0.0046	0.0008	-	-	-	-	-	<0.005	0.00058	0.004	0.005	0.001	-	-	-	-	-	<0.005
	Nickel	0.02	0.022	0.031	0.014	0.0091	-	-	-	-	-	0.025	0.0043	0.017	0.025	0.036	-	-	-	-	-	0.006
	Selenium	0.01	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	<0.003
	Vanadium	-	<0.0006	0.0011	<0.0006	0.0039	-	-	-	-	-	-	0.0016	0.0024	0.0017	0.0042	-	-	-	-	-	-
	Zinc	0.05	0.0083	0.012	0.025	0.017	-	-	-	-	-	0.005	0.015	2.2	0.61	0.13	-	-	-	-	-	0.016
	Mercury	0.001	0.000049	-	-	-	-	-	-	-	-	<0.001	0.000044	-	-	-	-	-	-	-	-	<0.001
	Antimony	0.005	<0.002	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-
	Barium	-	0.045	-	-	-	-	-	-	-	-	-	0.043	-	-	-	-	-	-	-	-	-
	Beryllium	-	<0.0005	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-
	Cobalt	0.1	0.011	-	-	-	-	-	-	-	-	-	0.0017	-	-	-	-	-	-	-	-	-
	Manganese	0.05	0.093	-	-	-	-	-	-	-	-	-	0.053	-	-	-	-	-	-	-	-	-
	Molybdenum	-	<0.0002	-	-	-	-	-	-	-	-	-	0.0012	-	-	-	-	-	-	-	-	-
	Gold	-	<0.001	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Tellurium	-	0.007	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Thorium	-	<0.01	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-
	Titanium	-	<0.005	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Uranium	-	<0.005	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
Major Ions	Sodium	200	22	13	23	31	-	-	-	-	-	-	38	54	24	12	-	-	-	-	-	-
	Potassium	-	5.8	8.3	5.7	3.1	-	-	-	-	-	-	2.8	7.3	8.5	6.7	-	-	-	-	-	-
	Calcium	-	160	170	120	120	-	-	-	-	-	-	100	140	120	120	-	-	-	-	-	-
	Magnesium	-	16	17	12	15	-	-	-	-	-	-	6.4	14	12	12	-	-	-	-	-	-
	Chloride	250	37	38	31	54	-	-	-	-	-	34	23	31	30	27	-	-	-	-	-	22
	Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-
	Bicarbonate Alkalinity as CaCO3	-	-	290	210	330	-	-	-	-	-	-	-	350	420	250	-	-	-	-	-	-
	Sulphate	250	96	110	110	110	-	-	-	-	-	100	29	86	95	98	-	-	-	-	-	44
-	Nitrate as NO_3	50	93	120	49	62	-	-	-	-	-	66	40	75	49	41	-	-	-	-	-	36
	Nitrite as NO_2	0.5	2.7	<0.02	<0.02	<0.02	-	-	-	-	-	-	0.29	0.079	<0.02	<0.02	-	-	-	-	-	-
	Total Cyanide	0.05	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-
	Ammoniacal Nitrogen as NH_4	0.39	0.1	1.7	0.032	<0.03	-	-	-	-	-	0.07	0.053	0.76	0.07	0.21	-	-	-	-	-	0.04
	Total Alkalinity as CaCO3	-	-	290	210	330	-	-	-	-	-	-	-	350	420	250	-	-	-	-	-	-
	Total Organic Carbon	-	<2.0	6.5	<2.0	6.3	-	-	-	-	-	-	<2.0	6.9	<2.0	3.5	-	-	-	-	-	-
	Total Suspended Solids	-	1400	73	21	320	-	-	-	-	-	-	100	230	810	490	-	-	-	-	-	-
	Organic Nitrogen	-	8.7	4.4	1.7	4.8	-	-	-	-	-	-	1.1	28	1.8	1.5	-	-	-	-	-	-
	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	-	-	-	-	-
	Chemical Oxygen Demand	-	22	-	-	-	-	-	-	-	-	-	36	-	-	-	-	-	-	-	-	-

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit
	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

Borehole Number		DWS/Freshwater EQS	BH103																		
Screened Stratum			UMH										LMH								
Sampling Technique											Bailer										Bailer
Date			29/08/03	26/11/13	05/02/14	08/05/14	05/06/14	28/10/14	23/01/15	01/05/15	20/07/15	09/10/15	29/08/13	26/11/13	05/02/14	08/05/14	05/06/14	28/10/14	23/01/15	01/05/15	20/07/15	09/10/15
-	Bromide	-	0.053	<0.05	<0.05	<0.05	0.050		0.072	0.045	0.039	0.044	1.200	0.370	0.350	0.380	0.294	0.930	1.002	0.884	0.832	0.771
	Bromate	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Field Readings	Dissolved Oxygen (ppm)	-	0.7	0.9	5.3	5.2	5.7	4.8	7.0	11.5	6.4	0.5	0.4	0.4	0.6	1.3	1.1	4.1	3.9	2.6	3.8	-
	Electric Conductivity (ms/cm^2)	-	519	0	158	267	532	953	274	261	316	350	801	425	357	520	959	611	628	649	655	-
	pH	-	7.6	7.0	6.7	6.7	6.5	6.8	7.0	7.2	6.9	7.5	6.8	-	6.9	6.6	6.3	6.9	6.8	6.9	6.7	7.2
	ORP	-	-21	182	172	131	257	179	221	168	218	-64	-13	136	135	147	236	152	233	210	235	-
Metals	Arsenic	0.01	<0.0009	0.0079	<0.0009	0.001	-	-	-	-	-	<0.0025	<0.0009	<0.0009	<0.0009	<0.009	-	-	-	-	-	<0.0025
	Boron	1.0	0.0078	0.015	0.02	0.022	-	-	-	-	-	0.025	0.31	0.089	0.11	0.098	-	-	-	-	-	0.22
	Cadmium	0.005	<0.00003	<0.00003	<0.00003	<0.00003	-	-	-	-	-	<0.0005	0.00014	0.00012	<0.00003	<0.00003	-	-	-	-	-	0.0005
	Total Chromium	0.05	<0.0002	<0.0002	<0.0002	0.0018	-	-	-	-	-	0.0047	<0.0002	0.00033	0.00027	<0.0002	-	-	-	-	-	<0.0015
	Copper	2	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.007	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.007
	Total Iron	0.2	<0.0047	<0.0047	0.0059	<0.0047	-	-	-	-	-	-	<0.0047	<0.0047	<0.0047	<0.0047	-	-	-	-	-	-
	Lead	0.01	<0.0004	0.0051	0.0027	0.00067	-	-	-	-	-	<0.005	<0.0004	0.0023	0.0077	0.0022	-	-	-	-	-	<0.005
	Nickel	0.02	<0.0002	0.0012	0.00092	0.00091	-	-	-	-	-	<0.002	0.083	0.0089	0.011	0.0088	-	-	-	-	-	0.055
	Selenium	0.01	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	<0.003
	Vanadium	-	<0.0006	0.0012	0.0007	0.004	-	-	-	-	-	-	<0.0006	0.0022	0.0007	0.0023	-	-	-	-	-	-
	Zinc	0.05	0.005	0.0025	0.0085	0.0074	-	-	-	-	-	0.004	0.0091	0.003	0.0017	0.003	-	-	-	-	-	0.014
	Mercury	0.001	<0.00001	-	-	-	-	-	-	-	-	<0.001	<0.00001	-	-	-	-	-	-	-	-	<0.001
	Antimony	0.005	<0.002	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-
	Barium	-	0.025	-	-	-	-	-	-	-	-	-	0.35	-	-	-	-	-	-	-	-	-
	Beryllium	-	<0.0005	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-
	Cobalt	0.1	<0.0001	-	-	-	-	-	-	-	-	-	0.00078	-	-	-	-	-	-	-	-	-
	Manganese	0.05	0.19	-	-	-	-	-	-	-	-	-	9.2	-	-	-	-	-	-	-	-	-
	Molybdenum	-	<0.0002	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-	-
	Gold	-	<0.001	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Tellurium	-	<0.005	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Thorium	-	<0.01	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-
	Titanium	-	<0.005	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Uranium	-	<0.005	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
Major Ions	Sodium	200	38	13	15	14	-	-	-	-	-	-	32	21	22	21	-	-	-	-	-	-
	Potassium	-	1.5	1.1	0.61	0.52	-	-	-	-	-	-	5.6	2.1	2.2	2.1	-	-	-	-	-	-
	Calcium	-	79	93	55	62	-	-	-	-	-	-	130	150	130	140	-	-	-	-	-	-
	Magnesium	-	5.7	5.3	3.2	3.4	-	-	-	-	-	-	12	5.1	5.2	5.4	-	-	-	-	-	-
	Chloride	250	12	9.5	9.3	9.1	-	-	-	-	-	13	49	36	36	35	-	-	-	-	-	40
	Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-
	Bicarbonate Alkalinity as CaCO3	-	-	220	170	160	-	-	-	-	-	-	-	310	340	310	-	-	-	-	-	-
	Sulphate	250	94	60	33	32	-	-	-	-	-	78	21	32	32	31	-	-	-	-	-	31
-	Nitrate as NO_3	50	0.97	1.6	2.3	2.5	-	-	-	-	-	1	0.66	22	19	19	-	-	-	-	-	11
	Nitrite as NO_2	0.5	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-
	Total Cyanide	0.05	<0.01	<0.01	0.022	<0.01	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-
	Ammoniacal Nitrogen as NH_4	0.39	0.046	<0.03	<0.03	<0.03	-	-	-	-	-	0.05	11	0.46	0.85	0.48	-	-	-	-	-	4.3
	Total Alkalinity as CaCO3	-	-	220	170	160	-	-	-	-	-	-	-	310	340	310	-	-	-	-	-	-
	Total Organic Carbon	-	2.3	6.1	<2.0	5	-	-	-	-	-	-	<2.0	6.4	<2.0	<2.0	-	-	-	-	-	-
	Total Suspended Solids	-	290	81	90	36	-	-	-	-	-	-	<10	11	13	<10	-	-	-	-	-	-
	Organic Nitrogen	-	2.0	15	0.81	1.4	-	-	-	-	-	-	1.2	17	2.4	2.4	-	-	-	-	-	-
	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	-	-	-	-	-
	Chemical Oxygen Demand	-	8.8	-	-	-	-	-	-	-	-	-	32	-	-	-	-	-	-	-	-	-

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit
	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

Borehole Number		DWS/Freshwater EQS	BH103										BH104									
Screened Stratum			CHALK										UMH									
Sampling Technique												Bailer										Bailer
Date			29/08/13	26/11/13	05/02/14	08/05/14	05/06/14	28/10/14	23/01/15	01/05/15	20/07/15	09/10/15	28/08/13	26/11/13	06/02/14	09/05/14	05/06/14	29/10/14	23/01/15	29/04/15	20/07/15	09/10/15
-	Bromide	-	0.440	0.380	0.340	0.380	0.397	0.070	0.411	0.405	0.372	0.394	0.071	0.088	0.300	0.150	0.199		0.056	0.113	0.116	0.102
	Bromate	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005
Field Readings	Dissolved Oxygen (ppm)	-	0.5	0.4	0.6	1.2	1.8	9.6	4.5	4.4	2.8	-	6.0	3.6	3.2	6.4	6.0	4.7	7.8	10.1	5.5	0.9
	Electric Conductivity (ms/cm^5)	-	846	421	352	518	974	483	321	558	598	-	233	241	100	198	386	162	201	291	338	302
	pH	-	6.9	-	6.9	6.7	5.9	6.9	7.0	7.1	6.8	7.3	6.9	-	6.8	6.4	6.1	6.3.5	6.7	7.1	6.5	7.1
	ORP	-	-8	123	126	141	250	149	213	208	243	-	22	106	86	231	177	170	246	195	131	-18
Metals	Arsenic	0.01	<0.0009	0.01	<0.0009	<0.0009	-	-	-	-	-	<0.0025	<0.0009	0.0085	0.0012	0.0016	-	-	-	-	-	<0.0025
	Boron	1.0	0.1	0.11	0.098	0.093	-	-	-	-	-	0.1	<0.002	0.0085	0.0074	0.02	-	-	-	-	-	0.014
	Cadmium	0.005	0.000041	<0.00003	<0.00003	0.000068	-	-	-	-	-	<0.0005	<0.00003	<0.00003	<0.00003	<0.00003	-	-	-	-	-	<0.0005
	Total Chromium	0.05	<0.0002	0.00048	<0.0002	<0.0002	-	-	-	-	-	0.0069	<0.0002	<0.0002	<0.0002	<0.0002	-	-	-	-	-	0.0042
	Copper	2	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.007	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.007
	Total Iron	0.2	<0.0047	<0.0047	0.0054	<0.0047	-	-	-	-	-	-	0.0049	0.051	0.02	<0.0047	-	-	-	-	-	-
	Lead	0.01	0.0028	0.0067	0.0076	0.0013	-	-	-	-	-	<0.005	<0.0004	0.0032	0.00068	<0.0004	-	-	-	-	-	<0.005
	Nickel	0.02	0.0091	0.0081	0.008	0.0082	-	-	-	-	-	0.006	0.015	0.0015	0.0008	0.0013	-	-	-	-	-	<0.002
	Selenium	0.01	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	<0.003
	Vanadium	-	<0.0006	<0.0006	<0.0006	<0.0006	-	-	-	-	-	-	0.0015	0.0031	0.003	<0.0006	-	-	-	-	-	-
	Zinc	0.05	0.0043	0.005	0.0024	0.0029	-	-	-	-	-	0.005	0.0015	0.028	0.0037	0.0037	-	-	-	-	-	0.009
	Mercury	0.001	0.00013	-	-	-	-	-	-	-	-	<0.001	0.000027	-	-	-	-	-	-	-	-	<0.001
	Antimony	0.005	<0.002	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-
	Barium	-	0.054	-	-	-	-	-	-	-	-	-	0.026	-	-	-	-	-	-	-	-	-
	Beryllium	-	<0.0005	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-
	Cobalt	0.1	<0.0001	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-
	Manganese	0.05	0.15	-	-	-	-	-	-	-	-	-	0.0022	-	-	-	-	-	-	-	-	-
	Molybdenum	-	0.00021	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-	-
	Gold	-	<0.001	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Tellurium	-	<0.005	-	-	-	-	-	-	-	-	-	0.015	-	-	-	-	-	-	-	-	-
	Thorium	-	<0.01	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-
	Titanium	-	<0.005	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Uranium	-	<0.005	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
Major Ions	Sodium	200	21	20	22	20	-	-	-	-	-	-	7.3	8.7	4.2	10	-	-	-	-	-	-
	Potassium	-	2.2	2.0	2.1	2	-	-	-	-	-	-	0.45	0.84	0.52	0.55	-	-	-	-	-	-
	Calcium	-	140	140	130	130	-	-	-	-	-	-	62	69	37	49	-	-	-	-	-	-
	Magnesium	-	5.3	5.0	5.0	5.2	-	-	-	-	-	-	2.3	5.2	2.0	2.2	-	-	-	-	-	-
	Chloride	250	37	35	36	34	-	-	-	-	-	38	18	19	6.5	20	-	-	-	-	-	21
	Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-
	Bicarbonate Alkalinity as CaCO3	-	-	320	320	280	-	-	-	-	-	-	-	120	100	97	-	-	-	-	-	-
	Sulphate	250	30	33	32	31	-	-	-	-	-	39	34	69	7.8	28	-	-	-	-	-	66
-	Nitrate as NO_3	50	21	22	22	20	-	-	-	-	-	23	7.1	7.1	1.2	3.7	-	-	-	-	-	3.5
	Nitrite as NO_2	0.5	<0.02	0.046	<0.02	<0.02	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-
	Total Cyanide	0.05	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-
	Ammoniacal Nitrogen as NH_4	0.39	0.7	0.46	0.49	0.4	-	-	-	-	-	0.22	<0.03	<0.03	0.039	0.03	-	-	-	-	-	0.09
	Total Alkalinity as CaCO3	-	-	320	320	280	-	-	-	-	-	-	-	120	100	97	-	-	-	-	-	-
	Total Organic Carbon	-	<2.0	5.9	<2.0	2.7	-	-	-	-	-	-	3.4	4.5	6.2	8.5	-	-	-	-	-	-
	Total Suspended Solids	-	<10	16	17	<10	-	-	-	-	-	-	75	14	19	<10	-	-	-	-	-	-
	Organic Nitrogen	-	0.86	5.9	1.9	1.4	-	-	-	-	-	-	<0.5	5.2	2.2	1.5	-	-	-	-	-	-
	Biological Oxygen Demand	-	1.4	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	-	-	-	-	-
	Chemical Oxygen Demand	-	<7.0	-	-	-	-	-	-	-	-	-	<7.0	-	-	-	-	-	-	-	-	-

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit
	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

Borehole Number			BH104																					
Screened Stratum		DWS/Freshwater EQS	LMH												CHALK									
Sampling Technique												Bailer											Bailer	
Date			04/09/13	26/11/13	06/02/14	09/05/14	05/06/14	02/07/14	29/10/14	29/10/14	23/01/15	29/04/15	20/07/15	09/10/15	28/08/13	26/11/13	06/02/14	09/05/14	05/06/14	02/07/14	29/10/14	23/01/15	29/04/15	20/07/15	09/10/15
-	Bromide	-	0.210	0.110	0.051	0.110	0.146	0.150	0.257	0.358	0.220	0.271	0.247	0.251	0.260	0.320	<0.05	0.180	0.180	0.190	0.352	0.371	0.340	0.296	0.344
	Bromate	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	0.0021	0.0041	0.0018	0.0009	0.0019	0.0019	<0.1	<0.1	<0.1	<0.1	0.0011	0.0018	0.0039	0.0042	0.0031	0.0031	0.0032
Field Readings	Dissolved Oxygen (ppm)	-	7.6	1.5	3.5	4.6	3.6	3.0			4.8	7.8	3.8	0.7	4.6	2.2	2.1	4.0	3.7	2.8		4.5	5.1	4.7	-
	Electric Conductivity (ms/cm^2)	-	444	307	171	266	586	221		Low Flow	346	337	428	324	368	321	250	315	595	247		431	420	490	-
	pH	-	7.2	-	7.1	6.2	6.5	6.0			6.9	7.1	6.8	7.2	7.2	-	7.1	5.7	6.5	6.2		7.0	7.1	6.9	7.4
	ORP	-	58	113	67	398	191	221			241	221	213	-48	2	95	35	514	152	61		238	214	227	-
Metals	Arsenic	0.01	0.003	0.0077	0.0011	<0.0009	-	-	-	-	-	-	-	0.0032	<0.0009	<0.0009	0.003	<0.0009	-	-	-	-	-	-	<0.0025
	Boron	1.0	0.014	0.017	0.006	0.011	-	-	-	-	-	-	-	0.021	0.024	0.024	0.029	0.023	-	-	-	-	-	-	0.046
	Cadmium	0.005	<0.00003	<0.00003	<0.00003	<0.00003	-	-	-	-	-	-	-	<0.0005	<0.00003	<0.00003	<0.00003	<0.00003	-	-	-	-	-	-	<0.0005
	Total Chromium	0.05	<0.0002	<0.0002	<0.0002	<0.0002	-	-	-	-	-	-	-	0.0062	<0.0002	0.00052	<0.0002	<0.0002	-	-	-	-	-	-	0.0071
	Copper	2	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	<0.007	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	<0.007
	Total Iron	0.2	<0.0047	<0.0047	<0.0047	<0.0047	-	-	-	-	-	-	-	-	<0.0047	0.012	0.022	0.023	-	-	-	-	-	-	-
	Lead	0.01	<0.0004	0.0039	<0.0004	<0.0004	-	-	-	-	-	-	-	<0.005	<0.0004	<0.0004	0.00091	0.00098	-	-	-	-	-	-	<0.005
	Nickel	0.02	<0.0002	<0.0002	<0.0002	0.00022	-	-	-	-	-	-	-	<0.002	<0.0002	0.001	0.00029	0.00037	-	-	-	-	-	-	<0.002
	Selenium	0.01	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	-	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	-	<0.003
	Vanadium	-	0.0008	0.0007	0.0025	0.0016	-	-	-	-	-	-	-	-	0.0011	0.0026	0.002	<0.0006	-	-	-	-	-	-	-
	Zinc	0.05	0.0034	0.0049	0.0023	0.0033	-	-	-	-	-	-	-	0.008	<0.0015	0.11	0.014	0.015	-	-	-	-	-	-	0.004
	Mercury	0.001	<0.00001	-	-	-	-	-	-	-	-	-	-	<0.001	0.000021	-	-	-	-	-	-	-	-	-	<0.001
	Antimony	0.005	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-
	Barium	-	0.035	-	-	-	-	-	-	-	-	-	-	-	0.03	-	-	-	-	-	-	-	-	-	-
	Beryllium	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-
	Cobalt	0.1	<0.0001	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-
	Manganese	0.05	0.0061	-	-	-	-	-	-	-	-	-	-	-	0.023	-	-	-	-	-	-	-	-	-	-
	Molybdenum	-	<0.0002	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-	-	-
	Gold	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-
	Tellurium	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-
	Thorium	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-
	Titanium	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-
	Uranium	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	0.015	-	-	-	-	-	-	-	-	-	-
Major Ions	Sodium	200	8.8	8.0	6.4	7.8	-	-	-	-	-	-	-	-	11	11	11	9.6	-	-	-	-	-	-	-
	Potassium	-	1.0	0.9	0.69	0.8	-	-	-	-	-	-	-	-	1.3	1.3	1.1	0.91	-	-	-	-	-	-	-
	Calcium	-	110	100	64	75	-	-	-	-	-	-	-	-	110	120	100	88	-	-	-	-	-	-	-
	Magnesium	-	4.2	3.9	2.8	3.3	-	-	-	-	-	-	-	-	3.8	3.9	3.0	3.2	-	-	-	-	-	-	-
	Chloride	250	20	17	12	16	-	-	-	-	-	-	-	18	24	24	23	21	-	-	-	-	-	-	25
	Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-
	Bicarbonate Alkalinity as CaCO3	-	-	210	150	150	-	-	-	-	-	-	-	-	-	250	240	200	-	-	-	-	-	-	-
	Sulphate	250	47	59	32	42	-	-	-	-	-	-	-	54	39	41	28	33	-	-	-	-	-	-	29
-	Nitrate as NO_3	50	12	8.0	4.4	4.9	-	-	-	-	-	-	-	8	15	12	11	8.4	-	-	-	-	-	-	16
	Nitrite as NO_2	0.5	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-	-
	Total Cyanide	0.05	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-
	Ammoniacal Nitrogen as NH_4	0.39	0.035	<0.03	<0.03	<0.03	-	-	-	-	-	-	-	0.04	0.034	<0.03	0.032	0.11	-	-	-	-	-	-	0.04
	Total Alkalinity as CaCO3	-	-	210	150	150	-	-	-	-	-	-	-	-	-	250	240	200	-	-	-	-	-	-	-
	Total Organic Carbon	-	<2.0	6.1	2.9	5.6	-	-	-	-	-	-	-	-	<2.0	6.4	<2.0	5.7	-	-	-	-	-	-	-
	Total Suspended Solids	-	35	<10	14	<10	-	-	-	-	-	-	-	-	350	31	220	10	-	-	-	-	-	-	-
	Organic Nitrogen	-	3.8	2.2	2.0	1.1	-	-	-	-	-	-	-	-	0.7	4.8	2.2	1.8	-	-	-	-	-	-	-
	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	-
	Chemical Oxygen Demand	-	25	-	-	-	-	-	-	-	-	-	-	-	51	-	-	-	-	-	-	-	-	-	-

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit
	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

Borehole Number		DWS/Freshwater EQS	BH105																							
Screened Stratum			UMH(X)						LMH																	
Sampling Technique							Bailer		Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer						Bailer	
Date			03/06/2014	29/10/14	23/01/15	29/04/15	16/07/15	08/10/15	30/08/13	26/09/13	22/10/13	19/11/13	12/12/13	10/01/14	07/02/14	03/03/14	09/04/14	09/05/14	03/06/14	02/07/14	02/07/14	29/10/14	23/01/15	29/04/15	16/07/15	08/10/15
	Bromide	-	0.202		0.161	0.169	0.590	0.140	1.100	0.180	0.260	0.520	0.430	0.170	0.140	0.140	0.640	0.890	0.619	0.910	1.047	0.830	0.991	0.910	0.869	1.001
	Bromate	0.01	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	0.33	<0.1	<0.1	0.12	<0.1	<0.1	0.29	<0.1	0.22	0.29	0.18	0.11	0.3106	0.2786	0.2997	0.3018	0.2654	0.3072
Field Readings	Dissolved Oxygen (ppm)	-	5.7	6.0	4.3	9.3	6.4	6.6	-	-	-	-	-	-	-	-	-	-	-	-	-	5.4	6.3	7.6	6.0	6.4
	Electric Conductivity (ms/cm^2)	-	946	266	486	451	530	473	-	-	-	-	-	-	-	-	-	-	-	-	-	266	470	470	556	522
	pH	-	6.0	6.1	6.7	6.9	6.6	6.6	-	-	-	-	-	-	-	-	-	-	-	-	-	6.2	7.0	7.1	6.9	7.0
	ORP	-	265	180	248	162	182	144	-	-	-	-	-	-	-	-	-	-	-	-	-	178	241	168	108	153
Metals	Arsenic	0.01	<0.0009	-	-	-	-	0.0034	<0.0009	-	-	0.0081	-	-	0.002	-	-	-	-	-	-	-	-	-	-	<0.0025
	Boron	1.0	0.03	-	-	-	-	0.037	0.018	-	-	0.03	-	-	0.025	-	-	-	-	-	-	-	-	-	-	0.034
	Cadmium	0.005	<0.00003	-	-	-	-	<0.0005	<0.00003	-	-	<0.00003	-	-	<0.00003	-	-	-	-	-	-	-	-	-	-	<0.0005
	Total Chromium	0.05	0.0110	-	-	-	-	0.052	<0.0002	-	-	0.087	-	-	0.11	-	-	-	-	-	-	-	-	-	-	0.013
	Copper	2	<0.003	-	-	-	-	<0.007	<0.003	-	-	<0.003	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	<0.007
	Total Iron	0.2	<0.0047	-	-	-	-	-	<0.0047	-	-	<0.0047	-	-	0.0053	-	-	-	-	-	-	-	-	-	-	-
	Lead	0.01	0.0004	-	-	-	-	<0.005	<0.0004	-	-	0.0031	-	-	<0.0004	-	-	-	-	-	-	-	-	-	-	<0.005
	Nickel	0.02	0.0026	-	-	-	-	<0.002	<0.0002	-	-	0.0003	-	-	<0.0002	-	-	-	-	-	-	-	-	-	-	<0.002
	Selenium	0.01	<0.0012	-	-	-	-	<0.003	<0.0012	-	-	<0.0012	-	-	<0.0012	-	-	-	-	-	-	-	-	-	-	<0.003
	Vanadium	-	0.0014	-	-	-	-	-	<0.0006	-	-	0.0014	-	-	0.0031	-	-	-	-	-	-	-	-	-	-	-
	Zinc	0.05	0.01	-	-	-	-	<0.003	0.0024	-	-	0.0056	-	-	0.009	-	-	-	-	-	-	-	-	-	-	<0.003
	Mercury	0.001	<0.0005	-	-	-	-	<0.001	0.000041	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
	Antimony	0.005	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Barium	-	-	-	-	-	-	-	0.029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Beryllium	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cobalt	0.1	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Manganese	0.05	-	-	-	-	-	-	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Molybdenum	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gold	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tellurium	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thorium	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Titanium	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Uranium	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major Ions	Sodium	200	16	-	-	-	-	-	15	-	-	19	-	-	18	-	-	-	-	-	-	-	-	-	-	-
	Potassium	-	1.1	-	-	-	-	-	1.8	-	-	1.7	-	-	1.4	-	-	-	-	-	-	-	-	-	-	-
	Calcium	-	150	-	-	-	-	-	120	-	-	110	-	-	99	-	-	-	-	-	-	-	-	-	-	-
	Magnesium	-	5.8	-	-	-	-	-	2.9	-	-	4.0	-	-	4.2	-	-	-	-	-	-	-	-	-	-	-
	Chloride	250	13	-	-	-	-	16	29	-	-	26	-	-	31	-	-	-	-	-	-	-	-	-	-	32
	Carbonate Alkalinity as CaCO3	-	<1	-	-	-	-	-	-	-	-	<1.0	-	-	<1.0	-	-	-	-	-	-	-	-	-	-	-
	Bicarbonate Alkalinity as CaCO3	-	330	-	-	-	-	-	-	-	-	230	-	-	260	-	-	-	-	-	-	-	-	-	-	-
	Sulphate	250	74	-	-	-	-	100	120	-	-	82	-	-	42	-	-	-	-	-	-	-	-	-	-	44
	Nitrate as NO_3	50	6.6	-	-	-	-	14	21	-	-	20	-	-	18	-	-	-	-	-	-	-	-	-	-	28
	Nitrite as NO_2	0.5	<0.02	-	-	-	-	-	0.49	-	-	<0.02	-	-	<0.02	-	-	-	-	-	-	-	-	-	-	-
	Total Cyanide	0.05	<0.01	-	-	-	-	-	<0.01	-	-	<0.01	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-
	Ammoniacal Nitrogen as NH_4	0.39	<0.03	-	-	-	-	0.04	0.19	-	-	0.046	-	-	0.033	-	-	-	-	-	-	-	-	-	-	<0.03
	Total Alkalinity as CaCO3	-	330	-	-	-	-	-	-	-	-	230	-	-	260	-	-	-	-	-	-	-	-	-	-	-
	Total Organic Carbon	-	<2	-	-	-	-	-	2.2	-	-	<2.0	-	-	<2.0	-	-	-	-	-	-	-	-	-	-	-
	Total Suspended Solids	-	10	-	-	-	-	-	82	-	-	220	-	-	91	-	-	-	-	-	-	-	-	-	-	-
	Organic Nitrogen	-	2.2	-	-	-	-	-	3.0	-	-	1.3	-	-	2.1	-	-	-	-	-	-	-	-	-	-	-
	Biological Oxygen Demand	-	-	-	-	-	-	-	<1.0	-	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chemical Oxygen Demand	-	-	-	-	-	-	-	16	-	-	7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit

	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

Borehole Number		DWS/Freshwater EQS	BH105																
Screened Stratum			CHALK																
Sampling Technique			Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer						Bailer
Date			30/08/13	26/09/13	22/10/13	19/11/13	12/12/13	10/01/14	07/02/14	03/03/14	09/04/14	09/05/14	03/06/14	02/07/14	02/07/14	29/10/14	23/01/15	01/05/15	16/07/15	08/10/15
'	Bromide	-	0.610	0.095	0.120	0.100	0.100	0.130	0.400	0.110	0.550	0.380	0.480	0.580	0.465	0.218	0.499	0.566	0.456	0.538
	Bromate	0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.19**	<0.1	**0.13**	**0.05**	**0.1205**	**0.0243**	**0.1166**	**0.1541**	**0.1180**	**0.1383**
Field Readings	Dissolved Oxygen (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.4	3.4	4.4	4.9	5.2
	Electric Conductivity (ms/cm^2)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	290	486	557	561	522
	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.3	6.9	7.1	6.8	6.8
	ORP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	178	234	188	80	152
Metals	Arsenic	0.01	<0.0009	-	-	0.0053	-	-	<0.0009	-	-	-	-	-	-	-	-	-	-	<0.0025
	Boron	1.0	0.03	-	-	0.034	-	-	0.027	-	-	-	-	-	-	-	-	-	-	0.041
	Cadmium	0.005	0.00012	-	-	<0.00003	-	-	<0.00003	-	-	-	-	-	-	-	-	-	-	<0.0005
	Total Chromium	0.05	0.0059	-	-	**0.22**	-	-	**0.14**	-	-	-	-	-	-	-	-	-	-	**0.14**
	Copper	2	<0.003	-	-	0.0089	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	<0.007
	Total Iron	0.2	<0.0047	-	-	**0.41**	-	-	<0.0047	-	-	-	-	-	-	-	-	-	-	-
	Lead	0.01	<0.0004	-	-	0.0058	-	-	0.00069	-	-	-	-	-	-	-	-	-	-	<0.005
	Nickel	0.02	0.0035	-	-	0.0023	-	-	0.00075	-	-	-	-	-	-	-	-	-	-	<0.002
	Selenium	0.01	<0.0012	-	-	<0.0012	-	-	<0.0012	-	-	-	-	-	-	-	-	-	-	<0.003
	Vanadium	-	<0.0006	-	-	0.004	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-
	Zinc	0.05	0.0075	-	-	0.018	-	-	0.0034	-	-	-	-	-	-	-	-	-	-	<0.003
	Mercury	0.001	<0.00001	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
	Antimony	0.005	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Barium	-	0.037	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Beryllium	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cobalt	0.1	0.0012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Manganese	0.05	**0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Molybdenum	-	0.0015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gold	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tellurium	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thorium	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Titanium	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Uranium	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major Ions	Sodium	200	63	-	-	25	-	-	22	-	-	-	-	-	-	-	-	-	-	-
	Potassium	-	2.0	-	-	2.0	-	-	1.5	-	-	-	-	-	-	-	-	-	-	-
	Calcium	-	120	-	-	96	-	-	91	-	-	-	-	-	-	-	-	-	-	-
	Magnesium	-	4.2	-	-	4.8	-	-	4.4	-	-	-	-	-	-	-	-	-	-	-
	Chloride	250	33	-	-	23	-	-	24	-	-	-	-	-	-	-	-	-	-	24
	Carbonate Alkalinity as CaCO3	-	-	-	-	<1.0	-	-	<1.0	-	-	-	-	-	-	-	-	-	-	-
	Bicarbonate Alkalinity as CaCO3	-	-	-	-	160	-	-	950	-	-	-	-	-	-	-	-	-	-	-
	Sulphate	250	32	-	-	130	-	-	97	-	-	-	-	-	-	-	-	-	-	110
'	Nitrate as NO_3	50	28	-	-	12	-	-	17	-	-	-	-	-	-	-	-	-	-	21
	Nitrite as NO_2	0.5	<0.02	-	-	<0.02	-	-	<0.02	-	-	-	-	-	-	-	-	-	-	-
	Total Cyanide	0.05	<0.01	-	-	<0.01	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-
	Ammoniacal Nitrogen as NH_4	0.39	0.069	-	-	0.096	-	-	0.048	-	-	-	-	-	-	-	-	-	-	0.03
	Total Alkalinity as CaCO3	-	-	-	-	160	-	-	950	-	-	-	-	-	-	-	-	-	-	-
	Total Organic Carbon	-	<2.0	-	-	4.1	-	-	<2.0	-	-	-	-	-	-	-	-	-	-	-
	Total Suspended Solids	-	880	-	-	74	-	-	1900	-	-	-	-	-	-	-	-	-	-	-
	Organic Nitrogen	-	1.3	-	-	2.5	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-
	Biological Oxygen Demand	-	<1.0	-	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chemical Oxygen Demand	-	12	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit

	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

Borehole Number		DWS/Freshwater EQS	BH106																		
Screened Stratum			UMH										LMH								
Sampling Technique			Bailer										Bailer								
Date			27/08/13	21/11/13	04/02/14	07/05/14	03/06/14	28/10/14	23/01/15	28/04/15	20/07/15	12/10/15	27/08/13	21/11/13	04/02/14	07/05/14	03/06/14	28/10/14	23/01/15	28/04/15	20/07/15	12/10/15
-	Bromide	-	0.052	<0.05	0.063	0.062	0.170		0.074	0.071	0.059	0.063	0.170	0.180	0.130	0.210	0.230	0.204	0.252	0.253	0.239	0.255
	Bromate	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		0.0021	0.0016	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005
Field Readings	Dissolved Oxygen (ppm)	-	4.5	5.0	2.1	2.4	0.7	6.8	5.1	6.5	5.0	5.9	2.4	2.5	3.0	3.9	3.1	6.4	3.4	6.4	4.0	4.3
	Electric Conductivity (ms/cm^2)	-	260	211	169	476	514	436	278	288	306	316	397	385	315	894	931	720	497	672	573	561
	pH	-	7.5	6.6	6.7	6.0	5.8	6.8	7.1	6.8	6.4	6.4	7.1	7.2	7.2	6.2	8.0	6.7	7.0	7.2	6.9	6.9
	ORP	-	47	65	-6	13	22	150	215	214	140	123	66	117	58	72	30	160	190	217	158	117
Metals	Arsenic	0.01	<0.0009	<0.0009	<0.0009	0.0028	-	-	-	-	-	<0.0025	<0.0009	<0.0009	<0.0009	0.0022	-	-	-	-	-	<0.0025
	Boron	1.0	0.035	0.017	0.041	0.041	-	-	-	-	-	0.028	0.034	0.028	0.033	0.032	-	-	-	-	-	0.042
	Cadmium	0.005	<0.00003	<0.00003	0.00026	0.00075	-	-	-	-	-	<0.0005	<0.00003	<0.00003	<0.00003	0.000085	-	-	-	-	-	<0.0005
	Total Chromium	0.05	<0.0002	<0.0002	<0.0002	<0.0002	-	-	-	-	-	0.0091	<0.0002	<0.0002	<0.0002	<0.0002	-	-	-	-	-	0.0064
	Copper	2	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.007	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.007
	Total Iron	0.2	0.0051	0.057	1.9	4.4	-	-	-	-	-	-	<0.0047	<0.0047	<0.0047	<0.0047	-	-	-	-	-	-
	Lead	0.01	0.0011	0.00065	0.0039	0.0058	-	-	-	-	-	<0.005	0.0014	0.0012	0.0044	0.0082	-	-	-	-	-	<0.005
	Nickel	0.02	0.00093	0.00054	0.0018	0.0065	-	-	-	-	-	<0.002	0.0012	<0.0002	0.00038	0.00053	-	-	-	-	-	<0.002
	Selenium	0.01	<0.0012	<0.0012	<0.0012	>0.0012	-	-	-	-	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	<0.003
	Vanadium	-	0.0014	<0.0006	<0.0006	0.0017	-	-	-	-	-	-	0.00093	<0.0006	0.0011	0.0006	-	-	-	-	-	-
	Zinc	0.05	0.01	0.11	3.0	0.32	-	-	-	-	-	0.007	0.0077	0.0017	0.0032	<0.0015	-	-	-	-	-	0.008
	Mercury	0.001	0.000027	-	-	-	-	-	-	-	-	<0.001	<0.00001	-	-	-	-	-	-	-	-	<0.001
	Antimony	0.005	<0.002	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-
	Barium	-	0.029	-	-	-	-	-	-	-	-	-	0.034	-	-	-	-	-	-	-	-	-
	Beryllium	-	<0.0005	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-
	Cobalt	0.1	0.00042	-	-	-	-	-	-	-	-	-	0.00029	-	-	-	-	-	-	-	-	-
	Manganese	0.05	0.1	-	-	-	-	-	-	-	-	-	0.13	-	-	-	-	-	-	-	-	-
	Molybdenum	-	0.00022	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-	-
	Gold	-	<0.001	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-
	Tellurium	-	0.0063	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Thorium	-	<0.01	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-
	Titanium	-	<0.005	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
	Uranium	-	<0.005	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-
Major Ions	Sodium	200	7.0	6.5	11	11	-	-	-	-	-	-	23	18	18	18	-	-	-	-	-	-
	Potassium	-	0.62	0.46	0.96	1.2	-	-	-	-	-	-	1.5	1.7	1.6	1.6	-	-	-	-	-	-
	Calcium	-	67	62	62	58	-	-	-	-	-	-	120	140	130	130	-	-	-	-	-	-
	Magnesium	-	6.0	6.8	4.8	4.8	-	-	-	-	-	-	5.6	4.8	5.2	4.9	-	-	-	-	-	-
	Chloride	250	8.8	8.5	8.7	10	-	-	-	-	-	10	23	30	26	30	-	-	-	-	-	35
	Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	<1.0	<1.0	<1	-	-	-	-	-	-
	Bicarbonate Alkalinity as CaCO3	-	-	130	180	170	-	-	-	-	-	-	-	270	300	280	-	-	-	-	-	-
	Sulphate	250	42	49	32	26	-	-	-	-	-	53	53	57	55	54	-	-	-	-	-	47
-	Nitrate as NO_3	50	4.2	5.8	2.9	2.4	-	-	-	-	-	7.5	19	20	18	23	-	-	-	-	-	26
	Nitrite as NO_2	0.5	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-	0.12	<0.02	<0.02	<0.02	-	-	-	-	-	-
	Total Cyanide	0.05	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-
	Ammoniacal Nitrogen as NH_4	0.39	<0.03	0.046	<0.03	0.04	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	-	-	-	0.09
	Total Alkalinity as CaCO3	-	-	130	180	170	-	-	-	-	-	-	-	270	300	280	-	-	-	-	-	-
	Total Organic Carbon	-	<2.0	4.4	2.6	4.1	-	-	-	-	-	-	<2.0	6.7	<2.0	<2.0	-	-	-	-	-	-
	Total Suspended Solids	-	30	13	31	23	-	-	-	-	-	-	41	26	26	<10	-	-	-	-	-	-
	Organic Nitrogen	-	10	<0.5	2.2	1.8	-	-	-	-	-	-	1.9	<0.5	2.7	2.4	-	-	-	-	-	-
	Biological Oxygen Demand	-	<1.0	<1.0	-	-	-	-	-	-	-	-	<1.0	<1.0	-	-	-	-	-	-	-	-
	Chemical Oxygen Demand	-	<7.0	9.7	-	-	-	-	-	-	-	-	<7.0	<7.0	-	-	-	-	-	-	-	-

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit
	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

Borehole Number		DWS/Freshwater EQS	BH106										BH107					
Screened Stratum			CHALK										UMH					
Sampling Technique												Bailer						Bailer
Date			27/08/13	21/11/13	05/02/14	07/05/14	03/06/14	28/10/14	23/01/15	28/04/15	20/07/15	12/10/15	04/06/14	28/10/14	23/01/15	30/04/15	17/07/15	07/10/15
'	Bromide	-	0.064	0.059	<0.05	<0.05	0.050	0.054	0.062	0.055	0.049	0.050	0.164		0.069	0.150	0.153	0.162
	Bromate	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005
Field Readings	Dissolved Oxygen (ppm)	-	3.2	0.9	3.1	4.9	4.5	6.4	5.1	8.5	4.4	5.5	5.0	3.3	6.6	5.8	3.5	0.5
	Electric Conductivity (ms/cm^2)	-	401	380	231	487	551	603	383	625	416	402	675	306	483	553	595	505
	pH	-	7.0	7.8	6.9	5.8	6.5	6.8	7.3	7.3	7.1	7.1	6.2	6.9	6.3	6.4	6.3	6.7
	ORP	-	58	26	220	68	79	134	184	120	146	113	154	138	87	165	182	-56
Metals	Arsenic	0.01	<0.0009	<0.0009	<0.0009	<0.0009	-	-	-	-	-	<0.0025	-	-	-	-	-	<0.0025
	Boron	1.0	0.1	0.049	0.013	0.016	-	-	-	-	-	0.02	-	-	-	-	-	0.046
	Cadmium	0.005	<0.00003	<0.00003	<0.00003	0.00015	-	-	-	-	-	<0.0005	-	-	-	-	-	<0.0005
	Total Chromium	0.05	<0.0002	<0.0002	<0.0002	0.00024	-	-	-	-	-	0.0033	-	-	-	-	-	0.0053
	Copper	2	<0.003	<0.003	0.016	<0.003	-	-	-	-	-	<0.007	-	-	-	-	-	<0.007
	Total Iron	0.2	0.0075	<0.0047	0.012	0.7	-	-	-	-	-	-	-	-	-	-	-	-
	Lead	0.01	<0.0004	0.00084	0.004	0.004	-	-	-	-	-	<0.005	-	-	-	-	-	<0.005
	Nickel	0.02	0.00092	0.0045	0.0035	0.0018	-	-	-	-	-	<0.002	-	-	-	-	-	0.003
	Selenium	0.01	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003
	Vanadium	-	<0.0006	<0.0006	0.0007	0.0015	-	-	-	-	-	-	-	-	-	-	-	-
	Zinc	0.05	0.0025	3.3	7.1	0.078	-	-	-	-	-	0.014	-	-	-	-	-	0.075
	Mercury	0.001	0.00037	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	<0.001
	Antimony	0.005	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Barium	-	0.048	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Beryllium	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cobalt	0.1	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Manganese	0.05	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Molybdenum	-	<0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gold	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tellurium	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thorium	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Titanium	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Uranium	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major Ions	Sodium	200	56	90	16	6.7	-	-	-	-	-	-	-	-	-	-	-	-
	Potassium	-	2.7	2.0	1.2	0.57	-	-	-	-	-	-	-	-	-	-	-	-
	Calcium	-	65	65	76	62	-	-	-	-	-	-	-	-	-	-	-	-
	Magnesium	-	5.0	3.6	6.6	7.3	-	-	-	-	-	-	-	-	-	-	-	-
	Chloride	250	14	13	9.7	9.3	-	-	-	-	-	11	-	-	-	-	-	13
	Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1	-	-	-	-	-	-	-	-	-	-	-	-
	Bicarbonate Alkalinity as CaCO3	-	-	350	230	120	-	-	-	-	-	-	-	-	-	-	-	-
	Sulphate	250	26	69	55	52	-	-	-	-	-	38	-	-	-	-	-	260
'	Nitrate as NO_3	50	11	1.7	4.9	9.7	-	-	-	-	-	9.7	-	-	-	-	-	14
	Nitrite as NO_2	0.5	0.36	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-
	Total Cyanide	0.05	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-
	Ammoniacal Nitrogen as NH_4	0.39	0.036	0.058	0.053	0.06	-	-	-	-	-	0.05	-	-	-	-	-	<0.03
	Total Alkalinity as CaCO3	-	-	350	230	120	-	-	-	-	-	-	-	-	-	-	-	-
	Total Organic Carbon	-	<2.0	8.7	<2.0	2.8	-	-	-	-	-	-	-	-	-	-	-	-
	Total Suspended Solids	-	4900	230	83	-	-	-	-	-	-	-	-	-	-	-	-	-
	Organic Nitrogen	-	2.0	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Biological Oxygen Demand	-	<1.0	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chemical Oxygen Demand	-	19	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit
	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

Borehole Number		DWS/Freshwater EQS	BH107											
Screened Stratum			LMH						CHALK					
Sampling Technique			Bailer						Bailer					
Date			04/06/14	28/10/14	23/01/15	30/04/15	17/07/15	07/10/15	04/06/14	28/10/14	23/01/15	30/04/15	17/07/15	07/10/15
,	Bromide	-	0.189	0.204	0.161	0.198	0.183	0.189	0.182	0.167	0.206	0.164	0.149	0.142
	Bromate	0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Field Readings	Dissolved Oxygen (ppm)	-	1.1	3.3	1.9	2.8	2.4	-	1.5	5.1	3.5	44.1	2.9	-
	Electric Conductivity (ms/cm^2)	-	848	925	577	621	662	-	808	921	582	569	618	-
	pH	-	6.9	6.4	6.9	7.0	6.9	7.2	5.8	6.1	6.9	1.0	6.8	7.1
	ORP	-	133	165	144	178	184	-	190	116	128	170	185	-
Metals	Arsenic	0.01	-	-	-	-	-	<0.0025	-	-	-	-	-	<0.0025
	Boron	1.0	-	-	-	-	-	0.093	-	-	-	-	-	0.1
	Cadmium	0.005	-	-	-	-	-	<0.0005	-	-	-	-	-	<0.0005
	Total Chromium	0.05	-	-	-	-	-	<0.0015	-	-	-	-	-	<0.0015
	Copper	2	-	-	-	-	-	<0.007	-	-	-	-	-	<0.007
	Total Iron	0.2	-	-	-	-	-	-	-	-	-	-	-	-
	Lead	0.01	-	-	-	-	-	<0.005	-	-	-	-	-	<0.005
	Nickel	0.02	-	-	-	-	-	<0.002	-	-	-	-	-	<0.002
	Selenium	0.01	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003
	Vanadium	-	-	-	-	-	-	-	-	-	-	-	-	-
	Zinc	0.05	-	-	-	-	-	<0.003	-	-	-	-	-	0.01
	Mercury	0.001	-	-	-	-	-	<0.001	-	-	-	-	-	<0.001
	Antimony	0.005	-	-	-	-	-	-	-	-	-	-	-	-
	Barium	-	-	-	-	-	-	-	-	-	-	-	-	-
	Beryllium	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cobalt	0.1	-	-	-	-	-	-	-	-	-	-	-	-
	Manganese	0.05	-	-	-	-	-	-	-	-	-	-	-	-
	Molybdenum	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gold	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tellurium	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thorium	-	-	-	-	-	-	-	-	-	-	-	-	-
	Titanium	-	-	-	-	-	-	-	-	-	-	-	-	-
	Uranium	-	-	-	-	-	-	-	-	-	-	-	-	-
Major Ions	Sodium	200	-	-	-	-	-	-	-	-	-	-	-	-
	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-
	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-
	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chloride	250	-	-	-	-	-	43	-	-	-	-	-	28
	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sulphate	250	-	-	-	-	-	59	-	-	-	-	-	110
,	Nitrate as NO_3	50	-	-	-	-	-	38	-	-	-	-	-	28
	Nitrite as NO_2	0.5	-	-	-	-	-	-	-	-	-	-	-	-
	Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-
	Ammoniacal Nitrogen as NH_4	0.39	-	-	-	-	-	0.04	-	-	-	-	-	0.03
	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-
	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-
	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit

	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

Borehole Number		DWS/Freshwater EQS	BH108																			
Screened Stratum			UMH						LMH							CHALK						
Sampling Technique							Bailer		Bailer	Bailer				Bailer		Bailer						Bailer	
Date			03/06/14	29/10/14	23/01/15	29/04/15	17/07/15	08/10/15	03/06/14	02/07/14	29/10/14	23/01/15	29/04/15	16/07/15	08/10/15	03/06/14	02/07/14	02/07/14	29/10/14	23/01/15	29/04/15	17/07/15	08/10/15
'	Bromide	-	0.140		0.184	0.113	0.084	0.093	0.200	0.160	0.188	0.337	0.360	0.110	0.265	1.060	0.580	1.095	0.929	0.956	0.938	0.888	0.954
	Bromate	0.01	<0.0005		0.0129	<0.0005	<0.0005	<0.0005	0.0073	0.0045	0.0048	0.0490	0.0657	0.0014	0.0374	0.26	0.09	0.2826	0.2913	0.3222	0.3226	0.2846	0.3135
Field Readings	Dissolved Oxygen (ppm)	-	1.8	5.3	5.4	8.7	4.9	5.2	-	-	7.6	294.0	5.6	3.9	4.5	-	-	-	5.1	5.2	7.7	5.4	6.8
	Electric Conductivity (ms/cm^2)	-	850	245	413	448	453	406	-	-	218	391	439	438	431	-	-	-	260	454	539	536	515
	pH	-	6.3	5.5	6.5	6.8	6.4	6.2	-	-	5.0	5.8	6.0	5.5	5.9	-	-	-	5.7	6.9	7.2	6.9	7.0
	ORP	-	190	182	251	153	215	153	-	-	193	274	190	135	153	-	-	-	182	256	167	204	119
Metals	Arsenic	0.01	-	-	-	-	-	0.0036	-	-	-	-	-	-	<0.0025	-	-	-	-	-	-	-	<0.0025
	Boron	1.0	-	-	-	-	-	0.031	-	-	-	-	-	-	0.044	-	-	-	-	-	-	-	0.028
	Cadmium	0.005	-	-	-	-	-	0.0007	-	-	-	-	-	-	0.0094	-	-	-	-	-	-	-	<0.0005
	Total Chromium	0.05	-	-	-	-	-	0.18	-	-	-	-	-	-	0.58	-	-	-	-	-	-	-	<0.0015
	Copper	2	-	-	-	-	-	<0.007	-	-	-	-	-	-	<0.007	-	-	-	-	-	-	-	<0.007
	Total Iron	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lead	0.01	-	-	-	-	-	<0.005	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	<0.005
	Nickel	0.02	-	-	-	-	-	0.003	-	-	-	-	-	-	0.017	-	-	-	-	-	-	-	<0.002
	Selenium	0.01	-	-	-	-	-	<0.003	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	<0.003
	Vanadium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Zinc	0.05	-	-	-	-	-	0.032	-	-	-	-	-	-	0.024	-	-	-	-	-	-	-	<0.003
	Mercury	0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	<0.001
	Antimony	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Barium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Beryllium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cobalt	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Manganese	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Molybdenum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gold	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tellurium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thorium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Titanium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Uranium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major Ions	Sodium	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chloride	250	-	-	-	-	-	10	-	-	-	-	-	-	15	-	-	-	-	-	-	-	29
	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sulphate	250	-	-	-	-	-	96	-	-	-	-	-	-	180	-	-	-	-	-	-	-	16
'	Nitrate as NO_3	50	-	-	-	-	-	7.5	-	-	-	-	-	-	8.9	-	-	-	-	-	-	-	32
	Nitrite as NO_2	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ammoniacal Nitrogen as NH_4	0.39	-	-	-	-	-	0.1	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	<0.03
	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit

	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

Borehole Number		DWS/Freshwater EQS	BH201															
Screened Stratum			LMH-S								LMH-D							
Sampling Technique			Bailer						Bailer		Bailer	Bailer					Bailer	
Date			03/06/14	02/07/14	02/07/14	29/10/14	23/01/15	29/04/15	17/07/15	09/10/15	03/06/14	02/07/14	29/10/14	23/01/15	29/04/15	17/07/15	09/10/15	
'	Bromide	-	0.500	0.680	0.569	0.573	0.611	0.554	0.549	0.080	0.370	0.383	0.397	0.421	0.416	0.359	0.391	
	Bromate	0.01	**0.11**	**0.06**	**0.1542**	**0.1200**	**0.1259**	**0.1309**	**0.1123**	**0.1220**	**0.09**	**0.0863**	**0.0865**	**0.0860**	**0.0897**	**0.0761**	**0.0770**	
Field Readings	Dissolved Oxygen (ppm)	-	-	-	-	4.8	5.7	6.7	4.1	5.6	-	-	5.9	5.3	7.7	4.7	5.6	
	Electric Conductivity (ms/cm^2)	-	-	-	-	306	542	633	614	585	-	-	261	443	501	505	500	
	pH	-	-	-	-	5.8	6.6	7.2	6.9	6.7	-	-	6.1	6.9	7.0	6.9	6.8	
	ORP	-	-	-	-	191	277	203	218	181	-	-	179	277	129	199	165	
Metals	Arsenic	0.01	-	-	-	-	-	-	-	<0.0025	-	-	-	-	-	-	<0.0025	
	Boron	1.0	-	-	-	-	-	-	-	0.025	-	-	-	-	-	-	0.031	
	Cadmium	0.005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	<0.0005	
	Total Chromium	0.05	-	-	-	-	-	-	-	<0.0015	-	-	-	-	-	-	0.0027	
	Copper	2	-	-	-	-	-	-	-	<0.007	-	-	-	-	-	-	<0.007	
	Total Iron	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Lead	0.01	-	-	-	-	-	-	-	<0.005	-	-	-	-		-	<0.005	
	Nickel	0.02	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002	
	Selenium	0.01	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	<0.003	
	Vanadium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Zinc	0.05	-	-	-	-	-	-	-	0.006	-	-	-	-	-	-	0.004	
	Mercury	0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001	
	Antimony	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Barium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Beryllium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Cobalt	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Manganese	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Molybdenum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Gold	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Tellurium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Thorium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Titanium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Uranium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Major Ions	Sodium	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Chloride	250	-	-	-	-	-	-	-	34	-	-	-	-	-	-	30	
	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Sulphate	250	-	-	-	-	-	-	-	91	-	-	-	-	-	-	31	
'	Nitrate as NO_3	50	-	-	-	-	-	-	-	29	-	-	-	-	-	-	32	
	Nitrite as NO_2	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Ammoniacal Nitrogen as NH_4	0.39	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	0.05	
	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit

	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

Borehole Number		DWS/Freshwater EQS	FT101		FT102								FT103	
Screened Stratum			UMH		UMH								UMH	
Sampling Technique				Bailer							Bailer			Bailer
Date			29/08/13	28/07/15	29/08/13	26/11/13	07/02/14	07/05/14	29/08/13	28/10/14	28/07/15	08/10/15	29/08/13	28/07/15
-	Bromide	-	0.070	0.043	<0.05	<0.05	<0.05	<0.05	0.033	0.033	0.042	0.041	<0.05	0.047
	Bromate	0.01	<0.1	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.1	<0.0005
Field Readings	Dissolved Oxygen (ppm)	-	0.3	3.4	2.3	9.0	6.2	6.0	9.5		8.3	1.7	4.1	7.4
	Electric Conductivity (ms/cm^2)	-	563	602	246	155	69	114	267		170	171	232	260
	pH	-	7.3	6.7	7.2	-	6.4	6.3	7.0		6.2	7.0	7.1	6.5
	ORP	-	-48	203	10	152	134	145	140		213	-10	31	197
Metals	Arsenic	0.01	<0.0009	-	<0.0009	<0.0009	<0.0009	<0.0009	-	-	-	<0.0025	<0.0009	-
	Boron	1.0	0.038	-	0.014	0.012	0.026	0.025	-	-	-	0.025	0.017	-
	Cadmium	0.005	0.00024	-	<0.00003	<0.00003	<0.00003	<0.00003	-	-	-	<0.0005	<0.00003	-
	Total Chromium	0.05	<0.0002	-	<0.0002	<0.0002	<0.0002	0.00039	-	-	-	<0.0015	<0.0002	-
	Copper	2	0.0035	-	<0.003	<0.003	<0.003	<0.003	-	-	-	<0.007	<0.003	-
	Total Iron	0.2	0.061	-	<0.0047	<0.0047	0.019	<0.0047	-	-	-	-	<0.0047	-
	Lead	0.01	0.0016	-	<0.0004	0.0015	0.0031	0.00087	-	-	-	<0.005	<0.0004	-
	Nickel	0.02	0.0038	-	0.002	0.001	0.00094	0.00052	-	-	-	<0.002	<0.0002	-
	Selenium	0.01	<0.0012	-	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	<0.003	<0.0012	-
	Vanadium	-	0.0014	-	<0.0006	0.0022	0.001	0.0033	-	-	-	-	<0.0006	-
	Zinc	0.05	0.0074	-	0.0022	0.0045	0.004	0.0043	-	-	-	<0.003	0.0043	-
	Mercury	0.001	<0.00001	-	<0.00001	-	-	-	-	-	-	<0.001	0.000026	-
	Antimony	0.005	<0.002	-	<0.002	-	-	-	-	-	-	-	<0.002	-
	Barium	-	0.045	-	0.018	-	-	-	-	-	-	-	0.017	-
	Beryllium	-	<0.0005	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-
	Cobalt	0.1	0.0041	-	0.0015	-	-	-	-	-	-	-	<0.0001	-
	Manganese	0.05	1.1	-	0.41	-	-	-	-	-	-	-	0.15	-
	Molybdenum	-	0.0015	-	<0.0002	-	-	-	-	-	-	-	<0.0002	-
	Gold	-	<0.001	-	<0.001	-	-	-	-	-	-	-	<0.001	-
	Tellurium	-	<0.005	-	0.0057	-	-	-	-	-	-	-	<0.005	-
	Thorium	-	<0.01	-	<0.01	-	-	-	-	-	-	-	<0.01	-
	Titanium	-	<0.005	-	<0.005	-	-	-	-	-	-	-	<0.005	-
	Uranium	-	<0.005	-	<0.005	-	-	-	-	-	-	-	<0.005	-
Major Ions	Sodium	200	10	-	6.1	5.2	5.2	3.8	-		-	-	4.9	-
	Potassium	-	3.3	-	1.4	1.4	0.38	0.31	-		-	-	0.35	-
	Calcium	-	120	-	45	47	23	27	-		-	-	47	-
	Magnesium	-	7.6	-	3.7	3.1	1.0	1.2	-		-	-	2.7	-
	Chloride	250	9.1	-	6.4	5.1	5.2	6.5	-		-	5.1	9.2	-
	Carbonate Alkalinity as CaCO3	-	-	-	-	<1.0	<1.0	<1.0	-		-	-	-	-
	Bicarbonate Alkalinity as CaCO3	-	-	-	-	91	60	66	-		-	-	-	-
	Sulphate	250	93	-	44	53	13	15	-		-	48	45	-
-	Nitrate as NO_3	50	1.3	-	4.4	7.1	1.6	2.3	-		-	89	2.3	-
	Nitrite as NO_2	0.5	0.023	-	0.043	<0.02	<0.02	<0.02	-		-	-	<0.02	-
	Total Cyanide	0.05	<0.01	-	<0.01	<0.01	<0.01	<0.01	-		-	-	<0.01	-
	Ammoniacal Nitrogen as NH_4	0.39	0.044	-	0.12	<0.03	0.075	<0.03	-		-	0.05	<0.03	-
	Total Alkalinity as CaCO3	-	-	-	-	91	60	66	-		-	-	-	-
	Total Organic Carbon	-	<2.0	-	<2.0	3.3	3.6	5.6	-		-	-	<2.0	-
	Total Suspended Solids	-	45	-	110	170	77	55	-		-	-	84	-
	Organic Nitrogen	-	22	-	6.9	2.9	1.7	1.3	-		-	-	0.91	-
	Biological Oxygen Demand	-	<1.0	-	<1.0	-	-		-		-	-	<1.0	-
	Chemical Oxygen Demand	-	16	-	13	-	-		-		-	-	12	-

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit
	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

	Borehole Number	DWS/Fresh water EQS	BHA					BHB									
	Screened Stratum		UMH					LMH									
	Date		27/11/13	06/02/14	12/05/14	29/07/15	09/10/15	27/11/13	06/02/14	13/05/14	05/06/14	02/07/14	29/10/14	23/01/15	01/05/15	17/07/15	07/10/15
'	Bromide		0.100	0.210	<0.05	0.073	0.110	0.350	0.300	0.390	0.325	0.310	0.400	0.326	0.418	0.384	0.364
	Bromate	0.01	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.1	<0.1	<0.1	0.0072	0.0033	0.0133	0.0108	0.0162	0.0186	0.015
Field Readings	Dissolved Oxygen (ppm)	-	-	-	-	2.1	1.3	-	-	-	-	-	-	-	5.2	3.5	-
	Electric Conductivity (ms/cm^2)	-	-	-	-	366	429	-	-	-	-	-	-	-	547	581	-
	pH	-	-	-	-	6.3	6.2	-	-	-	-	-	-	-	6.8	6.8	6.9
	ORP	-	-	-	-	68	83	-	-	-	-	-	-	-	186	196	-
Metals	Dissolved Arsenic	0.01	-	-	-	-	-	-	-	-	-		-	-	-	-	
	Dissolved Boron	1	-	-	-	-	-	-	-	-	-		-	-	-	-	
	Dissolved Cadmium	0.005	-	-	-	-	-	-	-	-	-		-	-	-	-	
	Total Dissolved Chromium	0.05	-	-	-	-	-	-	-	-	-		-	-	-	-	
	Dissolved Copper	2	-	-	-	-	-	-	-	-	-		-	-	-	-	
	Dissolved Lead	0.01	-	-	-	-	-	-	-	-	-		-	-	-	-	
	Dissolved Mercury	0.001	-	-	-	-	-	-	-	-	-		-	-	-	-	
	Dissolved Nickel	0.02	-	-	-	-	-	-	-	-	-		-	-	-	-	
	Dissolved Selenium	0.01	-	-	-	-	-	-	-	-	-		-	-	-	-	
	Dissolved Zinc	0.05	-	-	-	-	-	-	-	-	-		-	-	-	-	
'	Chloride	250	-	-	-	-	11	-	-	-	-	-	-	-	-	-	14
	Sulphate	250	-	-	-	-	130	-	-	-	-	-	-	-	-	-	110
	Nitrate as NO_3	50	-	-	-	-	2.5	-	-	-	-	-	-	-	-	-	39
	Ammoniacal Nitrogen as NH_4	0.39	-	-	-	-	0.14	-	-	-	-	-	-	-	-	-	0.03

Key

All results are in milligram per litre (mg/l).

–	Not sampled/analysed or no WQS available.
DWS	Drinking Water Standard
EQS	Freshwater Environmental Quality Standard
888	Exceeds DWS/EQS
888	Exceeds Detection Limit

	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

	Borehole Number	DWS/Fresh water EQS	BHC					BHD				BHE				BHF			
	Screened Stratum		UMH					UMH				UMH				UMH			
	Date		27/11/13	06/02/14	13/05/14	28/07/15	07/10/15	06/02/14	13/05/14	28/07/15	09/10/15	04/02/14	12/05/14	29/07/15	12/10/15	05/02/14	12/05/14	28/07/15	08/10/15
'	Bromide		0.150	0.680	0.140	0.158	0.181	<0.05	0.280			<0.05	<0.05	0.073	0.081	0.055	0.066	0.057	0.058
	Bromate	0.01	<0.1	<0.1	<0.1	<0.0005	0.0006	<0.1	<0.1			<0.1	<0.1	<0.0005	<0.0005	<0.1	<0.1	<0.0005	<0.0005
Field Readings	Dissolved Oxygen (ppm)	-	-	-	-	5.1	3.2	-	-			-	-	4.8	4.2	-	-	7.5	-
	Electric Conductivity (ms/cm^2)	-	-	-	-	572	580	-	-			-	-	521	535	-	-	342	-
	pH	-	-	-	-	6.5	6.3	-	-			-	-	6.4	6.2	-	-	6.6	7.1
	ORP	-	-	-	-	196	199	-	-			-	-	252	120	-	-	236	-
Metals	Dissolved Arsenic	0.01	-	-	-	-		-	-			-	-	-	<0.0025	-	-	-	0.0027
	Dissolved Boron	1	-	-	-	-		-	-			-	-	-	0.062	-	-	-	0.025
	Dissolved Cadmium	0.005	-	-	-	-		-	-			-	-	-	0.0006	-	-	-	<0.0005
	Total Dissolved Chromium	0.05	-	-	-	-		-	-	Dry	Dry	-	-	-	0.0079	-	-	-	0.0038
	Dissolved Copper	2	-	-	-	-		-	-			-	-	-	<0.007	-	-	-	<0.007
	Dissolved Lead	0.01	-	-	-	-		-	-			-	-	-	<0.005	-	-	-	<0.005
	Dissolved Mercury	0.001	-	-	-	-		-	-			-	-	-	<0.001	-	-	-	<0.001
	Dissolved Nickel	0.02	-	-	-	-		-	-			-	-	-	0.003	-	-	-	<0.002
	Dissolved Selenium	0.01	-	-	-	-		-	-			-	-	-	<0.003	-	-	-	<0.003
	Dissolved Zinc	0.05	-	-	-	-		-	-			-	-	-	0.012	-	-	-	<0.003
'	Chloride	250	-	-	-	-	11	-	-			-	-	-	8.9	-	-	-	15
	Sulphate	250	-	-	-	-	96	-	-			-	-	-	120	-	-	-	40
	Nitrate as NO_3	50	-	-	-	-	18	-	-			-	-	-	5.3	-	-	-	27
	Ammoniacal Nitrogen as NH_4	0.39	-	-	-	-	0.04	-	-			-	-	-	0.04	-	-	-	0.06

Key

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888	Exceeds Detection Limit
	Analysed by Jones Environmental Subcontractor
	Analysed by Affinity Water

Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

	Borehole Number	DWS/Fresh water EQS	BHG								BHH				BHI		BHJ			BHK		
	Screened Stratum		LMH								UMH				UMH		UMH			UMH		
	Date		05/02/14	12/05/14	04/06/14	28/10/14	23/01/15	01/05/15	20/07/15	08/10/15	05/02/14	12/05/14	28/07/15	08/10/15	12/05/14	29/07/15	12/05/14	29/07/15	09/10/15	12/05/14	28/07/15	08/10/15
	Bromide		<0.05	0.110	0.118	0.088	0.064	0.139	0.150	0.132	<0.05	<0.05	0.055	0.079			0.150	0.126	<0.005	0.091	0.105	0.119
	Bromate	0.01	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0024	<0.1	<0.1	<0.0005	<0.0005			<0.1	<0.0005	<0.0005	<0.1	<0.0005	<0.0005
Field Readings	Dissolved Oxygen (ppm)	-	-	-	-	-	-	8.1	6.8	-	-	-	5.7	-			-	4.9	4.7	-	5.6	-
	Electric Conductivity (ms/cm^2)	-	-	-	-	-	-	396	479	-	-	-	378	-			-	603	637	-	256	-
	pH	-	-	-	-	-	-	7.0	6.8	7.3	-	-	6.4	6.8			-	6.1	6.0	-	6.1	6.7
	ORP	-	-	-	-	-	-	200	242	-	-	-	198	-			-	133	136	-	223	-
Metals	Dissolved Arsenic	0.01	-	-	-	-	-	-	-	<0.0025	-	-	-				-	-	-	-	-	<0.0025
	Dissolved Boron	1	-	-	-	-	-	-	-	0.034	-	-	-				-	-	-	-	-	0.048
	Dissolved Cadmium	0.005	-	-	-	-	-	-	-	<0.0005	-	-	-				-	-	-	-	-	<0.0005
	Total Dissolved Chromium	0.05	-	-	-	-	-	-	-	0.0024	-	-	-		Dry	Dry	-	-	-	-	-	<0.0015
	Dissolved Copper	2	-	-	-	-	-	-	-	<0.007	-	-	-				-	-	-	-	-	<0.007
	Dissolved Lead	0.01	-	-	-	-	-	-	-	<0.005	-	-	-				-	-	-	-	-	<0.005
	Dissolved Mercury	0.001	-	-	-	-	-	-	-	<0.001	-	-	-				-	-	-	-	-	<0.001
	Dissolved Nickel	0.02	-	-	-	-	-	-	-	<0.002	-	-	-				-	-	-	-	-	<0.002
	Dissolved Selenium	0.01	-	-	-	-	-	-	-	<0.003	-	-	-				-	-	-	-	-	<0.003
	Dissolved Zinc	0.05	-	-	-	-	-	-	-	<0.003	-	-	-				-	-	-	-	-	0.011
	Chloride	250	-	-	-	-	-	-	-	26	-	-	-	16			-	-	10	-	-	18
	Sulphate	250	-	-	-	-	-	-	-	38	-	-	-	55			-	-	140	-	-	49
	Nitrate as NO_3	50	-	-	-	-	-	-	-	31	-	-	-	33			-	-	3.8	-	-	7.1
	Ammoniacal Nitrogen as NH_4	0.39	-	-	-	-	-	-	-	0.06	-	-	-	0.05			-	-	0.04	-	-	0.04

Key

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888	Exceeds Detection Limit
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Well Screen Geology

UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk

	Borehole Number	WQS	BH101			BH102			BH103			BH104		
	Screened Stratum		UMH	LMH	CHALK	UMH	LMH	CHALK	UMH	LMH	CHALK	UMH	LMH	CHALK
	Date		28/08/13	04/09/13	28/08/13	28/08/13	04/09/13	28/08/13	29/08/03	29/08/13	29/08/13	28/08/13	04/09/13	28/08/13
Speciated Total Petroleum Hydrocarbons	Aliphatics C5-C6	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aliphatics >C6-C8	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aliphatics >C8-C10	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aliphatics >C10-C12	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aliphatics >C12-C16	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Aliphatics >C16-C21	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Aliphatics >C21-C35	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Total aliphatics C5-35	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Aromatics C6-C7	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aromatics >C7-C8	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aromatics >EC8-EC10	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aromatics >EC10-EC12	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aromatics >EC12-EC16	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Aromatics >EC16-EC21	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Aromatics >EC21-EC35	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Total aromatics C5-35	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Total TPH	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Organophosphorus Pesticides	Azinphos ethyl	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Azinphos methyl	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Carbophenothion	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Chlorfenvinphos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Chlorpyrifos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Chlorpyrifos-methyl	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Diazinon	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Dichlorvos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Dimethoate	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Ethion	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Ethyl Parathion (Parathion)	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Etrimphos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Fenitrothion	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Fenthion	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Malathion	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Methyl Parathion	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Mevinphos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Phosalone	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Pirimiphos Methyl	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Propetamphos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Triazophos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Organochlorine Pesticides	Aldrin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Alpha-BHC	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Beta-BHC	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Chlorothalonil	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	cis-Chlordane	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Dieldrin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Endosulphan I	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Endosulphan II	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Endosulphan sulphate	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Endrin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Gamma-BHC	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Heptachlor	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Heptachlor Epoxide	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Hexachlorobenzene	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Isodrin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	o,p'-DDE	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	o,p'-DDT	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	o,p'-Methoxychlor	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	o,p'-TDE	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	p,p'-DDE	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	p,p'-DDT	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	p,p'-Methoxychlor	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	p,p'-TDE	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Pendimethalin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Permethrin I	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Permethrin II	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Quintozene	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Tecnazene	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Telodrin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	trans-Chlordane	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Triadimefon	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Triallate	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Trifluralin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
BTEX	Methyl Tertiary Butyl Ether	0.02	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Benzene	0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Toluene	0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Ethyl benzene	0.02	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	m & p Xylene	0.03	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	o Xylene	0.03	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
TDT	Dibutyltin	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Tributyltin	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Triphenyltin	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

–	Not sampled/analysed	888	Exceeds WQS
	All results reported in mg/l.	UMH	Upper Mineral Horizon
WQS	Water Quality Standard (SLR EIC GAS 2010)	LMH	Lower Mineral Horizon
888	Exceeds Detection Limit	CHALK	Chalk

	Borehole Number	WQS	BH105			BH106		FT101	FT102	FT103
	Screened Stratum		LMH	CHALK	UMH	LMH	CHALK	UMH	UMH	UMH
	Date		30/08/13	30/08/13	27/08/13	27/08/13	27/08/13	29/08/13	29/08/13	29/08/13
Speciated Total Petroleum Hydrocarbons	Aliphatics C5-C6	**0.01**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aliphatics >C6-C8	**0.01**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aliphatics >C8-C10	**0.01**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aliphatics >C10-C12	**0.01**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aliphatics >C12-C16	**0.01**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Aliphatics >C16-C21	**0.01**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Aliphatics >C21-C35	**0.01**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Total aliphatics C5-35	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Aromatics C6-C7	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aromatics >C7-C8	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aromatics >EC8-EC10	**0.01**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aromatics >EC10-EC12	**0.01**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Aromatics >EC12-EC16	**0.01**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Aromatics >EC16-EC21	**0.01**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Aromatics >EC21-EC35	**0.01**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Total aromatics C5-35	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Total TPH	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Organophosphorus Pesticides	Azinphos ethyl	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Azinphos methyl	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Carbophenothion	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Chlorfenvinphos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Chlorpyrifos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Chlorpyrifos-methyl	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Diazinon	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Dichlorvos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Dimethoate	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Ethion	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Ethyl Parathion (Parathion)	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Etrimphos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Fenitrothion	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Fenthion	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Malathion	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Methyl Parathion	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Mevinphos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Phosalone	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Pirimiphos Methyl	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Propetamphos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Triazophos	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Organochlorine Pesticides	Aldrin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Alpha-BHC	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Beta-BHC	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Chlorothalonil	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	cis-Chlordane	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Dieldrin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Endosulphan I	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Endosulphan II	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Endosulphan sulphate	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Endrin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Gamma-BHC	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Heptachlor	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Heptachlor Epoxide	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Hexachlorobenzene	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Isodrin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	o,p'-DDE	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	o,p'-DDT	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	o,p'-Methoxychlor	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	o,p'-TDE	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	p,p'-DDE	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	p,p'-DDT	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	p,p'-Methoxychlor	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	p,p'-TDE	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Pendimethalin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Permethrin I	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Permethrin II	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Quintozene	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Tecnazene	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Telodrin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	trans-Chlordane	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Triadimefon	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Triallate	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Trifluralin	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
BTEX	Methyl Tertiary Butyl Ether	**0.02**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Benzene	**0.01**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Toluene	**0.05**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Ethyl benzene	**0.02**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	m & p Xylene	**0.03**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	o Xylene	**0.03**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
TDT	Dibutyltin	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Tributyltin	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Triphenyltin	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

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WQS
888

BH ID	BH101					BH102				BH103						BH104						BH105					
Screened Stratum	UMH	LMH		CHALK		UMH		LMH	CHALK	UMH		LMH		CHALK		UMH		LMH		CHALK		UMHX		LMH			
Date	28/08/13	04/09/13	18/10/15	28/08/13	16/10/15	28/08/13	07/10/15	04/09/13	28/08/13	29/08/03	09/10/15	29/08/13	09/10/15	29/08/13	09/10/15	28/08/13	09/10/15	04/09/13	09/10/15	28/08/13	09/10/15	29/10/14	08/10/15	30/08/13	14/11/14	08/10/15	30/08/13
Dichlorodifluoromethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Methyl Tertiary Butyl Ether	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chloromethane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Vinyl Chloride	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	**0.0011**	<0.0001	**0.0048**
Bromomethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Trichlorofluoromethane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1-Dichloroethene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Dichloromethane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
trans-1-2-Dichloroethene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1-Dichloroethane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	**0.003**	**0.008**	<0.003	**0.011**	<0.003	**0.0062**
cis-1-2-Dichloroethene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	**0.022**	**0.083**	<0.003	**0.11**	**0.01**	**0.22**
2,2-Dichloropropane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chloroform	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1-Trichloroethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	**0.014**	<0.002	**0.0056**
1,1-Dichloropropene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Carbon tetrachloride	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dichloroethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Benzene	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Trichloroethene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	**0.038**	**0.12**	<0.003	**0.15**	**0.012**	**0.11**
1,2-Dichloropropane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Dibromomethane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Bromodichloromethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
cis-1-3-Dichloropropene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Toluene	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
trans-1-3-Dichloropropene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2-Trichloroethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Tetrachloroethene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,3-Dichloropropane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Dibromochloromethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromoethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chlorobenzene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ethylbenzene	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
p/m-Xylene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Xylene	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Styrene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Bromoform	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Isopropylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1,2,2-Tetrachloroethane	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Bromobenzene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2,3-Trichloropropane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Propylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
2-Chlorotoluene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,3,5-Trimethylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
4-Chlorotoluene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
tert-Butylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2,4-Trimethylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
sec-Butylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
4-Isopropyltoluene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,3-Dichlorobenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,4-Dichlorobenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
n-Butylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2-Dichlorobenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2-Dibromo-3-chloropropane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2,4-Trichlorobenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Hexachlorobutadiene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Naphthalene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2,3-Trichlorobenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003

Key

All results reported in mg/l.

–	Not sampled/analysed
888	Exceeds Detection Limit
UMH	Upper Mineral Horizon
LMH	Lower Mineral Horizon
CHALK	Chalk
	Bailer Sample (all other results from Low Flow Sampling)

BH ID	BH105		BH106					BH108					BH201S	BH201D		FT101	FT102		FT103	BH-A	BH-B	BH-E	BH-J
Screened Stratum	CHALK		UMH	LMH		CHALK		UMH	LMH		CHALK		LMH	LMH		UMH	UMH		UMH	UMH	LMH	UMH	UMH
Date	14/11/14	08/10/15	27/08/13	27/08/13	12/10/15	27/08/13	12/10/15	08/10/15	29/10/14	08/10/15	29/10/14	08/10/15	09/10/15	29/10/14	09/10/15	29/08/13	29/08/13	08/10/15	29/08/13	09/10/15	07/10/15	12/10/15	09/10/15
Dichlorodifluoromethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Methyl Tertiary Butyl Ether	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chloromethane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Vinyl Chloride	0.0009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0042	0.0016	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bromomethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Trichlorofluoromethane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1-Dichloroethene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.01	0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.006	<0.003	<0.003	<0.003
Dichloromethane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
trans-1-2-Dichloroethene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1-Dichloroethane	0.012	0.009	<0.003	<0.003	<0.003	<0.003	<0.003	0.006	0.025	0.012	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.015	<0.003	<0.003	<0.003
cis-1-2-Dichloroethene	0.13	0.096	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.047	0.03	<0.003	<0.003	0.021	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
2,2-Dichloropropane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chloroform	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1-Trichloroethane	0.016	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.033	<0.002	<0.002	<0.002
1,1-Dichloropropene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Carbon tetrachloride	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dichloroethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Benzene	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Trichloroethene	0.17	0.11	<0.003	<0.003	<0.003	<0.003	<0.003	0.005	0.077	0.065	<0.003	<0.003	0.057	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2-Dichloropropane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Dibromomethane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Bromodichloromethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
cis-1-3-Dichloropropene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Toluene	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
trans-1-3-Dichloropropene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2-Trichloroethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Tetrachloroethene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,3-Dichloropropane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Dibromochloromethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromoethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chlorobenzene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ethylbenzene	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
p/m-Xylene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Xylene	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Styrene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Bromoform	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Isopropylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1,2,2-Tetrachloroethane	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Bromobenzene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2,3-Trichloropropane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Propylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
2-Chlorotoluene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,3,5-Trimethylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
4-Chlorotoluene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
tert-Butylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2,4-Trimethylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
sec-Butylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
4-Isopropyltoluene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,3-Dichlorobenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,4-Dichlorobenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
n-Butylbenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2-Dichlorobenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2-Dibromo-3-chloropropane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2,4-Trichlorobenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Hexachlorobutadiene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Naphthalene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2,3-Trichlorobenzene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003

Key

All results reported in mg/l.

888
UMH
LMH
CHALK

BROMATE AND BROMIDE

Hatfield Road Quarry
Groundwater Quality Data - Bromate

Borehole	Zone	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19	Aug-20	Apr-21
BHA	UMH	Bromate (mg/L)	0.01		<0.1	<0.1	<0.1						<0.0005	<0.0005				<0.0005						<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
BHB	LMH	Bromate (mg/L)	0.01		<0.1	<0.1	<0.1	0.0072	0.0033	0.0133	0.0108	0.0162	0.0186	0.0150	0.0170	0.0168	0.0178	0.0253	<0.0005	0.0234	0.0276	0.0293	0.0252	0.0280	0.0241	0.0101	0.0139	0.0233	0.0231	0.0242	0.0166	0.0172
BHC	UMH	Bromate (mg/L)	0.01		<0.1	<0.1	<0.1						<0.0005	0.0006				<0.0005						<0.0005									
BHD	UMH	Bromate (mg/L)	0.01		<0.1	<0.1												<0.0005						<0.0005	<0.0005							
BHE	UMH	Bromate (mg/L)	0.01			<0.1	<0.1						<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0112	<0.0005		
BHF	UMH	Bromate (mg/L)	0.01			<0.1	<0.1						<0.0005	<0.0005				<0.0005														
BHG	LMH	Bromate (mg/L)	0.01			<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	0.0024	<0.0005	<0.0005	<0.0005	<0.0005				<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0003
BHH	UMH	Bromate (mg/L)	0.01			<0.1	<0.1						<0.0005	<0.0005																		
BHJ	UMH	Bromate (mg/L)	0.01				<0.1						<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005													
BHK	UMH	Bromate (mg/L)	0.01				<0.1						<0.0005	<0.0005	<0.0005																	
BH101	UMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
BH101	LMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	0.0047	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0003
BH101	CHK	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0003
BH102	UMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
BH102	LMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	0.0000	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005				<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0003
BH102	CHK	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0.0006	<0.0005	<0.0005				<0.0005	0.0005	0.0005		<0.0005	0.0005	<0.0005	<0.0005	<0.0005		<0.0003
BH103	UMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
BH103	LMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003	<0.0003
BH103	CHK	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0014	0.0010	<0.0003	<0.0003
BH104	UMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005			
BH104	LMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	0.0021	0.0018	0.0009	0.0019	0.0019	<0.0005	<0.0005	0.0015	0.0008	0.0001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	0.0008	<0.0005	0.0011	0.0015	0.0012	0.0017	0.0007
BH104	CHK	Bromate (mg/L)	0.01	0.0000	0.0000	0.0000	0.0000	0.0011	0.0018	0.0039	0.0042	0.0031	0.0031	0.0032	<0.0005	0.0031	0.0027	<0.0005	0.0022	<0.0005	0.0019		0.0029	0.0028	0.0026	0.0023	0.0025	0.0025	0.0027	0.0025	0.0027	0.0025
BH105	UMH X	Bromate (mg/L)	0.01					<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0073	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
BH105	LMH	Bromate (mg/L)	0.01	0.330	0.120	0.290	0.290	0.180	0.311	0.279	0.300	0.302	0.265	0.307	0.200	0.298	0.277	0.272		0.248	0.186	0.238	0.233	0.236	0.104	0.240	0.234	0.211	0.075	0.1012	0.0982	0.1787
BH105	CHK	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	0.13	0.1205	0.0243	0.1166	0.1541	0.1180	0.1383	0.0007	0.1631	0.1820	0.1965	0.1344	0.2077	0.1220	0.1885	0.1737	0.2042	0.0066	0.1621	0.1786	0.1751	0.0934	0.1774	0.1647	
BH106	UMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005			0.0021	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	0.0054	0.0014	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
BH106	LMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0053	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003	<0.0003
BH106	CHK	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0074	<0.0005	<0.0003	<0.0003
BH107	UMH	Bromate (mg/L)	0.01					<0.0005			<0.0005	<0.0005	<0.0005	<0.0005																		
BH107	LMH	Bromate (mg/L)	0.01					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005																			<0.0003
BH107	CHK	Bromate (mg/L)	0.01					<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005																		<0.0003
BH108	UMH	Bromate (mg/L)	0.01					<0.0005			0.0129	<0.0005	<0.0005	<0.0005	<0.0005	0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	DRY	<0.0005	0.0008	<0.0005		
BH108	LMH	Bromate (mg/L)	0.01					0.0073	0.0045	0.0048	0.0490	0.0657	0.0014	0.0374	<0.0005	0.0575	0.0414	0.0409	0.0204	0.0224	<0.0005	0.0192	<0.0005	<0.0005	<0.0005	0.0013	<0.0005	0.0187	0.0209	0.0225	0.0286	0.0609
BH108	CHK	Bromate (mg/L)	0.01					0.2600	0.2826	0.2913	0.3222	0.3226	0.2846	0.3135	<0.0005	0.3027	0.2659	0.2758	0.2785	0.2746	0.265	0.2570	0.2493	0.235	0.2146	0.2299	0.2273	0.1940	0.1961	0.2149	0.1897	0.1784
BH201 L (S)	LMH	Bromate (mg/L)	0.01					0.1100	0.1542	0.1200	0.1259	0.1309	0.1123	0.1220	0.1180	0.1299	0.1188	0.1163	0.1123	0.0782	0.0862	0.1065	0.1032	0.1102	0.1702	0.0964	0.0926	0.0814	0.0408	0.0754	0.0779	<0.0003
BH201 L (D)	LMH	Bromate (mg/L)	0.01					0.0900	0.0863	0.0865	0.0860	0.0897	0.0761	0.0770	0.0650	0.0818	0.0769	0.0836						0.0762	0.0841							
FT101	UMH	Bromate (mg/L)	0.01	<0.1									<0.0005					<0.0005						<0.0005	<0.0005							
FT102	UMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1			<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005															
FT103	UMH	Bromate (mg/L)	0.01	<0.1									<0.0005																			
BH301	LMH	Bromate (mg/L)	0.01															0.0033	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0007	<0.0005	<0.0005	<0.0005	0.0011	<0.0005	<0.0003	<0.0003
BH301	CHK	Bromate (mg/L)	0.01															<0.0005	0.0012	0.0006	0.0010	<0.0005	0.0025	0.0018	0.0007	0.0008	0.0029	<0.0005	0.0024	0.0014	0.0011	0.001
BH302	LMH	Bromate (mg/L)	0.01															<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0035	0.0005	0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003	<0.0003
BH302	CHK	Bromate (mg/L)	0.01															<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0.0040	0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003	<0.0003
BH305	LMH	Bromate (mg/L)	0.01															0.557		0.579	0.653	0.623	0.609	0.454	0.560	0.603	0.563	0.531	0.496	0.517	0.487	0.468
BH305	CHK	Bromate (mg/L)	0.01															0.411		0.520	0.522	0.549	0.489	0.478	0.439			0.335	0.477	0.504	0.465	0.399
BH306	UMH	Bromate (mg/L)	0.01															<0.0005	<0.0005	0.0008	<0.0005	0.0007		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
BH307	UMH	Bromate (mg/L)	0.01															<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005								
GMW101	UMH	Bromate (mg/L)	0.01																					<0.0005								
GMW102	UMH	Bromate (mg/L)	0.01																					0.0068								
GMW103	UMH	Bromate (mg/L)	0.01																					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
GMW103 L	UMH	Bromate (mg/L)	0.01																					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
GMW104	UMH	Bromate (mg/L)	0.01															<0.0005		<0.0005	<0.0005	0.0052		<0.0005	<0.0005							
GMW105	UMH	Bromate (mg/L)	0.01																					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005		
GMW106	UMH	Bromate (mg/L)	0.01																					<0.0005								
GMW107	UMH	Bromate (mg/L)	0.01															<0.0005		<0.0005	<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0008	<0.0005		
GMW108	UMH	Bromate (mg/L)	0.01																					<0.0005								
GMW109	UMH	Bromate (mg/L)	0.01															<0.0005		<0.0005	<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
GMW110	UMH	Bromate (mg/L)	0.01																					<0.0005	<0.0005					<0.0005		
GMW111	UMH	Bromate (mg/L)	0.01																					<0.0005	<0.0005							
GMW112	UMH	Bromate (mg/L)	0.01																						<0.0005							
GMW113	UMH	Bromate (mg/L)	0.01															<0.0005						<0.0005	<0.0005							
GMW114	UMH	Bromate (mg/L)	0.01															<0.0005						<0.0005	<0.0005							

Hatfield Road Quarry
Groundwater Quality Data - Bromide

Borehole	Zone	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19	Aug-20	Apr-21
BHA	UMH	Bromide (mg/L)	-		0.100	0.210	<0.05						0.073	0.110				0.108						0.057	0.133	0.169	0.084	0.091	0.084	0.091		
BHB	LMH	Bromide (mg/L)	-		0.350	0.300	0.390	0.325	0.310	0.400	0.326	0.418	0.384	0.364	0.359	0.366	0.347	0.404	0.235	0.352	0.362	0.352	0.302	0.326	0.331	0.242	0.263	0.359	0.357	0.404	0.345	0.36
BHC	UMH	Bromide (mg/L)	-		0.150	0.680	0.140						0.158	0.181				0.129						0.128								
BHD	UMH	Bromide (mg/L)	-		<0.05	0.280												0.260						0.189	0.189							
BHE	UMH	Bromide (mg/L)	-			<0.05	<0.05						0.073	0.081	0.111	0.110	0.098	0.088	0.075	0.074	0.084	0.082	0.009	0.125	0.091	0.065	0.068	0.063	0.080	0.098		
BHF	UMH	Bromide (mg/L)	-			0.055	0.066						0.057	0.058				0.064														
BHG	LMH	Bromide (mg/L)	-			<0.05	0.110	0.118		0.088	0.064	0.139	0.150	0.132	0.094	0.072	0.143	0.207				0.166		0.102	0.086	0.087	0.130	0.143	0.179	0.187		0.080
BHH	UMH	Bromide (mg/L)	-			<0.05	<0.05						0.055	0.079																		
BHJ	UMH	Bromide (mg/L)	-				0.150						0.126	<0.005		0.184	0.210	0.227	0.204													
BHK	UMH	Bromide (mg/L)	-				0.091						0.105	0.119	0.014																	
BH101	UMH	Bromide (mg/L)	-	0.099	0.130	<0.05	0.150	0.203			0.080	0.077	0.105	0.113	0.093	0.098	0.112	0.121					0.086	0.072	0.120	0.093	0.086	0.080	0.086	0.140		
BH101	LMH	Bromide (mg/L)	-	0.120	<0.05	<0.05	0.006	0.172	0.170	0.106	0.153	0.104	0.127	0.267	0.059	0.119	0.124	0.135		0.081	0.093	0.081	0.0169	0.068	0.078	0.081	0.102	0.085	0.084	0.080		0.163
BH101	CHK	Bromide (mg/L)	-	0.120	0.110	0.098	0.066	0.158	0.150	0.148	0.064	0.142	0.136	0.145	0.136	0.135	0.124	0.134	0.105	0.145	0.144	0.145	0.171	0.144	0.152	0.138	0.149	0.135	0.137	0.157		0.145
BH102	UMH	Bromide (mg/L)	-	0.096	0.079	0.074	0.072	0.147			0.114	0.086	0.065	0.061	0.079	0.113	0.078	0.058	0.058	0.072	0.079	0.091	0.088	0.129		0.080	0.126	0.118	0.107	0.132		
BH102	LMH	Bromide (mg/L)	-	0.090	0.100	0.062	0.130	0.130		0.117	0.091	0.118	0.120	0.097	0.130	0.140	0.144	0.140				0.1280	0.151	0.186		0.118	0.165	0.153	0.139	0.133		0.166
BH102	CHK	Bromide (mg/L)	-	0.055	0.100	0.100	0.076	0.142		0.069	0.083	0.083	0.076	0.075	0.068	0.064	0.057	0.071				0.0610	0.065	0.063		0.061	0.062	0.061	0.379	0.061		0.065
BH103	UMH	Bromide (mg/L)	-	0.053	<0.05	<0.05	<0.05	0.050			0.072	0.045	0.039	0.044	0.066	0.052	0.100	0.050					0.049	0.051	0.030	0.063	0.035	0.038	1.019	0.041		
BH103	LMH	Bromide (mg/L)	-	1.200	0.370	0.350	0.380	0.294		0.930	1.002	0.884	0.832	0.771	0.837	0.548	0.685	0.970	0.919	0.638	1.063	0.810	1.046	0.966	<0.005	0.993	1.049	1.058	1.003	0.987	1	1.046
BH103	CHK	Bromide (mg/L)	-	0.440	0.380	0.340	0.380	0.397		0.070	0.411	0.405	0.372	0.394	0.412	0.149	0.342	0.047	0.343	0.099	0.394	0.393	0.369	0.372	0.393	0.332	0.411	0.408	0.054	0.442	0.396	0.407
BH104	UMH	Bromide (mg/L)	-	0.071	0.088	0.300	0.150	0.199			0.056	0.113	0.116	0.102	0.034	0.062	0.060	0.106					0.070	0.077	0.084	0.084	0.054	0.088	0.087	0.081		
BH104	LMH	Bromide (mg/L)	-	0.210	0.110	0.051	0.110	0.146	0.150	0.257	0.220	0.271	0.247	0.251	0.096	0.112	0.243	0.166	0.172	0.241	0.161	0.090	0.097	0.106	0.145	0.204	0.122	0.191	0.225	0.242	0.265	0.248
BH104	CHK	Bromide (mg/L)	-	0.260	0.320	0.000	0.180	0.180	0.190	0.352	0.371	0.340	0.296	0.344	0.083	0.330	0.314	0.112	0.322	0.146	0.384		0.365	0.354	0.334	0.350	0.354	0.346	0.340	0.381	0.302	0.275
BH105	UMH X	Bromide (mg/L)	-					0.202			0.161	0.169	0.590	0.140	0.185	0.194	0.344	0.138	0.126	0.156	0.119	0.115	0.096	0.161	0.112	0.152	0.088	0.104	0.115	0.120		
BH105	LMH	Bromide (mg/L)	-	1.100	0.520	0.140	0.890	0.619	1.047	0.830	0.991	0.910	0.869	1.001	0.692	0.915	0.840	0.893		0.788	0.833	0.775	0.788	0.808	0.858	0.773	0.794	0.778	0.000	0.484	0.408	0.63
BH105	CHK	Bromide (mg/L)	-	0.610	0.100	0.400	0.380	0.480	0.465	0.218	0.499	0.566	0.456	0.538	0.170	0.599	0.666	0.710	0.484	0.710	0.488	0.655	0.651	0.669	0.162	0.605	0.665	0.654	0.376	0.632	0.605	
BH106	UMH	Bromide (mg/L)	-	0.052	<0.05	0.063	0.062	0.170			0.074	0.071	0.059	0.063	0.042	0.096	0.076		0.057	0.069	0.061	0.064	0.102	0.035	0.056	0.046	0.057	0.059	0.069	0.055		
BH106	LMH	Bromide (mg/L)	-	0.170	0.180	0.130	0.210	0.230		0.204	0.252	0.253	0.239	0.255	0.254	0.244	0.234	0.263	0.238	0.297	0.312	0.310	0.318	0.294	0.276	0.261	0.309	0.240	0.221	0.295	0.037	0.175
BH106	CHK	Bromide (mg/L)	-	0.064	0.059	<0.05	<0.05	0.050		0.054	0.062	0.055	0.049	0.050	0.028	0.054	0.051	0.047	0.044	0.044	0.042	0.039	0.261	0.060	0.055	0.033	0.036	0.041	0.052	0.040	0.184	0.486
BH107	UMH	Bromide (mg/L)	-					0.164			0.069	0.150	0.153	0.162																		
BH107	LMH	Bromide (mg/L)	-					0.189	0.204	0.161	0.198	0.183	0.189																			0.187
BH107	CHK	Bromide (mg/L)	-					0.182		0.167	0.206	0.164	0.149	0.142																		0.146
BH108	UMH	Bromide (mg/L)	-					0.140			0.184	0.113	0.084	0.093	0.105	0.145	0.115	0.158	0.119	0.134	0.120	0.104	0.372	0.151	0.082	0.109	DRY	0.099	0.100	0.136		
BH108	LMH	Bromide (mg/L)	-					0.200	0.160	0.188	0.337	0.360	0.110	0.265	0.104	0.357	0.287	0.300	0.204	0.240	0.130	0.217	0.408	0.128	0.127	0.157	0.168	0.187	0.219	0.251	0.27	0.422
BH108	CHK	Bromide (mg/L)	-					1.060	1.095	0.929	0.956	0.938	0.888	0.954	0.095	0.881	0.825	0.876	0.742	0.805	0.818	0.765	0.800	0.738	0.718	0.723	0.788	0.715	0.626	0.680	0.637	0.62
BH201 L (S)	LMH	Bromide (mg/L)	-					0.500	0.569	0.573	0.611	0.554	0.549	0.080	0.542	0.556	0.528	1.385	0.494	0.397	0.381	0.514	0.548	0.486	0.466	0.469	0.499	0.475	0.254	0.483	0.457	0.062
BH201 L (D)	LMH	Bromide (mg/L)	-					0.370	0.383	0.397	0.421	0.416	0.359	0.391	0.323	0.373	0.394	0.409						0.378	0.371							
FT101	UMH	Bromide (mg/L)	-	0.070									0.043					0.047						0.042	0.032							
FT102	UMH	Bromide (mg/L)	-	<0.05	<0.05	<0.05	<0.05			0.033			0.042	0.041	0.031	0.034	0.029															
FT103	UMH	Bromide (mg/L)	-	<0.05									0.047																			
BH301	LMH	Bromide (mg/L)	-															0.450	0.446	0.452	0.475	0.490	0.319	0.272	0.453	0.410	0.215	0.160	0.188	0.283	0.287	0.215
BH301	CHK	Bromide (mg/L)	-															0.950	0.678	0.832	0.845	0.810	0.880	0.459	1.386	0.663	0.660	0.310	0.434	0.578	0.396	0.388
BH302	LMH	Bromide (mg/L)	-															1.794	0.087	1.079	1.745	1.478	1.875	1.963	1.821	1.976	2.280	2.223	2.052	1.994	1.373	1.238
BH302	CHK	Bromide (mg/L)	-															0.235	1.463	0.227	1.697	1.744	1.868	1.733	1.998	1.977	1.898	1.717	1.658	1.716	1.891	1.759
BH305	LMH	Bromide (mg/L)	-															1.538		1.437	1.402	1.396	1.581	1.346	1.389	1.338	1.397	1.364	1.223	1.279	1.186	1.167
BH305	CHK	Bromide (mg/L)	-															1.377		1.265	1.216	1.177	1.185	1.101	1.178			1.145	0.918	1.016	1.02	0.96
BH306	UMH	Bromide (mg/L)	-															0.077	0.100	0.113	0.125	0.109		0.160	0.108	0.096	0.087	0.081	0.091	0.087		
BH307	UMH	Bromide (mg/L)	-															0.133	0.128	0.131	0.126	0.138		0.162								
GMW101	UMH	Bromide (mg/L)	-																					0.043								
GMW102	UMH	Bromide (mg/L)	-																					0.054								
GMW103	UMH	Bromide (mg/L)	-																					<0.005	2.097	1.038	1.400	1.155	0.094	1.176		
GMW103 L	UMH	Bromide (mg/L)	-																					0.163	0.153	0.138	0.381	0.196	0.029	0.082		
GMW104	UMH	Bromide (mg/L)	-															0.080		0.120	0.138	0.288		0.078	0.053							
GMW105	UMH	Bromide (mg/L)	-																					0.207	0.223	0.062	0.116	0.122		0.065		
GMW106	UMH	Bromide (mg/L)	-																					0.080								
GMW107	UMH	Bromide (mg/L)	-															0.367		0.279	0.286			0.167	0.205	0.208	0.162	0.180	0.223	0.307		
GMW108	UMH	Bromide (mg/L)	-																					0.116								
GMW109	UMH	Bromide (mg/L)	-															0.288		0.200	0.276			0.107	0.142	0.174	0.074	0.182	0.436	0.358		
GMW110	UMH	Bromide (mg/L)	-																					0.059	0.063					0.079		
GMW111	UMH	Bromide (mg/L)	-																					0.067	0.054							
GMW112	UMH	Bromide (mg/L)	-																						0.028							
GMW113	UMH	Bromide (mg/L)	-															0.084						0.066	0.058							
GMW114	UMH	Bromide (mg/L)	-															0.040						0.010	0.077							

METALS

Hatfield Road Quarry
Groundwater Quality Data- Metals

Borehole	Aquifer	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH101	UMH	Cadmium	**0.005**	<0.00003	0.00013	0.000087	<0.00003	-	0.00023	-	-	-	-	<0.00003	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH101	UMH	Total Chromium	**0.05**	<0.0002	<0.0002	<0.0002	<0.0002	-	<0.0002	-	-	-	-	<0.0002	-	-	-	0.0059	0.0002	0.0041	0.0065	0.011	0.0094	0.014	0.0082
BH101	UMH	Copper	**2**	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH101	UMH	Total Iron	**0.2**	<0.0047	<0.0047	<0.0047	<0.0047	-	<0.0047	-	-	-	-	0.048	-	-	-	<0.0047	0.046	<0.0047	<0.0047	0.0066	<0.0047	<0.0047	0.016
BH101	UMH	Lead	**0.01**	<0.0004	0.0031	0.0015	<0.0004	-	0.0019	-	-	-	-	<0.0004	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH101	UMH	Manganese	**0.05**	0.65	-	-	-	-	-	-	-	-	-	0.012	-	-	-	0.0093	<0.0015	0.017	0.016	0.021	0.0061	0.039	<0.0015
BH101	UMH	Mercury	**0.001**	0.000034	-	-	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH101	UMH	Nickel	**0.02**	0.011	0.0087	0.0083	0.0043	-	0.0068	-	-	-	-	0.0028	-	-	-	0.0048	0.0021	0.003	0.0037	0.0021	0.0025	0.0021	0.0047
BH101	UMH	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.0012	-	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH101	UMH	Zinc (Hardness dependent)	**0.5**	0.0065	0.0081	0.0069	0.0032	-	0.0054	-	-	-	-	0.003	-	-	-	0.0024	0.0043	<0.0015	<0.0015	0.0032	0.0076	0.0031	0.0027
BH101	LMH	Cadmium	**0.005**	<0.00003	0.00014	0.000033	<0.00003	-	0.00011	0.00015	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.0005	<0.00003	<0.00003	0.00009	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH101	LMH	Total Chromium	**0.05**	<0.0002	0.0022	<0.0002	<0.0002	-	0.0024	<0.0002	<0.0002	<0.0002	0.0003	0.0021	<0.0002	0.0003	<0.0015	0.0053	0.007	<0.0002	0.0073	0.0061	0.011	0.0098	0.0092
BH101	LMH	Copper	**2**	0.0077	0.011	0.0031	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH101	LMH	Total Iron	**0.2**	0.014	1	0.02	<0.0047	-	<0.0047	0.011	<0.0047	<0.0047	<0.0047	0.023	<0.0047	<0.0047	<0.02	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	0.0088
BH101	LMH	Lead	**0.01**	<0.0004	0.0093	0.0033	0.0031	-	0.0047	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH101	LMH	Manganese	**0.05**	1.5	-	-	-	-	-	0.074	<0.0015	0.12	0.0024	<0.0015	<0.0015	0.039	0.15	<0.0015	<0.0015	<0.0015	0.0075	0.029	0.017	0.0069	0.0072
BH101	LMH	Mercury	**0.001**	<0.00001	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH101	LMH	Nickel	**0.02**	0.0047	0.0069	0.0016	0.00077	-	0.0024	0.0012	<0.0002	0.0005	0.0004	0.0007	<0.0002	0.0015	<0.002	<0.0002	0.0018	0.001	0.0006	0.0011	0.0008	0.0006	0.0002
BH101	LMH	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH101	LMH	Zinc (Hardness dependent)	**0.5**	0.029	0.013	0.0072	0.0023	-	0.0023	<0.0015	<0.0015	<0.0015	0.0021	0.004	<0.0015	<0.0015	<0.003	<0.0015	<0.0015	<0.0015	<0.0015	0.0024	<0.0015	0.0015	<0.0015
BH101	CHK	Cadmium	**0.005**	<0.00003	<0.00003	<0.00003	0.000079	-	0.00012	0.00005	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.0005	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH101	CHK	Total Chromium	**0.05**	<0.0002	<0.0002	<0.0002	0.00057	-	0.0063	0.001	<0.0002	<0.0002	<0.0002	0.0049	0.0007	0.0011	<0.0015	0.0058	0.0067	0.0015	0.0073	0.0081	0.0093	0.0088	0.0083
BH101	CHK	Copper	**2**	<0.003	<0.003	<0.003	<0.03	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH101	CHK	Total Iron	**0.2**	<0.0047	<0.0047	0.0062	<0.0047	-	<0.0047	0.0089	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.02	<0.0047	<0.0047	0.37	<0.0047	<0.0047	<0.0047	0.013	0.0075
BH101	CHK	Lead	**0.01**	<0.0004	0.0062	0.0043	0.0067	-	0.0057	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH101	CHK	Manganese	**0.05**	0.24	-	-	-	-	-	<0.0015	<0.0015	<0.0015	0.012	<0.0015	0.0021	<0.0015	<0.002	<0.0015	<0.0015	0.004	<0.0015	<0.0015	<0.0015	0.0018	<0.0015
BH101	CHK	Mercury	**0.001**	0.000019	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0015	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH101	CHK	Nickel	**0.02**	0.00043	0.0017	0.00027	<0.0002	-	<0.0002	<0.0002	<0.0002	<0.0002	0.0011	<0.0002	<0.0002	<0.0002	<0.002	<0.0002	0.0015	<0.0002	0.001	0.0003	<0.0002	0.0007	0.0008
BH101	CHK	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH101	CHK	Zinc (Hardness dependent)	**0.5**	0.0027	0.013	0.0051	<0.0015	-	0.0024	<0.0015	0.0024	0.02	0.0056	-	0.0034	<0.0015	<0.003	<0.0015	0.0021	0.0019	<0.0015	0.0017	<0.0015	0.0016	<0.0015
BH102	UMH	Cadmium	**0.005**	<0.00003	<0.00003	<0.00003	0.000079	-	<0.0005	0.00015	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.00021	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH102	UMH	Total Chromium	**0.05**	<0.0002	0.00031	0.00048	<0.0002	-	0.0071	0.0028	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0009	<0.0002	0.0051	0.0056	0.0007	<0.0002	0.0037	0.0016	0.0008	0.0011
BH102	UMH	Copper	**2**	<0.003	<0.003	<0.003	<0.003	-	<0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH102	UMH	Total Iron	**0.2**	<0.0047	0.013	0.015	0.33	-	-	<0.0047	0.013	<0.0047	0.0072	0.019	<0.0047	<0.0047	0.009	4	0.0076	<0.0047	<0.0047	0.0054	<0.0047	0.0052	0.007
BH102	UMH	Lead	**0.01**	0.00082	0.0033	0.004	0.0032	-	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH102	UMH	Manganese	**0.05**	0.062	-	-	-	-	-	0.011	<0.0015	0.0018	0.0017	0.35	0.0028	<0.0015	<0.0015	0.04	0.002	<0.0015	<0.0015	0.0094	<0.0015	0.031	0.015
BH102	UMH	Mercury	**0.001**	0.000097	-	-	-	-	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH102	UMH	Nickel	**0.02**	0.0098	0.011	0.075	0.0081	-	0.009	0.0077	0.0079	0.0098	0.011	0.019	0.013	0.014	0.018	0.02	0.013	0.016	0.021	0.019	0.019	0.023	0.022
BH102	UMH	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH102	UMH	Zinc (Hardness dependent)	**0.5**	0.012	0.12	0.2	0.016	-	0.009	0.0053	0.0076	0.0086	0.0059	0.007	0.0081	0.0065	0.0092	0.015	0.013	0.0079	0.011	0.0083	0.0086	0.017	0.011
BH102	LMH	Cadmium	**0.005**	<0.00003	<0.00003	<0.00003	<0.00003	-	<0.0005	-	-	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH102	LMH	Total Chromium	**0.05**	<0.0002	<0.0002	0.00052	0.00085	-	0.0027	-	-	-	-	<0.00003	0.0003	0.001	<0.0002	0.0004	0.0053	0.0014	0.0055	0.0079	0.0047	0.0009	0.0009
BH102	LMH	Copper	**2**	0.0068	<0.003	<0.003	<0.003	-	<0.007	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH102	LMH	Total Iron	**0.2**	<0.0047	0.04	0.025	0.0074	-	-	-	-	-	-	0.0072	<0.0047	0.0069	<0.0047	0.015	0.009	<0.0047	0.0067	0.0097	0.0092	0.014	0.022
BH102	LMH	Lead	**0.01**	<0.0004	0.0055	0.0046	0.0008	-	<0.005	-	-	-	-	<0.004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH102	LMH	Manganese	**0.05**	0.093	-	-	-	-	-	-	-	-	-	0.05	<0.0015	0.066	0.073	0.066	0.057	0.35	0.11	0.083	0.15	0.095	0.061
BH102	LMH	Mercury	**0.001**	0.000049	-	-	-	-	<0.001	-	-	-	-	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH102	LMH	Nickel	**0.02**	0.022	0.031	0.014	0.0091	-	0.025	-	-	-	-	0.024	0.0017	0.026	0.028	0.028	0.031	0.03	0.032	0.033	0.033	0.034	0.032
BH102	LMH	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.003	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH102	LMH	Zinc (Hardness dependent)	**0.5**	0.0083	0.012	0.025	0.017	-	0.005	-	-	-	-	0.0029	0.011	0.0068	0.0066	0.01	0.0096	0.0066	0.0084	0.009	0.02	0.013	0.0097

Hatfield Road Quarry
Groundwater Quality Data- Metals

Borehole	Aquifer	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH102	CHK	Cadmium	**0.005**	<0.00003	<0.00003	<0.00003	<0.00003	-	<0.0005	-	-	-	-	<0.00003	<0.00003	<0.00003	0.00019	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH102	CHK	Total Chromium	**0.05**	<0.0002	<0.0002	<0.0002	0.0013	-	0.0061	-	-	-	-	<0.0002	0.0011	<0.0002	<0.0002	0.0041	0.0092	0.0005	<0.0002	0.0033	0.0008	0.0005	0.0011
BH102	CHK	Copper	**2**	<0.003	0.0031	<0.003	<0.003	-	<0.007	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH102	CHK	Total Iron	**0.2**	<0.0047	<0.0047	0.029	0.075	-	-	-	-	-	-	<0.0047	0.0086	<0.0047	<0.0047	1.5	<0.0047	<0.0047	0.63	0.0079	0.18	0.15	<0.0047
BH102	CHK	Lead	**0.01**	0.00058	0.004	0.005	0.001	-	<0.005	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH102	CHK	Manganese	**0.05**	0.053	-	-	-	-	-	-	-	-	-	0.0075	0.057	<0.0015	0.0035	0.022	<0.0015	0.047	0.12	0.0075	0.03	0.051	0.0047
BH102	CHK	Mercury	**0.001**	0.000044	-	-	-	-	<0.001	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH102	CHK	Nickel	**0.02**	0.0043	0.017	0.025	0.036	-	0.006	-	-	-	-	0.002	0.024	0.0015	0.006	0.0067	0.0013	0.0021	0.0038	0.0016	0.0018	0.0024	0.0009
BH102	CHK	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.003	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH102	CHK	Zinc (Hardness dependent)	**0.5**	0.015	2.2	0.61	0.13	-	0.016	-	-	-	-	0.011	0.0087	0.0091	0.0097	0.021	0.0087	0.0085	0.0098	0.0082	0.0067	0.015	0.0082
BH103	UMH	Cadmium	**0.005**	<0.00003	<0.00003	<0.00003	<0.00003	-	<0.0005	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.00045	<0.00003	<0.00003	<0.00003	<0.00003	-
BH103	UMH	Total Chromium	**0.05**	<0.0002	<0.0002	<0.0002	0.0018	-	0.0047	0.0056	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0017	<0.0002	<0.0002	0.0096	<0.0002	<0.0002	<0.0002	<0.0002	0.0023	-
BH103	UMH	Copper	**2**	<0.003	<0.003	<0.003	<0.003	-	<0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-
BH103	UMH	Total Iron	**0.2**	<0.0047	<0.0047	0.0059	<0.0047	-	-	<0.0047	0.0057	<0.02	<0.0047	0.024	<0.0047	<0.0047	0.024	0.031	0.0064	0.0051	0.0084	<0.0047	<0.0047	<0.0047	-
BH103	UMH	Lead	**0.01**	<0.0004	0.0051	0.0027	0.00067	-	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	-
BH103	UMH	Manganese	**0.05**	0.19	-	-	-	-	-	<0.0015	<0.0015	0.004	0.0045	<0.0015	<0.0015	0.37	0.9	0.014	<0.0015	0.0033	0.0051	0.06	0.013	0.05	-
BH103	UMH	Mercury	**0.001**	<0.00001	-	-	-	-	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
BH103	UMH	Nickel	**0.02**	<0.0002	0.0012	0.00092	0.00091	-	<0.002	0.0004	<0.0002	0.0013	0.0007	<0.0002	0.0014	0.0045	0.0028	0.0007	<0.0002	0.001	0.0006	<0.0002	0.0006	0.0022	-
BH103	UMH	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	-
BH103	UMH	Zinc (Hardness dependent)	**0.5**	0.005	0.0025	0.0085	0.0074	-	0.004	0.0025	<0.0015	0.0061	<0.0015	0.0026	<0.0015	0.0018	<0.0015	<0.0015	<0.0015	0.0016	<0.0015	<0.0015	0.0031	<0.0015	-
BH103	LMH	Cadmium	**0.005**	0.00014	0.00012	<0.00003	<0.00003	-	0.0005	0.00037	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH103	LMH	Total Chromium	**0.05**	<0.0002	0.00033	0.00027	<0.0002	-	<0.0015	0.0077	<0.0002	0.0014	0.0005	<0.0002	0.0012	0.0029	0.0003	0.0004	0.011	0.0028	0.003	0.0003	<0.0002	0.001	0.0016
BH103	LMH	Copper	**2**	<0.003	<0.003	<0.003	<0.003	-	<0.007	0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH103	LMH	Total Iron	**0.2**	<0.0047	<0.0047	<0.0047	<0.0047	-	-	0.007	<0.0047	<0.02	0.0067	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047
BH103	LMH	Lead	**0.01**	<0.0004	0.0023	0.0077	0.0022	-	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH103	LMH	Manganese	**0.05**	9.2	-	-	-	-	-	5.6	1.8	2.7	4.9	7.4	3.8	8.6	9	9.7	9.1	7.5	9.1	8.5	8.6	8.8	8.6
BH103	LMH	Mercury	**0.001**	<0.00001	-	-	-	-	<0.001	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00008	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH103	LMH	Nickel	**0.02**	0.083	0.0089	0.011	0.0088	-	0.055	0.059	0.023	0.032	0.051	0.074	0.039	0.087	0.091	0.099	0.091	0.074	0.093	0.087	0.089	0.091	0.086
BH103	LMH	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH103	LMH	Zinc (Hardness dependent)	**0.5**	0.0091	0.003	0.0017	0.003	-	0.014	0.01	0.0028	0.0053	0.0082	0.011	0.0095	0.0099	0.027	0.012	0.011	0.0077	0.007	0.0084	0.012	0.011	0.011
BH103	CHK	Cadmium	**0.005**	0.000041	<0.00003	<0.00003	0.000068	-	<0.0005	0.00024	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	-
BH103	CHK	Total Chromium	**0.05**	<0.0002	0.00048	<0.0002	<0.0002	-	0.0069	0.0043	<0.0002	0.0009	0.0008	<0.0002	0.0004	0.0012	0.0007	0.0004	0.011	0.0064	0.0008	<0.0002	<0.0002	0.0006	-
BH103	CHK	Copper	**2**	<0.003	<0.003	<0.003	<0.003	-	<0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-
BH103	CHK	Total Iron	**0.2**	<0.0047	<0.0047	0.0054	<0.0047	-	-	0.006	0.15	<0.02	<0.0047	0.018	<0.0047	<0.0047	<0.0047	<0.0047	0.0055	<0.0047	0.0051	<0.0047	<0.0047	-	-
BH103	CHK	Lead	**0.01**	0.0028	0.0067	0.0076	0.0013	-	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	-
BH103	CHK	Manganese	**0.05**	0.15	-	-	-	-	-	0.14	0.21	0.1	0.0066	0.11	0.011	0.065	0.072	0.073	0.075	0.064	0.049	0.085	0.079	-	-
BH103	CHK	Mercury	**0.001**	0.00013	-	-	-	-	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
BH103	CHK	Nickel	**0.02**	0.0091	0.0081	0.008	0.0082	-	0.006	0.0093	0.008	0.0075	0.0008	0.0053	0.0014	0.006	0.0062	0.0066	0.0065	0.0057	0.0046	0.0064	0.0073	0.0063	-
BH103	CHK	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	-
BH103	CHK	Zinc (Hardness dependent)	**0.5**	0.0043	0.005	0.0024	0.0029	-	0.005	0.0051	0.0017	0.0065	0.0035	0.0023	0.0053	0.0019	0.019	0.0082	0.0024	<0.0015	0.0049	0.0019	0.0042	0.0027	-
BH104	UMH	Cadmium	**0.005**	<0.00003	<0.00003	<0.00003	<0.00003	-	<0.0005	-	-	-	<0.00003	<0.00003	-	-	<0.00003	<0.00003	-	-	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH104	UMH	Total Chromium	**0.05**	<0.0002	<0.0002	<0.0002	<0.0002	-	0.0042	-	-	-	0.0004	<0.0002	-	-	0.0008	<0.0002	0.0013	0.0064	0.0009	0.012	0.013	0.0012	0.0008
BH104	UMH	Copper	**2**	<0.003	<0.003	<0.003	<0.003	-	<0.007	-	-	-	<0.003	<0.003	-	-	<0.003	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003
BH104	UMH	Total Iron	**0.2**	0.0049	0.051	0.02	<0.0047	-	-	-	-	-	0.064	0.042	-	-	<0.0047	<0.0047	0.017	<0.0047	<0.0047	0.0069	<0.0047	<0.0047	0.0096
BH104	UMH	Lead	**0.01**	<0.0004	0.0032	0.00068	<0.0004	-	<0.005	-	-	-	<0.0004	<0.0004	-	-	<0.0004	<0.0004	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH104	UMH	Manganese	**0.05**	0.0022	-	-	-	-	-	-	-	-	3.7	<0.0015	-	-	<0.0015	0.0028	<0.0015	<0.0015	0.012	<0.0015	0.0077	0.0056	<0.0015
BH104	UMH	Mercury	**0.001**	0.000027	-	-	-	-	<0.001	-	-	-	<0.0005	<0.0005	-	-	<0.00001	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH104	UMH	Nickel	**0.02**	0.015	0.0015	0.0008	0.0013	-	<0.002	-	-	-	0.0059	0.0044	-	-	0.0021	0.003	-	-	0.0023	0.0045	0.0012	0.0016	0.0008
BH104	UMH	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.003	-	-	-	<0.0012	<0.0012	-	-	<0.0012	<0.0012	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH104	UMH	Zinc (Hardness dependent)	**0.5**	0.0015	0.028	0.0037	0.0037	-	0.009	-	-	-	0.0064	<0.0015	-	-	0.0028	0.0018	-	-	<0.0015	0.0022	0.003	0.0087	0.0045

Hatfield Road Quarry
Groundwater Quality Data- Metals

Borehole	Aquifer	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH104	LMH	Cadmium	**0.005**	<0.00003	<0.00003	<0.00003	<0.00003	-	<0.0005	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH104	LMH	Total Chromium	**0.05**	<0.0002	<0.0002	<0.0002	<0.0002	-	0.0062	0.0025	<0.0002	<0.0002	<0.0002	0.0051	<0.0002	0.0003	0.0009	<0.0002	<0.0002	0.007	0.0037	0.0081	0.001	0.0005	0.0007
BH104	LMH	Copper	**2**	<0.003	<0.003	<0.003	<0.003	-	<0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH104	LMH	Total Iron	**0.2**	<0.0047	<0.0047	<0.0047	<0.0047	-	-	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	0.0078
BH104	LMH	Lead	**0.01**	<0.0004	0.0039	<0.0004	<0.0004	-	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH104	LMH	Manganese	**0.05**	0.0061	-	-	-	-	-	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.0046	<0.0015	<0.0015	<0.0015	0.0041
BH104	LMH	Mercury	**0.001**	<0.00001	-	-	-	-	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH104	LMH	Nickel	**0.02**	<0.0002	<0.0002	<0.0002	0.00022	-	<0.002	<0.0002	<0.0002	0.0012	0.0004	<0.0002	0.0004	0.0003	0.0012	<0.0002	0.0006	<0.0002	0.0003	<0.0002	<0.0002	0.0011	0.0008
BH104	LMH	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH104	LMH	Zinc (Hardness dependent)	**0.5**	0.0034	0.0049	0.0023	0.0033	-	0.008	<0.0015	<0.0015	<0.0015	0.0016	<0.0015	0.0022	0.004	0.0038	<0.0015	0.0023	<0.0015	<0.0015	<0.0015	<0.0015	0.019	<0.0015
BH104	CHK	Cadmium	**0.005**	<0.00003	<0.00003	<0.00003	<0.00003	-	<0.0005	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH104	CHK	Total Chromium	**0.05**	<0.0002	0.00052	<0.0002	<0.0002	-	0.0071	<0.0002	0.0004	<0.0002	0.0002	0.005	<0.0002	0.001	<0.0002	<0.0002	<0.0002	0.0078	0.0067	0.0039	0.0004	0.0006	0.0009
BH104	CHK	Copper	**2**	<0.003	<0.003	<0.003	<0.003	-	<0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH104	CHK	Total Iron	**0.2**	<0.0047	0.012	0.022	0.023	-	-	<0.0047	0.015	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	0.0082	<0.0047	<0.0047	<0.0047	0.014	0.0062
BH104	CHK	Lead	**0.01**	<0.0004	<0.0004	0.00091	0.00098	-	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH104	CHK	Manganese	**0.05**	0.023	-	-	-	-	-	0.0047	<0.0015	<0.0015	0.0049	<0.0015	0.011	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.014	0.0033	0.012	0.0064
BH104	CHK	Mercury	**0.001**	0.000021	-	-	-	-	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH104	CHK	Nickel	**0.02**	<0.0002	0.001	0.00029	0.00037	-	<0.002	<0.0002	0.0008	0.0013	0.0013	<0.0002	0.001	0.0014	0.0021	0.0003	0.0003	0.0016	0.002	0.0013	0.0008	0.0011	0.0012
BH104	CHK	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH104	CHK	Zinc (Hardness dependent)	**0.5**	<0.0015	0.11	0.014	0.015	-	0.004	<0.0015	<0.0015	<0.0015	0.009	<0.0015	0.0067	0.003	0.0063	<0.0015	<0.0015	<0.0015	<0.0015	0.0029	0.0046	0.0028	0.0042
BH105 X	UMH	Cadmium	**0.005**	<0.00003	0.00013	0.000087	<0.00003	-	0.00023	-	-	-	-	<0.00003	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH105 X	UMH	Total Chromium	**0.05**	<0.0002	<0.0002	<0.0002	<0.0002	-	<0.0002	-	-	-	-	<0.0002	-	-	-	0.0059	0.0002	0.0041	0.0065	0.011	0.0094	0.014	0.0082
BH105 X	UMH	Copper	**2**	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105 X	UMH	Total Iron	**0.2**	<0.0047	<0.0047	<0.0047	<0.0047	-	<0.0047	-	-	-	-	0.048	-	-	-	<0.0047	0.046	<0.0047	<0.0047	0.0066	<0.0047	<0.0047	0.016
BH105 X	UMH	Lead	**0.01**	<0.0004	0.0031	0.0015	<0.0004	-	0.0019	-	-	-	-	<0.0004	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH105 X	UMH	Manganese	**0.05**	0.65	-	-	-	-	-	-	-	-	-	0.012	-	-	-	0.0093	<0.0015	0.017	0.016	0.021	0.0061	0.039	<0.0015
BH105 X	UMH	Mercury	**0.001**	0.000034	-	-	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH105 X	UMH	Nickel	**0.02**	0.011	0.0087	0.0083	0.0043	-	0.0068	-	-	-	-	0.0028	-	-	-	0.0048	0.0021	0.003	0.0037	0.0021	0.0025	0.0021	0.0047
BH105 X	UMH	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.0012	-	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH105 X	UMH	Zinc (Hardness dependent)	**0.5**	0.0065	0.0081	0.0069	0.0032	-	0.0054	-	-	-	-	0.003	-	-	-	0.0024	0.0043	<0.0015	<0.0015	0.0032	0.0076	0.0031	0.0027
BH105 X	UMH	Vanadium	**0.02**	-	-	-	-	0.0014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Cadmium	**0.005**	<0.00003	<0.00003	<0.00003	-	-	<0.0005	-	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH105	LMH	Total Chromium	**0.05**	<0.0002	0.087	0.11	-	-	0.013	-	-	-	-	0.016	0.046	0.03	0.036	-	-	-	0.017	0.018	<0.0002	0.17	0.16
BH105	LMH	Copper	**2**	<0.003	<0.003	<0.003	-	-	<0.007	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	Total Iron	**0.2**	<0.0047	<0.0047	0.0053	-	-	-	-	-	-	-	<0.0047	<0.0047	<0.0047	<0.0047	-	-	-	<0.0047	<0.0047	<0.0047	-	<0.0047
BH105	LMH	Lead	**0.01**	<0.0004	0.0031	<0.0004	-	-	<0.005	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH105	LMH	Manganese	**0.05**	0.12	-	-	-	-	-	-	-	-	-	<0.0015	0.0019	0.0016	0.0028	-	-	-	0.0077	0.037	0.0027	-	0.0078
BH105	LMH	Mercury	**0.001**	0.000041	<0.0005	-	-	-	<0.001	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.00001	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH105	LMH	Nickel	**0.02**	<0.0002	0.0003	<0.0002	-	-	<0.002	-	-	-	-	<0.0002	0.0008	<0.0002	0.0012	-	-	-	<0.0002	<0.0002	<0.0002	0.0018	0.0022
BH105	LMH	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	-	-	<0.003	-	-	-	-	<0.0012	-	<0.0012	<0.0012	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH105	LMH	Zinc (Hardness dependent)	**0.5**	0.0024	0.0056	0.009	-	-	<0.003	-	-	-	-	<0.0015	-	<0.0015	<0.0015	-	-	-	<0.0015	0.0019	0.0017	<0.0015	0.0017
BH105	CHK	Cadmium	**0.005**	0.00012	<0.00003	<0.00003	-	-	<0.0005	-	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	-	-	-	<0.00003	<0.00003	0.00015	<0.00003	<0.00003
BH105	CHK	Total Chromium	**0.05**	0.0059	0.22	0.14	-	-	0.14	-	-	-	-	0.14	0.051	0.22	0.041	-	-	-	0.046	0.028	<0.0002	0.23	0.022
BH105	CHK	Copper	**2**	<0.003	0.0089	<0.003	-	-	<0.007	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	Total Iron	**0.2**	<0.0047	0.41	<0.0047	-	-	-	-	-	-	-	<0.0047	<0.0047	<0.0047	<0.0047	-	-	-	0.031	<0.0047	0.013	-	<0.0047
BH105	CHK	Lead	**0.01**	<0.0004	0.0058	0.00069	-	-	<0.005	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH105	CHK	Manganese	**0.05**	0.3	-	-	-	-	-	-	-	-	-	<0.0015	<0.0015	0.0049	<0.0015	-	-	-	0.0032	<0.0015	<0.0015	-	<0.0015
BH105	CHK	Mercury	**0.001**	<0.00001	<0.0005	-	-	-	<0.001	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.00001	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH105	CHK	Nickel	**0.02**	0.0035	0.0023	0.00075	-	-	<0.002	-	-	-	-	<0.0002	<0.0002	0.0006	0.0012	-	-	-	<0.0002	<0.0002	0.0021	0.0012	0.0012
BH105	CHK	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	-	-	<0.003	-	-	-	-	<0.0012	-	<0.0012	<0.0012	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH105	CHK	Zinc (Hardness dependent)	**0.5**	0.0075	0.018	0.0034	-	-	<0.003	-	-	-	-	<0.0015	<0.0015	0.0017	<0.0015	-	-	-	<0.0015	<0.0015	0.0034	0.0016	0.0051

Hatfield Road Quarry
Groundwater Quality Data- Metals

Borehole	Aquifer	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH106	UMH	Cadmium	**0.005**	<0.00003	<0.00003	0.00026	0.00075	-	<0.0005	-	-	-	-	<0.00003	-	-	-	-	<0.00003	-	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH106	UMH	Total Chromium	**0.05**	<0.0002	<0.0002	<0.0002	<0.0002	-	0.0091	-	-	-	-	<0.0002	-	-	-	-	0.0067	0.0044	0.0063	0.0075	0.0004	0.012	0.0083
BH106	UMH	Copper	**2**	<0.003	<0.003	<0.003	<0.003	-	<0.007	-	-	-	-	<0.003	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003
BH106	UMH	Total Iron	**0.2**	0.0051	0.057	1.9	4.4	-	-	-	-	-	-	0.075	-	-	-	-	<0.0047	<0.0047	0.028	0.0048	0.0056	0.0063	<0.0047
BH106	UMH	Lead	**0.01**	0.0011	0.00065	0.0039	0.0058	-	<0.005	-	-	-	-	<0.0004	-	-	-	-	<0.0004	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH106	UMH	Manganese	**0.05**	0.1	-	-	-	-	-	-	-	-	-	0.013	-	-	-	-	0.0044	0.072	0.0034	<0.0015	<0.0015	0.0075	<0.0015
BH106	UMH	Mercury	**0.001**	0.000027	-	-	-	-	<0.001	-	-	-	-	<0.0005	-	-	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH106	UMH	Nickel	**0.02**	0.00093	0.00054	0.0018	0.0065	-	<0.002	-	-	-	-	<0.0002	-	-	-	-	0.0015	-	<0.0002	0.0012	0.0005	0.0019	0.0015
BH106	UMH	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.003	-	-	-	-	-	-	-	-	-	<0.0012	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH106	UMH	Zinc (Hardness dependent)	**0.5**	0.01	0.11	3	0.32	-	0.007	-	-	-	-	<0.0015	-	-	-	-	0.0023	-	0.0036	0.0045	0.0037	0.0062	0.0037
BH106	LMH	Cadmium	**0.005**	<0.00003	<0.00003	<0.00003	0.000085	-	<0.0005	0.00015	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.00015	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH106	LMH	Total Chromium	**0.05**	<0.0002	<0.0002	<0.0002	<0.0002	-	0.0064	0.0004	<0.0002	<0.0002	0.0093	0.0053	<0.0002	0.0006	0.0011	<0.0002	0.0064	<0.0002	0.0015	<0.0002	0.0072	0.014	0.0078
BH106	LMH	Copper	**2**	<0.003	<0.003	<0.003	<0.003	-	<0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH106	LMH	Total Iron	**0.2**	<0.0047	<0.0047	<0.0047	<0.0047	-	-	<0.0047	<0.0047	<0.0047	<0.0047	0.0061	<0.0047	0.0051	0.022	<0.0047	<0.0047	<0.0047	0.0054	1.3	<0.0047	<0.0047	<0.0047
BH106	LMH	Lead	**0.01**	0.0014	0.0012	0.0044	0.0082	-	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH106	LMH	Manganese	**0.05**	0.13	-	-	-	-	-	<0.0015	0.0035	0.031	<0.0015	<0.0015	<0.0015	0.0056	0.0092	0.0044	<0.0015	<0.0015	<0.0015	0.29	<0.0015	<0.0015	<0.0015
BH106	LMH	Mercury	**0.001**	<0.00001	-	-	-	-	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH106	LMH	Nickel	**0.02**	0.0012	<0.0002	0.00038	0.00053	-	<0.002	0.0011	<0.0002	0.0005	0.001	<0.0002	0.0004	0.0018	0.003	0.0015	0.0025	0.0009	0.0013	0.0033	<0.0002	0.0018	0.0009
BH106	LMH	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH106	LMH	Zinc (Hardness dependent)	**0.5**	0.0077	0.0017	0.0032	<0.0015	-	0.008	0.0026	0.0018	0.0026	0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.0029	0.0022	0.004	0.0018
BH106	CHK	Cadmium	**0.005**	<0.00003	<0.00003	<0.00003	0.00015	-	<0.0005	0.00014	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH106	CHK	Total Chromium	**0.05**	<0.0002	<0.0002	<0.0002	0.00024	-	0.0033	0.001	<0.0002	<0.0002	<0.0002	0.0049	0.0011	0.0002	<0.0002	0.0005	0.007	0.0099	0.0068	0.01	0.0065	0.0083	0.0083
BH106	CHK	Copper	**2**	<0.003	<0.003	0.016	<0.003	-	<0.007	0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH106	CHK	Total Iron	**0.2**	0.0075	<0.0047	0.012	0.7	-	-	0.49	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047
BH106	CHK	Lead	**0.01**	<0.0004	0.00084	0.004	0.004	-	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH106	CHK	Manganese	**0.05**	0.06	-	-	-	-	-	0.22	0.0096	0.012	0.0097	<0.0015	0.0028	0.0046	0.043	0.0083	0.015	<0.0015	0.0017	<0.0015	0.0073	0.0023	0.011
BH106	CHK	Mercury	**0.001**	0.00037	-	-	-	-	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	0.0073	<0.0005	<0.0005	<0.00001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH106	CHK	Nickel	**0.02**	0.00092	0.0045	0.0035	0.0018	-	<0.002	0.0027	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.0014	0.0006	<0.0002	0.0009	<0.0002	0.0005	0.0007	<0.0002	0.0006	0.0012
BH106	CHK	Selenium	**0.01**	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH106	CHK	Zinc (Hardness dependent)	**0.5**	0.0025	3.3	7.1	0.078	-	0.014	0.065	0.0104	0.014	0.0099	-	0.014	0.0063	0.0087	0.0084	0.0073	0.004	0.0048	0.0061	0.012	0.0071	0.0075
BH107	UMH	Cadmium	**0.005**	-	-	-	-	-	<0.0005	-	-	-	-	<0.0003	-	<0.00003	0.00004	-	-	-	-	-	-	-	
BH107	UMH	Total Chromium	**0.05**	-	-	-	-	-	0.0053	-	-	-	-	<0.0002	-	0.0002	<0.0002	-	-	-	-	-	-	-	
BH107	UMH	Copper	**2**	-	-	-	-	-	<0.007	-	-	-	-	<0.003	-	<0.003	<0.003	-	-	-	-	-	-	-	
BH107	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.013	-	<0.0047	<0.0047	-	-	-	-	-	-	-	
BH107	UMH	Lead	**0.01**	-	-	-	-	-	<0.005	-	-	-	-	<0.0004	-	<0.0004	<0.0004	-	-	-	-	-	-	-	
BH107	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	0.079	-	0.26	0.4	-	-	-	-	-	-	-	
BH107	UMH	Mercury	**0.001**	-	-	-	-	-	<0.001	-	-	-	-	<0.0005	-	<0.0005	<0.0005	-	-	-	-	-	-	-	
BH107	UMH	Nickel	**0.02**	-	-	-	-	-	0.003	-	-	-	-	0.0012	-	0.0031	0.004	-	-	-	-	-	-	-	
BH107	UMH	Selenium	**0.01**	-	-	-	-	-	<0.003	-	-	-	-	<0.0012	-	<0.0012	<0.0012	-	-	-	-	-	-	-	
BH107	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	0.075	-	-	-	-	0.016	-	0.026	0.03	-	-	-	-	-	-	-	
BH107	LMH	Cadmium	**0.005**	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	LMH	Total Chromium	**0.05**	-	-	-	-	-	<0.0015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	LMH	Copper	**2**	-	-	-	-	-	<0.007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	LMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	LMH	Lead	**0.01**	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	LMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	LMH	Mercury	**0.001**	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	LMH	Nickel	**0.02**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	LMH	Selenium	**0.01**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	LMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- Metals

Borehole	Aquifer	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH107	CHK	Cadmium	**0.005**	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	CHK	Total Chromium	**0.05**	-	-	-	-	-	<0.0015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	CHK	Copper	**2**	-	-	-	-	-	<0.007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	CHK	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	CHK	Lead	**0.01**	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	CHK	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	CHK	Mercury	**0.001**	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	CHK	Nickel	**0.02**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	CHK	Selenium	**0.01**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH107	CHK	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH108	UMH	Cadmium	**0.005**	-	-	-	-	-	0.0007	-	-	-	-	0.00033	<0.00003	0.0011	<0.00003	0.00054	0.00018	<0.00003	0.00077	DRY	0.0015	<0.00003	0.00092
BH108	UMH	Total Chromium	**0.05**	-	-	-	-	-	0.18	-	-	-	-	<0.0002	0.19	0.29	0.22	0.2	0.22	0.22	0.29	DRY	0.26	0.29	0.3
BH108	UMH	Copper	**2**	-	-	-	-	-	<0.007	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	DRY	0.006	<0.003	<0.003
BH108	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	DRY	0.84	-	0.0064
BH108	UMH	Lead	**0.01**	-	-	-	-	-	<0.005	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	DRY	<0.0004	<0.0004	<0.0004
BH108	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	0.033	0.0063	0.12	0.038	0.04	0.039	0.033	0.082	DRY	0.23	-	0.11
BH108	UMH	Mercury	**0.001**	-	-	-	-	-	<0.001	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.00001	<0.0005	<0.0005	<0.0005	<0.0005	DRY	<0.0005	<0.0005	<0.0005
BH108	UMH	Nickel	**0.02**	-	-	-	-	-	0.003	-	-	-	-	0.0005	0.0013	0.0052	0.003	0.0022	0.0019	0.0018	0.0047	DRY	0.0072	0.0044	0.0061
BH108	UMH	Selenium	**0.01**	-	-	-	-	-	<0.003	-	-	-	-	<0.0012	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	DRY	<0.0012	<0.0012	<0.0012
BH108	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	0.032	-	-	-	-	0.0071	0.0021	0.005	0.0052	0.0033	0.0039	0.0043	0.0086	DRY	0.016	0.0053	0.0094
BH108	LMH	Cadmium	**0.005**	-	-	-	-	-	0.0094	-	-	-	-	0.0055	0.0091	0.0094	0.0084	0.011	0.012	<0.00003	0.012	0.011	0.012	0.0086	0.0085
BH108	LMH	Total Chromium	**0.05**	-	-	-	-	-	0.58	-	-	-	-	0.38	0.57	0.59	0.56	0.68	0.71	0.0098	0.6	0.57	0.6	0.42	0.41
BH108	LMH	Copper	**2**	-	-	-	-	-	<0.007	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	-	<0.0047
BH108	LMH	Lead	**0.01**	-	-	-	-	-	<0.005	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH108	LMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	0.32	0.54	0.54	0.48	0.7	0.78	0.0036	0.77	0.72	0.78	-	0.63
BH108	LMH	Mercury	**0.001**	-	-	-	-	-	<0.001	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.00001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH108	LMH	Nickel	**0.02**	-	-	-	-	-	0.017	-	-	-	-	0.012	0.019	0.02	0.018	0.024	0.026	0.0009	0.025	0.025	0.029	0.021	0.023
BH108	LMH	Selenium	**0.01**	-	-	-	-	-	<0.003	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH108	LMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	0.024	-	-	-	-	0.015	0.029	0.027	0.023	0.034	0.037	0.0016	0.046	0.042	0.034	0.021	0.023
BH108	CHK	Cadmium	**0.005**	-	-	-	-	-	<0.0005	-	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.011	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH108	CHK	Total Chromium	**0.05**	-	-	-	-	-	<0.0015	-	-	-	-	0.0006	0.0024	0.0023	0.0012	0.0011	0.0062	0.59	0.0031	0.0021	0.12	0.017	0.016
BH108	CHK	Copper	**2**	-	-	-	-	-	<0.007	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.016	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	-	<0.0047
BH108	CHK	Lead	**0.01**	-	-	-	-	-	<0.005	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH108	CHK	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0015	0.0031	<0.0015	<0.0015	<0.0015	0.0022	0.72	0.0033	0.007	0.0043	-	0.011
BH108	CHK	Mercury	**0.001**	-	-	-	-	-	<0.001	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.00001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH108	CHK	Nickel	**0.02**	-	-	-	-	-	<0.002	-	-	-	-	<0.0002	<0.0002	<0.0002	0.0008	<0.0002	<0.0002	0.026	<0.0002	<0.0002	<0.0002	0.0011	0.0019
BH108	CHK	Selenium	**0.01**	-	-	-	-	-	<0.003	-	-	-	-	<0.0012	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH108	CHK	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	<0.003	-	-	-	-	<0.0015	0.0043	<0.0015	<0.0015	<0.0015	0.0018	0.035	<0.0015	<0.0015	0.0023	0.0022	0.0029
BH201 S	LMH	Cadmium	**0.005**	-	-	-	-	-	<0.0005	-	-	-	-	<0.00003	<0.00003	-	<0.00003	-	-	-	<0.00003	<0.00003	0.00004	<0.00003	<0.00003
BH201 S	LMH	Total Chromium	**0.05**	-	-	-	-	-	<0.0015	-	-	-	-	<0.0002	0.017	-	0.0013	-	-	-	0.0017	0.0037	<0.0002	0.043	0.015
BH201 S	LMH	Copper	**2**	-	-	-	-	-	<0.007	-	-	-	-	<0.003	<0.003	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003
BH201 S	LMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	<0.0047	<0.0047	-	<0.0047	-	-	-	<0.0047	<0.0047	<0.0047	-	<0.0047
BH201 S	LMH	Lead	**0.01**	-	-	-	-	-	<0.005	-	-	-	-	<0.0004	<0.005	-	<0.0004	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH201 S	LMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0015	<0.0015	-	0.0028	-	-	-	<0.0015	0.0015	0.0023	-	0.011
BH201 S	LMH	Mercury	**0.001**	-	-	-	-	-	<0.001	-	-	-	-	<0.0005	<0.0005	-	<0.00001	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH201 S	LMH	Nickel	**0.02**	-	-	-	-	-	<0.002	-	-	-	-	<0.0002	0.0008	-	<0.0002	-	-	-	<0.0002	<0.0002	<0.0002	0.0022	0.0014
BH201 S	LMH	Selenium	**0.01**	-	-	-	-	-	<0.003	-	-	-	-	<0.0012	0.0019	-	<0.0012	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH201 S	LMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	0.006	-	-	-	-	<0.0015	-	-	<0.0015	-	-	-	0.0045	0.0037	0.0036	0.0025	0.0022

Hatfield Road Quarry
Groundwater Quality Data- Metals

Borehole	Aquifer	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH201 D	LMH	Cadmium	**0.005**	-	-	-	-	-	<0.0005	-	-	-	-	-	-	<0.00003	-	-	-	-	-	-	-		
BH201 D	LMH	Total Chromium	**0.05**	-	-	-	-	-	0.0027	-	-	-	-	-	-	0.0016	-	-	-	-	-	-	-		
BH201 D	LMH	Copper	**2**	-	-	-	-	-	<0.007	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-		
BH201 D	LMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	-	-	<0.0047	-	-	-	-	-	-	-		
BH201 D	LMH	Lead	**0.01**	-	-	-	-	-	<0.005	-	-	-	-	-	-	<0.0004	-	-	-	-	-	-	-		
BH201 D	LMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	<0.0015	-	-	-	-	-	-	-		
BH201 D	LMH	Mercury	**0.001**	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-		
BH201 D	LMH	Nickel	**0.02**	-	-	-	-	-	<0.002	-	-	-	-	-	-	0.0009	-	-	-	-	-	-	-		
BH201 D	LMH	Selenium	**0.01**	-	-	-	-	-	<0.003	-	-	-	-	-	-	<0.0012	-	-	-	-	-	-	-		
BH201 D	LMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	0.004	-	-	-	-	-	-	<0.0015	-	-	-	-	-	-	-		
BH301	LMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	<0.00003	<0.0005	<0.00003	<0.00003	<0.00003	<0.00003	-	<0.00003	<0.00003	<0.00003
BH301	LMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	<0.0002	0.001	<0.0015	0.0007	<0.0002	0.001	0.0028	-	0.0066	0.0067	0.0054
BH301	LMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.007	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH301	LMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.092	<0.0047	<0.0047	<0.02	0.091	<0.0047	<0.0047	0.0094	-	<0.0047	-	0.015
BH301	LMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	-	<0.0004	<0.0004	<0.0004
BH301	LMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	0.96	0.52	0.38	0.13	0.084	0.02	0.03	0.036	-	0.013	-	0.032
BH301	LMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005
BH301	LMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.004	0.0085	0.0055	0.006	0.0021	0.0026	0.0016	0.0004	-	<0.0002	0.0015	0.0015
BH301	LMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.0012	<0.0012	<0.0012
BH301	LMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	<0.0015	0.0053	<0.0015	<0.003	<0.0015	0.0017	<0.0015	<0.0015	-	<0.0015	<0.0015	<0.0015
BH301	CHK	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.00035	<0.00003	-	<0.00003	<0.00003	<0.00003
BH301	CHK	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	<0.0002	0.0021	<0.0002	<0.0002	0.0004	<0.0002	0.0014	-	0.005	0.0069	0.0071
BH301	CHK	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH301	CHK	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.011	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	0.016	-	0.01	<0.0047	0.0077
BH301	CHK	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	-	<0.0004	<0.0004	<0.0004
BH301	CHK	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	0.38	0.32	0.31	0.25	0.2	0.019	0.098	0.075	-	0.048	0.0086	0.01
BH301	CHK	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	0.00002	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005
BH301	CHK	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.003	0.0048	0.0044	0.0032	0.0028	0.0015	0.0029	0.0012	-	0.001	0.0017	0.0016
BH301	CHK	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.0012	<0.0012	<0.0012
BH301	CHK	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	0.0033	0.0045	0.0042	0.0045	<0.0015	0.0031	0.0046	0.002	-	<0.0015	0.002	<0.0015
BH302	LMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.0019	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH302	LMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	<0.0002	0.0016	0.0005	<0.0002	<0.0002	<0.0002	0.0011	<0.0002	<0.0002	0.0005	<0.0002
BH302	LMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	0.006	<0.003	0.02	<0.003	0.006	<0.003	<0.003	0.008	0.004
BH302	LMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	26	<0.0047	25	26	29	32	13	33	33	30	37	32
BH302	LMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH302	LMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	2.5	1.1	2.6	2.4	2.6	2.8	2.6	2.7	2.7	2.7	2.7	2.6
BH302	LMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.00001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH302	LMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.0089	0.0089	0.011	0.01	0.016	0.013	0.01	0.0091	0.011	0.012	0.011	0.012
BH302	LMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH302	LMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	0.006	0.0036	0.006	0.0054	0.007	0.0085	0.0039	0.0067	0.0061	0.0038	0.0067	0.0057
BH302	CHK	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.00018	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH302	CHK	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	<0.0002	0.0003	0.0005	<0.0002	0.0005	<0.0002	0.0004	<0.0002	0.0004	0.0003	0.0004
BH302	CHK	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH302	CHK	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	8	12	7.4	6.6	6.2	6.8	0.039	6.3	5.4	7.4	6.6	6.2
BH302	CHK	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	0.0006	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH302	CHK	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	0.69	0.55	0.64	0.64	0.66	0.72	0.61	0.62	0.66	0.75	0.7	0.66
BH302	CHK	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.00001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH302	CHK	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	-	0.0034	0.02	0.022	0.023	0.023	0.015	0.019	0.021	0.019	0.02	0.022
BH302	CHK	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH302	CHK	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	<0.0015	0.0074	0.0031	0.0027	0.0028	0.0042	0.0017	0.0024	0.0018	<0.0015	0.0024	0.0025

Hatfield Road Quarry
Groundwater Quality Data- Metals

Borehole	Aquifer	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH305	LMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH305	LMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	0.0006	0.0006	0.0017	0.0011	-	-	-	0.0073	0.0078	0.017	0.0073	0.0011
BH305	LMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003
BH305	LMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.037	<0.0047	<0.0047	<0.0047	-	-	-	<0.0047	<0.0047	<0.0047	-	<0.0047
BH305	LMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH305	LMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	0.041	0.081	0.04	0.065	-	-	-	0.033	0.038	0.013	-	0.097
BH305	LMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.00001	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH305	LMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.0003	0.0015	0.0006	0.0009	-	-	-	<0.0002	<0.0002	<0.0002	0.0015	0.0019
BH305	LMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH305	LMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	0.0029	0.0051	<0.0015	0.0016	-	-	-	0.0025	<0.0015	<0.0015	0.0039	<0.0015
BH305	CHK	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	-	-	-	-	-	<0.00003	<0.00003	<0.00003
BH305	CHK	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	0.0003	0.0006	0.0014	<0.0002	-	-	-	-	-	0.0007	0.0087	0.0087
BH305	CHK	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003
BH305	CHK	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.0057	<0.0047	<0.0047	<0.0047	-	-	-	-	-	<0.0047	-	<0.0047
BH305	CHK	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	-	-	-	-	-	<0.0004	<0.0004	<0.0004
BH305	CHK	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	0.01	0.081	0.067	<0.0015	-	-	-	-	-	0.014	-	0.005
BH305	CHK	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.00001	-	-	-	-	-	<0.0005	<0.0005	<0.0005
BH305	CHK	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.0008	0.0015	0.0013	0.0004	-	-	-	-	-	0.0015	0.0007	0.0007
BH305	CHK	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	-	<0.0012	<0.0012	<0.0012
BH305	CHK	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	0.003	0.0051	0.0038	<0.0015	-	-	-	-	-	<0.0015	0.003	0.0022
BH306	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
BH306	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	0.0008	0.0009	0.0006	-	-	-	0.0008	0.0009	0.0044	0.0009	0.0006
BH306	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	<0.0047	<0.0047	<0.0047	<0.0047	-	-	-	<0.0047	0.33	0.0071	-	<0.0047
BH306	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BH306	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	0.1	0.045	0.21	0.15	-	-	-	0.24	0.4	0.3	-	0.37
BH306	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.00001	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH306	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.0005	0.0008	0.0014	0.0011	-	-	-	0.0004	0.0016	0.001	0.002	0.002
BH306	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	0.0014	<0.0012	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BH306	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	<0.0015	<0.0015	<0.0015	<0.0015	-	-	-	0.002	0.0036	0.0026	0.0052	0.0025
BH307	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003	-	-	-	-	DRY	-	-	-
BH307	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	<0.0002	0.001	0.0009	-	-	-	-	DRY	-	-	-
BH307	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	DRY	-	-	-
BH307	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.0098	<0.0047	<0.0047	0.0062	-	-	-	-	DRY	-	-	-
BH307	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	-	-	-	-	DRY	-	-	-
BH307	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	2.2	0.88	0.61	0.32	-	-	-	-	DRY	-	-	-
BH307	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.00001	-	-	-	-	DRY	-	-	-
BH307	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.0024	0.0038	0.003	0.0032	-	-	-	-	DRY	-	-	-
BH307	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	-	-	-	-	DRY	-	-	-
BH307	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	0.0026	0.0042	0.0026	0.003	-	-	-	-	DRY	-	-	-
GMW 102	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	-	-	-	<0.00003	-	-	-	-	-	-
GMW 102	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	0.0011	-	-	-	<0.0002	-	-	-	-	-	-
GMW 102	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	-	-	-
GMW 102	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.71	<0.0047	-	-	-	0.012	-	-	-	-	-	-
GMW 102	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	-	-	-	<0.0004	-	-	-	-	-	-
GMW 102	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	2.7	2.1	-	-	-	0.0016	-	-	-	-	-	-
GMW 102	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-
GMW 102	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.0023	0.0026	-	-	-	0.0009	-	-	-	-	-	-
GMW 102	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	-	-	-	<0.0012	-	-	-	-	-	-
GMW 102	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	0.0053	0.0044	-	-	-	0.0025	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Metals

Borehole	Aquifer	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
GMW 103	LMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	<0.00003	-	<0.00003	<0.00003	<0.00003	<0.00003	-	0.00045	<0.00003	-	<0.00003	<0.00003	<0.00003
GMW 103	LMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	0.0046	<0.0002	0.001	0.0002	<0.0002	<0.0002	-	<0.0002	<0.0002	-	0.0005	0.007	<0.0002
GMW 103	LMH	Copper	**2**	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	<0.003
GMW 103	LMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	<0.0047	0.01	0.0065	<0.0047	<0.0047	<0.0047	-	0.0062	0.0056	-	<0.0047	-	0.2
GMW 103	LMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	-	<0.0004	<0.0004	-	<0.0004	<0.0004	<0.0004
GMW 103	LMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	4.4	1.4	0.21	0.0024	<0.0015	<0.0015	-	<0.0015	0.0028	-	<0.0015	-	0.95
GMW 103	LMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.00001	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005
GMW 103	LMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	0.01	0.0093	0.001	<0.0002	<0.0002	0.0002	-	0.0008	0.0003	-	<0.0002	<0.0002	0.0049
GMW 103	LMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	-	<0.0012	<0.0012	-	<0.0012	<0.0012	<0.0012
GMW 103	LMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	0.013	0.0024	0.0027	<0.0015	<0.0015	<0.0015	-	<0.0015	0.0018	-	<0.0015	<0.0015	0.0027
GMW 103	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	<0.00003	-	-	<0.00003	-	-	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
GMW 103	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	<0.0002	<0.0002	0.001	-	-	0.0002	-	-	0.0004	<0.0002	0.0004	<0.0002	0.0006
GMW 103	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003
GMW 103	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	<0.0047	0.15	0.0065	-	-	1.2	-	-	0.33	0.053	1.1	0.85	0.0049
GMW 103	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	<0.0004	-	-	<0.0004	-	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
GMW 103	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	6.3	1.5	0.21	-	-	2.1	-	-	0.96	0.35	0.95	1	0.0018
GMW 103	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	-	-	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
GMW 103	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	0.011	0.0099	0.001	-	-	0.013	-	-	0.0044	0.0027	0.0081	0.005	0.0003
GMW 103	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	-	-	<0.0012	-	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
GMW 103	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	0.0071	0.0044	0.0027	-	-	0.0047	-	-	0.0027	<0.0015	<0.0015	0.0036	0.0021
GMW 104	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	<0.00003	-	<0.00003	<0.00003	<0.00003	-	<0.00003	0.00006	-	-	-	-	-
GMW 104	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	<0.0002	-	0.0003	0.0008	<0.0002	-	0.0006	<0.0002	-	-	-	-	-
GMW 104	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	-	-	-	-	-
GMW 104	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	0.091	-	<0.0047	0.005	0.0048	-	<0.0047	<0.0047	-	-	-	-	-
GMW 104	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	<0.0004	-	<0.0004	<0.0004	<0.0004	-	<0.0004	<0.0004	-	-	-	-	-
GMW 104	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	4.8	-	0.38	1.8	1.7	-	0.0086	<0.0015	-	-	-	-	-
GMW 104	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	<0.0005	-	<0.0005	<0.0005	<0.00001	-	<0.0005	<0.0005	-	-	-	-	-
GMW 104	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	0.0052	-	0.0022	0.0037	0.0054	-	0.0008	0.0018	-	-	-	-	-
GMW 104	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	<0.0012	-	<0.0012	<0.0012	<0.0012	-	<0.0012	<0.0012	-	-	-	-	-
GMW 104	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	0.0042	-	0.006	0.0017	0.0034	-	0.0022	<0.0015	-	-	-	-	-
GMW 105	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	-	<0.00003	-	-	-	-	<0.00003	-	<0.00003	-	<0.00003
GMW 105	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	-	0.001	-	-	-	-	<0.0002	-	<0.0002	-	0.0043
GMW 105	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	-	0.004	-	-	-	-	<0.003	-	<0.003	-	<0.003
GMW 105	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	2.8	-	<0.0047	-	-	-	-	<0.0047	-	1.6	-	0.11
GMW 105	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	-	<0.0004	-	-	-	-	<0.0004	-	<0.0004	-	<0.0004
GMW 105	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	2.8	-	0.084	-	-	-	-	0.09	-	1.2	-	0.45
GMW 105	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	<0.0005	-	<0.0005
GMW 105	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.0044	-	0.012	-	-	-	-	0.0039	-	0.011	-	0.0036
GMW 105	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	-	<0.0012	-	-	-	-	<0.0012	-	<0.0012	-	<0.0012
GMW 105	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	0.0061	-	0.0057	-	-	-	-	0.0022	-	0.0029	-	0.0074
GMW 106	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	-	-	-	-	<0.00003	-	-	-	-	-	-
GMW 106	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	0.0066	<0.0002	-	-	-	-	0.0005	-	-	-	-	-	-
GMW 106	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-
GMW 106	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	<0.0047	<0.0047	-	-	-	-	<0.0047	-	-	-	-	-	-
GMW 106	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	-	-	-	-	<0.0004	-	-	-	-	-	-
GMW 106	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	0.016	0.0071	-	-	-	-	<0.0015	-	-	-	-	-	-
GMW 106	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	-
GMW 106	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	<0.0002	<0.0002	-	-	-	-	<0.0002	-	-	-	-	-	-
GMW 106	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	-	-	-	-	<0.0012	-	-	-	-	-	-
GMW 106	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	0.0041	<0.0015	-	-	-	-	0.0018	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Metals

Borehole	Aquifer	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
GMW 107	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	<0.00003	-	<0.00003	<0.00003	-	<0.00003	-	0.00017	<0.00003	-	<0.00003	<0.00003	<0.00003
GMW 107	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	<0.0002	-	<0.0002	0.0012	-	<0.0002	-	<0.0002	0.0021	-	0.0003	<0.0002	0.0034
GMW 107	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	<0.003	-	<0.003	<0.003	-	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	<0.003
GMW 107	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	0.22	-	0.021	<0.0047	-	<0.0047	-	<0.0047	0.0094	-	0.014	-	0.019
GMW 107	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	<0.0004	-	<0.0004	<0.0004	-	<0.0004	-	<0.0004	<0.0004	-	<0.0004	<0.0004	<0.0004
GMW 107	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	0.59	-	0.028	0.076	-	<0.0015	-	0.029	0.019	-	0.003	-	0.01
GMW 107	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	<0.0005	-	<0.0005	<0.0005	-	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005
GMW 107	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	0.0009	-	0.001	0.0008	-	0.0008	-	0.0012	<0.0002	-	<0.0002	0.0011	<0.0002
GMW 107	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	<0.0012	-	<0.0012	<0.0012	-	<0.0012	-	<0.0012	<0.0012	-	<0.0012	<0.0012	<0.0012
GMW 107	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	<0.0015	-	0.0051	<0.0015	-	<0.0015	-	<0.0015	<0.0015	-	<0.0015	<0.0015	<0.0015
GMW 109	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	<0.00003	-	<0.00003	<0.00003	-	<0.00003	-	0.00031	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
GMW 109	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	<0.0002	-	<0.0002	0.0012	-	<0.0002	-	<0.0002	0.0055	0.013	<0.0002	<0.0002	<0.0002
GMW 109	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	<0.003	-	<0.003	<0.003	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
GMW 109	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	0.042	-	<0.0047	<0.0047	-	<0.0047	-	<0.0047	0.014	<0.0047	<0.0047	-	0.011
GMW 109	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	<0.0004	-	<0.0004	<0.0004	-	<0.0004	-	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
GMW 109	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	0.028	-	0.0038	<0.0015	-	<0.0015	-	0.057	<0.0015	<0.0015	<0.0015	-	0.011
GMW 109	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	<0.0005	-	<0.0005	<0.0005	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
GMW 109	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	0.0007	-	0.0006	0.0014	-	<0.0002	-	0.0011	0.0007	<0.0002	<0.0002	0.0004	0.0004
GMW 109	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	<0.0012	-	<0.0012	<0.0012	-	<0.0012	-	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
GMW 109	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	0.0034	-	<0.0015	<0.0015	-	<0.0015	-	<0.0015	0.0018	0.0015	<0.0015	<0.0015	0.008
GMW 110	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	-	-	-	-	-	-	-	-	-	-	-
GMW 110	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-	-	-	-
GMW 110	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-
GMW 110	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.013	-	-	-	-	-	-	-	-	-	-	-
GMW 110	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	-	-	-	-	-	-	-	-	-
GMW 110	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	0.34	-	-	-	-	-	-	-	-	-	-	-
GMW 110	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-
GMW 110	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.0014	-	-	-	-	-	-	-	-	-	-	-
GMW 110	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	-	-	-	-	-	-	-	-	-	-	-
GMW 110	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	<0.0015	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	<0.0047	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	0.04	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	0.0036	-	-	-	-	-	-	-	-	-	-	-
GMW 113	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	-	-	0.00016	<0.00003	<0.00003	0.00025	-	-	-	-	-
GMW 113	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	<0.0002	0.0005	-	-	<0.0002	<0.0002	<0.0002	<0.0002	-	-	-	-	-
GMW 113	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
GMW 113	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	<0.0047	0.042	-	-	0.0061	0.34	<0.0047	<0.0047	-	-	-	-	-
GMW 113	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	-	-	<0.0004	<0.0004	<0.0004	<0.0004	-	-	-	-	-
GMW 113	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	0.0049	0.0026	-	-	0.0026	0.0033	0.024	0.0045	-	-	-	-	-
GMW 113	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	-	-	<0.0012	<0.0012	<0.0005	<0.0005	-	-	-	-	-
GMW 113	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	0.0037	<0.0015	-	-	<0.0015	<0.0015	0.0011	0.0003	-	-	-	-	-
GMW 113	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	<0.0005	<0.0005	<0.0012	<0.0012	-	-	-	-	-
GMW 113	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	0.64	0.13	-	-	0.18	0.77	0.0019	0.0017	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Metals

Borehole	Aquifer	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
GMW 114	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	<0.00003	-	<0.00003	<0.00003	0.00036	-	-	-	-	-
GMW 114	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	0.0007	<0.0002	-	<0.0002	<0.0002	<0.0002	-	-	-	-	-
GMW 114	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	0.004	0.003	-	0.004	<0.003	0.005	-	-	-	-	-
GMW 114	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.041	0.16	0.024	-	0.03	0.037	0.032	-	-	-	-	-
GMW 114	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	<0.0004	-	<0.0004	<0.0004	<0.0004	-	-	-	-	-
GMW 114	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	0.12	0.07	0.069	-	0.018	0.024	0.026	-	-	-	-	-
GMW 114	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-	-	-	-	-
GMW 114	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.0046	-	0.0055	-	0.0057	0.0059	0.0098	-	-	-	-	-
GMW 114	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	-	<0.0012	<0.0012	<0.0012	-	-	-	-	-
GMW 114	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	0.0032	0.015	0.005	-	0.0036	0.0043	0.0044	-	-	-	-	-
FT101	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	-	-	-	<0.00003	<0.00003	<0.00003	-	-	-	-	-
FT101	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	0.0059	<0.0002	0.0076	-	-	-	-	-
FT101	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	0.004	<0.003	<0.003	-	-	-	-	-
FT101	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	<0.0047	-	-	-	<0.0047	<0.0047	<0.0047	-	-	-	-	-
FT101	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	-	<0.0004	<0.0004	<0.0004	-	-	-	-	-
FT101	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0015	-	-	-	0.022	<0.0015	<0.0015	-	-	-	-	-
FT101	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	-	-	-	-	-
FT101	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	0.0005	<0.0002	<0.0002	-	-	-	-	-
FT101	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	-	-	-	<0.0012	<0.0012	<0.0012	-	-	-	-	-
FT101	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	<0.0015	-	-	-	<0.0015	<0.0015	<0.0015	-	-	-	-	-
FT 102	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00022	-	-	-	-	-	-	-	-
FT 102	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-
FT 102	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-
FT 102	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-
FT 102	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	-	-	-	-	-	-
FT 102	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	0.078	-	-	-	-	-	-	-	-
FT 102	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-
FT 102	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0059	-	-	-	-	-	-	-	-
FT 102	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0012	-	-	-	-	-	-	-	-
FT 102	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	0.014	-	-	-	-	-	-	-	-
BHA	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	-	<0.00003	<0.0005	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.00037
BHA	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	-	0.0008	<0.0015	0.0007	0.0007	0.0015	<0.0002	<0.0002	0.0086	0.011	0.002
BHA	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	-	<0.003	<0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BHA	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.007	-	0.014	0.35	<0.0047	<0.0047	0.066	0.015	<0.0047	<0.0047	<0.0047	0.04
BHA	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	-	<0.0004	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BHA	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	2.2	-	2.1	1.6	1.9	0.81	1.6	0.63	0.62	0.91	1.9	1.2
BHA	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	-	<0.0005	<0.001	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BHA	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.0082	-	0.011	0.009	0.0094	0.0056	0.008	0.0075	0.0071	0.011	0.013	0.011
BHA	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	-	<0.0012	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BHA	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	0.0076	-	0.015	0.009	0.014	0.0099	0.011	0.0084	0.0071	0.015	0.015	0.021
BHB	LMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Metals

Borehole	Aquifer	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BHC	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	0.00023	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.034	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	0.0026	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	0.19	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	0.0055	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.029	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.0015	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	<0.0015	-	-	-	-	-	-	-	-	-	-	-
BHE	UMH	Cadmium	**0.005**	-	-	-	-	-	0.0006	0.00019	0.00037	0.00034	<0.00003	0.00029	<0.00003	<0.00003	<0.00003	<0.00003	0.00035	0.00035	<0.00003	<0.00003	0.00037	<0.00003	<0.00003
BHE	UMH	Total Chromium	**0.05**	-	-	-	-	-	0.0079	<0.0002	<0.0002	<0.0002	<0.0002	0.0065	0.0004	0.0015	0.0005	<0.0002	0.0089	<0.0002	<0.0002	0.0094	0.0085	0.01	0.0082
BHE	UMH	Copper	**2**	-	-	-	-	-	<0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BHE	UMH	Total Iron	**0.2**	-	-	-	-	-	-	0.0058	0.0111	<0.02	<0.0047	0.026	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	0.008	<0.0047	<0.0047	<0.0047	<0.0047	0.0068
BHE	UMH	Lead	**0.01**	-	-	-	-	-	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
BHE	UMH	Manganese	**0.05**	-	-	-	-	-	-	<0.0015	0.0022	0.005	0.0031	0.0026	-	0.0047	<0.0015	0.012	0.0016	<0.0015	<0.0015	<0.0015	0.0096	0.0019	0.0025
BHE	UMH	Mercury	**0.001**	-	-	-	-	-	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BHE	UMH	Nickel	**0.02**	-	-	-	-	-	0.003	0.0042	0.0048	0.0054	0.0018	0.001	0.0019	0.0039	0.0035	0.003	0.0039	0.0035	0.0011	0.0024	0.003	0.0044	0.0029
BHE	UMH	Selenium	**0.01**	-	-	-	-	-	<0.003	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
BHE	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	0.012	0.023	0.0282	0.025	0.014	0.19	-	0.013	0.014	0.018	0.021	0.0065	0.0057	0.011	0.018	0.021	0.019
BHF	UMH	Cadmium	**0.005**	-	-	-	-	-	<0.0005	-	-	-	<0.00003	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Total Chromium	**0.05**	-	-	-	-	-	0.0038	-	-	-	0.0005	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Copper	**2**	-	-	-	-	-	<0.007	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	<0.0047	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Lead	**0.01**	-	-	-	-	-	<0.005	-	-	-	<0.0004	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	<0.0015	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Mercury	**0.001**	-	-	-	-	-	<0.001	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Nickel	**0.02**	-	-	-	-	-	<0.002	-	-	-	0.0008	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Selenium	**0.01**	-	-	-	-	-	<0.003	-	-	-	<0.0012	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	<0.003	-	-	-	0.0023	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Cadmium	**0.005**	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	0.0002	-	-	-	-	-	-	-	-
BHG	LMH	Total Chromium	**0.05**	-	-	-	-	-	0.0024	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-
BHG	LMH	Copper	**2**	-	-	-	-	-	<0.007	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-
BHG	LMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0057	-	-	-	-	-	-	-	-
BHG	LMH	Lead	**0.01**	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	<0.0004	-	-	-	-	-	-	-	-
BHG	LMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Mercury	**0.001**	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-
BHG	LMH	Nickel	**0.02**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	0.0013	-	-	-	-	-	-	-	-
BHG	LMH	Selenium	**0.01**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	<0.0012	-	-	-	-	-	-	-	-
BHG	LMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	<0.0015	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Metals

Borehole	Aquifer	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BHH	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Copper	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Lead	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Cadmium	**0.005**	-	-	-	-	-	-	-	<0.00003	<0.00003	<0.00003	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Total Chromium	**0.05**	-	-	-	-	-	-	-	0.0006	<0.0002	<0.0002	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Copper	**2**	-	-	-	-	-	-	-	<0.003	<0.003	0.007	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Total Iron	**0.2**	-	-	-	-	-	-	-	<0.0047	<0.0047	16	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Lead	**0.01**	-	-	-	-	-	-	-	<0.0004	<0.0004	<0.0004	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Manganese	**0.05**	-	-	-	-	-	-	-	0.0056	<0.0015	2.8	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Mercury	**0.001**	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Nickel	**0.02**	-	-	-	-	-	-	-	0.0002	<0.0002	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Selenium	**0.01**	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	0.0027	0.0032	0.0064	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Cadmium	**0.005**	-	-	-	-	-	<0.0005	<0.00003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Total Chromium	**0.05**	-	-	-	-	-	<0.0015	<0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Copper	**2**	-	-	-	-	-	<0.007	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Total Iron	**0.2**	-	-	-	-	-	-	0.0054	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Lead	**0.01**	-	-	-	-	-	<0.005	<0.0004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Manganese	**0.05**	-	-	-	-	-	-	<0.0015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Mercury	**0.001**	-	-	-	-	-	<0.001	0.0008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Nickel	**0.02**	-	-	-	-	-	<0.002	<0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Selenium	**0.01**	-	-	-	-	-	<0.003	<0.0012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	0.011	<0.0015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	SW	Cadmium	**0.005**	-	-	-	-	-	-	-	-	-	-	<0.00003	-	-	-	-	-	-	-	<0.00003	<0.00003	-	<0.00003
SW11	SW	Total Chromium	**0.05**	-	-	-	-	-	-	-	-	-	-	0.011	-	-	-	-	-	-	-	0.0061	<0.0002	-	0.001
SW11	SW	Copper	**2**	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	<0.003	<0.003	-	<0.003
SW11	SW	Total Iron	**0.2**	-	-	-	-	-	-	-	-	-	-	0.032	-	-	-	-	-	-	-	0.043	0.11	-	0.07
SW11	SW	Lead	**0.05**	-	-	-	-	-	-	-	-	-	-	0.037	-	-	-	-	-	-	-	<0.0004	<0.0004	-	<0.0004
SW11	SW	Manganese	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	-	-	-	-	-	0.043	0.81	-	0.82
SW11	SW	Mercury	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	<0.0005	<0.0005	-	<0.0005
SW11	SW	Nickel	**0.02**	-	-	-	-	-	-	-	-	-	-	0.0014	-	-	-	-	-	-	-	0.0013	0.002	-	<0.0002
SW11	SW	Selenium	**0.01**	-	-	-	-	-	-	-	-	-	-	<0.0012	-	-	-	-	-	-	-	<0.0012	<0.0012	-	<0.0012
SW11	SW	Zinc (Hardness dependent)	**0.5**	-	-	-	-	-	-	-	-	-	-	0.0033	-	-	-	-	-	-	-	0.0044	0.0059	-	0.0025

Borehole	Aquifer	Analysis	DWS / Freshwater	Aug-13	Nov-13	Feb-14	May-14	Jul-14	Oct-15	Aug-16	Feb-17
BH101	UMH	Arsenic	0.01	<0.0009	0.0058	<0.0009	<0.0009	-	<0.0009	-	-
BH101	UMH	Boron	1	0.025	0.04	0.029	0.034	-	0.044	-	-
BH101	UMH	Antimony	0.005	<0.002	-	-	-	-	-	-	-
BH101	UMH	Barium	0.1	0.027	-	-	-	-	-	-	-
BH101	UMH	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH101	UMH	Cobalt	0.003	0.0055	-	-	-	-	-	-	-
BH101	UMH	Molybdenum	0.07	<0.0002	-	-	-	-	-	-	-
BH101	UMH	Gold	-	<0.001	-	-	-	-	-	-	-
BH101	UMH	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH101	UMH	Thorium	-	<0.01	-	-	-	-	-	-	-
BH101	UMH	Titanium	-	<0.005	-	-	-	-	-	-	-
BH101	UMH	Vanadium	0.02	0.00068	<0.0006	0.0012	0.0015	-	<0.0006	-	-
BH101	UMH	Uranium	-	<0.005	-	-	-	-	-	-	-
BH101	LMH	Arsenic	0.01	0.0069	0.0098	<0.0009	0.012	-	<0.0009	-	-
BH101	LMH	Boron	1	0.039	0.038	0.027	0.023	-	0.08	-	-
BH101	LMH	Antimony	0.005	<0.002	-	-	-	-	-	-	-
BH101	LMH	Barium	0.1	0.039	-	-	-	-	-	-	-
BH101	LMH	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH101	LMH	Cobalt	0.003	0.0097	-	-	-	-	-	-	-
BH101	LMH	Molybdenum	0.07	<0.0002	-	-	-	-	-	-	-
BH101	LMH	Gold	-	0.01	-	-	-	-	-	-	-
BH101	LMH	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH101	LMH	Thorium	-	<0.01	-	-	-	-	-	-	-
BH101	LMH	Titanium	-	<0.005	-	-	-	-	-	-	-
BH101	LMH	Vanadium	0.02	0.0011	0.0052	0.001	<0.0006	-	<0.0006	-	-
BH101	LMH	Uranium	-	<0.005	-	-	-	-	-	-	-
BH101	CHK	Arsenic	0.01	<0.0009	0.0088	0.0019	0.0031	-	<0.0009	-	-
BH101	CHK	Boron	1	0.028	0.03	0.028	0.031	-	0.037	-	-
BH101	CHK	Antimony	0.005	<0.002	-	-	-	-	-	-	-
BH101	CHK	Barium	0.1	0.04	-	-	-	-	-	-	-
BH101	CHK	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH101	CHK	Cobalt	0.003	<0.0001	-	-	-	-	-	-	-
BH101	CHK	Molybdenum	0.07	<0.0002	-	-	-	-	-	-	-
BH101	CHK	Gold	-	<0.001	-	-	-	-	-	-	-
BH101	CHK	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH101	CHK	Thorium	-	<0.01	-	-	-	-	-	-	-
BH101	CHK	Titanium	-	<0.005	-	-	-	-	-	-	-
BH101	CHK	Vanadium	0.02	0.00075	0.0015	0.0016	0.0008	-	<0.0006	-	-
BH101	CHK	Uranium	-	<0.005	-	-	-	-	-	-	-
BH102	UMH	Arsenic	0.01	<0.0009	0.0072	<0.0009	<0.009	-	<0.0025	-	-
BH102	UMH	Boron	1	0.045	0.045	0.029	0.038	-	0.054	-	-
BH102	UMH	Antimony	0.005	<0.002	-	-	-	-	-	-	-
BH102	UMH	Barium	0.1	0.035	-	-	-	-	-	-	-
BH102	UMH	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH102	UMH	Cobalt	0.003	0.0062	-	-	-	-	-	-	-
BH102	UMH	Molybdenum	0.07	0.00024	-	-	-	-	-	-	-
BH102	UMH	Gold	-	<0.001	-	-	-	-	-	-	-
BH102	UMH	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH102	UMH	Thorium	-	<0.01	-	-	-	-	-	-	-
BH102	UMH	Titanium	-	<0.005	-	-	-	-	-	-	-
BH102	UMH	Vanadium	0.02	0.00064	<0.0006	0.001	0.0015	-	-	-	-
BH102	UMH	Uranium	-	<0.005	-	-	-	-	-	-	-

Borehole	Aquifer	Analysis	DWS / Freshwater	Aug-13	Nov-13	Feb-14	May-14	Jul-14	Oct-15	Aug-16	Feb-17
BH102	LMH	Arsenic	0.01	0.0026	0.012	<0.0009	<0.0009	-	<0.0025	-	-
BH102	LMH	Boron	1	0.046	0.047	0.035	0.035	-	0.048	-	-
BH102	LMH	Antimony	0.005	<0.002	-	-	-	-	-	-	-
BH102	LMH	Barium	0.1	0.045	-	-	-	-	-	-	-
BH102	LMH	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH102	LMH	Cobalt	0.003	0.011	-	-	-	-	-	-	-
BH102	LMH	Molybdenum	0.07	<0.0002	-	-	-	-	-	-	-
BH102	LMH	Gold	-	<0.001	-	-	-	-	-	-	-
BH102	LMH	Tellurium	-	0.007	-	-	-	-	-	-	-
BH102	LMH	Thorium	-	<0.01	-	-	-	-	-	-	-
BH102	LMH	Titanium	-	<0.005	-	-	-	-	-	-	-
BH102	LMH	Vanadium	0.02	<0.0006	0.0011	<0.0006	0.0039	-	-	-	-
BH102	LMH	Uranium	-	<0.005	-	-	-	-	-	-	-
BH102	CHK	Arsenic	0.01	<0.0009	0.0086	<0.0009	<0.0009	-	<0.0025	-	-
BH102	CHK	Boron	1	0.026	0.04	0.049	0.047	-	0.033	-	-
BH102	CHK	Antimony	0.005	<0.002	-	-	-	-	-	-	-
BH102	CHK	Barium	0.1	0.043	-	-	-	-	-	-	-
BH102	CHK	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH102	CHK	Cobalt	0.003	0.0017	-	-	-	-	-	-	-
BH102	CHK	Molybdenum	0.07	0.0012	-	-	-	-	-	-	-
BH102	CHK	Gold	-	<0.001	-	-	-	-	-	-	-
BH102	CHK	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH102	CHK	Thorium	-	<0.01	-	-	-	-	-	-	-
BH102	CHK	Titanium	-	<0.005	-	-	-	-	-	-	-
BH102	CHK	Vanadium	0.02	0.0016	0.0024	0.0017	0.0042	-	-	-	-
BH102	CHK	Uranium	-	<0.005	-	-	-	-	-	-	-
BH103	UMH	Arsenic	0.01	<0.0009	0.0079	<0.0009	0.001	-	<0.0025	<0.0009	-
BH103	UMH	Boron	1	0.0078	0.015	0.02	0.022	-	0.025	0.033	-
BH103	UMH	Antimony	0.005	<0.002	-	-	-	-	-	-	
BH103	UMH	Barium	0.1	0.025	-	-	-	-	-	-	
BH103	UMH	Beryllium	-	<0.0005	-	-	-	-	-	-	
BH103	UMH	Cobalt	0.003	<0.0001	-	-	-	-	-	-	
BH103	UMH	Molybdenum	0.07	<0.0002	-	-	-	-	-	-	-
BH103	UMH	Gold	-	<0.001	-	-	-	-	-	-	-
BH103	UMH	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH103	UMH	Thorium	-	<0.01	-	-	-	-	-	-	-
BH103	UMH	Titanium	-	<0.005	-	-	-	-	-	-	-
BH103	UMH	Vanadium	0.02	<0.0006	0.0012	0.0007	0.004	-	-	-	
BH103	UMH	Uranium	-	<0.005	-	-	-	-	-	-	-
BH103	LMH	Arsenic	0.01	<0.0009	<0.0009	<0.0009	<0.009	-	<0.0025	0.0021	-
BH103	LMH	Boron	1	0.31	0.089	0.11	0.098	-	0.22	0.17	-
BH103	LMH	Antimony	0.005	<0.002	-	-	-	-	-	-	-
BH103	LMH	Barium	0.1	0.35	-	-	-	-	-	-	-
BH103	LMH	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH103	LMH	Cobalt	0.003	0.00078	-	-	-	-	-	-	-
BH103	LMH	Molybdenum	0.07	<0.0002	-	-	-	-	-	-	-
BH103	LMH	Gold	-	<0.001	-	-	-	-	-	-	-
BH103	LMH	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH103	LMH	Thorium	-	<0.01	-	-	-	-	-	-	-
BH103	LMH	Titanium	-	<0.005	-	-	-	-	-	-	-
BH103	LMH	Vanadium	0.02	<0.0006	0.0022	0.0007	0.0023	-	-	-	-
BH103	LMH	Uranium	-	<0.005	-	-	-	-	-	-	-

Borehole	Aquifer	Analysis	DWS / Freshwater	Aug-13	Nov-13	Feb-14	May-14	Jul-14	Oct-15	Aug-16	Feb-17
BH103	CHK	Arsenic	0.01	<0.0009	0.01	<0.0009	<0.0009	-	<0.0025	<0.0009	-
BH103	CHK	Boron	1	0.1	0.11	0.098	0.093	-	0.1	0.11	-
BH103	CHK	Antimony	0.005	<0.002	-	-	-	-	-	-	-
BH103	CHK	Barium	0.1	0.054	-	-	-	-	-	-	-
BH103	CHK	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH103	CHK	Cobalt	0.003	<0.0001	-	-	-	-	-	-	-
BH103	CHK	Molybdenum	0.07	0.00021	-	-	-	-	-	-	-
BH103	CHK	Gold	-	<0.001	-	-	-	-	-	-	-
BH103	CHK	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH103	CHK	Thorium	-	<0.01	-	-	-	-	-	-	-
BH103	CHK	Titanium	-	<0.005	-	-	-	-	-	-	-
BH103	CHK	Vanadium	0.02	<0.0006	<0.0006	<0.0006	<0.0006	-	-	-	-
BH103	CHK	Uranium	-	<0.005	-	-	-	-	-	-	-
BH104	UMH	Arsenic	0.01	<0.0009	0.0085	0.0012	0.0016	-	<0.0025	-	-
BH104	UMH	Boron	1	<0.002	0.0085	0.0074	0.02	-	0.014	-	-
BH104	UMH	Antimony	0.005	<0.002	-	-	-	-	-	-	-
BH104	UMH	Barium	0.1	0.026	-	-	-	-	-	-	-
BH104	UMH	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH104	UMH	Cobalt	0.003	<0.0001	-	-	-	-	-	-	-
BH104	UMH	Molybdenum	0.07	<0.0002	-	-	-	-	-	-	-
BH104	UMH	Gold	-	<0.001	-	-	-	-	-	-	-
BH104	UMH	Tellurium	-	0.015	-	-	-	-	-	-	-
BH104	UMH	Thorium	-	<0.01	-	-	-	-	-	-	-
BH104	UMH	Titanium	-	<0.005	-	-	-	-	-	-	-
BH104	UMH	Vanadium	0.02	0.0015	0.0031	0.003	<0.0006	-	-	-	-
BH104	UMH	Uranium	-	<0.005	-	-	-	-	-	-	-
BH104	LMH	Arsenic	0.01	0.003	0.0077	0.0011	<0.0009	-	0.0032	-	-
BH104	LMH	Boron	1	0.014	0.017	0.006	0.011	-	0.021	-	-
BH104	LMH	Antimony	0.005	<0.002	-	-	-	-	-	-	-
BH104	LMH	Barium	0.1	0.035	-	-	-	-	-	-	-
BH104	LMH	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH104	LMH	Cobalt	0.003	<0.0001	-	-	-	-	-	-	-
BH104	LMH	Molybdenum	0.07	<0.0002	-	-	-	-	-	-	-
BH104	LMH	Gold	-	<0.001	-	-	-	-	-	-	-
BH104	LMH	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH104	LMH	Thorium	-	<0.01	-	-	-	-	-	-	-
BH104	LMH	Titanium	-	<0.005	-	-	-	-	-	-	-
BH104	LMH	Vanadium	0.02	0.0008	0.0007	0.0025	0.0016	-	-	-	-
BH104	LMH	Uranium	-	<0.005	-	-	-	-	-	-	-
BH104	CHK	Arsenic	0.01	<0.0009	<0.0009	0.003	<0.0009	-	<0.0025	-	-
BH104	CHK	Boron	1	0.024	0.024	0.029	0.023	-	0.046	-	-
BH104	CHK	Antimony	0.005	<0.002	-	-	-	-	-	-	-
BH104	CHK	Barium	0.1	0.03	-	-	-	-	-	-	-
BH104	CHK	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH104	CHK	Cobalt	0.003	<0.0001	-	-	-	-	-	-	-
BH104	CHK	Molybdenum	0.07	<0.0002	-	-	-	-	-	-	-
BH104	CHK	Gold	-	<0.001	-	-	-	-	-	-	-
BH104	CHK	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH104	CHK	Thorium	-	<0.01	-	-	-	-	-	-	-
BH104	CHK	Titanium	-	<0.005	-	-	-	-	-	-	-
BH104	CHK	Vanadium	0.02	0.0011	0.0026	0.002	<0.0006	-	-	-	-
BH104	CHK	Uranium	-	0.015	-	-	-	-	-	-	-
BH105 X	UMH	Arsenic	0.01	-	-	-	<0.0009		0.0034	-	-
BH105 X	UMH	Boron	1	-	-	-	0.028		0.037	-	-

Borehole	Aquifer	Analysis	DWS / Freshwater	Aug-13	Nov-13	Feb-14	May-14	Jul-14	Oct-15	Aug-16	Feb-17
BH105	LMH	Arsenic	**0.01**	<0.0009	**0.0081**	**0.002**	-	-	<0.0025	-	-
BH105	LMH	Boron	**1**	**0.018**	**0.03**	**0.025**	-	-	**0.034**	-	-
BH105	LMH	Antimony	**0.005**	<0.002	-	-	-	-	-	-	-
BH105	LMH	Barium	**0.1**	**0.029**	-	-	-	-	-	-	-
BH105	LMH	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH105	LMH	Cobalt	**0.003**	<0.0001	-	-	-	-	-	-	-
BH105	LMH	Molybdenum	**0.07**	<0.0002	-	-	-	-	-	-	-
BH105	LMH	Gold	-	<0.001	-	-	-	-	-	-	-
BH105	LMH	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH105	LMH	Thorium	-	<0.01	-	-	-	-	-	-	-
BH105	LMH	Titanium	-	<0.005	-	-	-	-	-	-	-
BH105	LMH	Vanadium	**0.02**	<0.0006	**0.0014**	**0.0031**	-	-	-	-	-
BH105	LMH	Uranium	-	<0.005	-	-	-	-	-	-	-
BH105	CHK	Arsenic	**0.01**	<0.0009	**0.0053**	<0.0009	-	-	<0.0025	-	-
BH105	CHK	Boron	**1**	**0.03**	**0.034**	**0.027**	-	-	**0.041**	-	-
BH105	CHK	Antimony	**0.005**	<0.002	-	-	-	-	-	-	-
BH105	CHK	Barium	**0.1**	**0.037**	-	-	-	-	-	-	-
BH105	CHK	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH105	CHK	Cobalt	**0.003**	**0.0012**	-	-	-	-	-	-	-
BH105	CHK	Molybdenum	**0.07**	**0.0015**	-	-	-	-	-	-	-
BH105	CHK	Gold	-	<0.001	-	-	-	-	-	-	-
BH105	CHK	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH105	CHK	Thorium	-	<0.01	-	-	-	-	-	-	-
BH105	CHK	Titanium	-	<0.005	-	-	-	-	-	-	-
BH105	CHK	Vanadium	**0.02**	<0.0006	**0.004**	**0.003**	-	-	-	-	-
BH105	CHK	Uranium	-	<0.005	-	-	-	-	-	-	-
BH106	UMH	Arsenic	**0.01**	<0.0009	<0.0009	<0.0009	**0.0028**	-	<0.0025	-	-
BH106	UMH	Boron	**1**	**0.035**	**0.017**	**0.041**	**0.041**	-	**0.028**	-	-
BH106	UMH	Antimony	**0.005**	<0.002	-	-	-	-	-	-	-
BH106	UMH	Barium	**0.1**	**0.029**	-	-	-	-	-	-	-
BH106	UMH	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH106	UMH	Cobalt	**0.003**	**0.00042**	-	-	-	-	-	-	-
BH106	UMH	Molybdenum	**0.07**	**0.00022**	-	-	-	-	-	-	-
BH106	UMH	Gold	-	<0.001	-	-	-	-	-	-	-
BH106	UMH	Tellurium	-	**0.0063**	-	-	-	-	-	-	-
BH106	UMH	Thorium	-	<0.01	-	-	-	-	-	-	-
BH106	UMH	Titanium	-	<0.005	-	-	-	-	-	-	-
BH106	UMH	Vanadium	**0.02**	**0.0014**	<0.0006	<0.0006	**0.0017**	-	-	-	<0.0012
BH106	UMH	Uranium	-	<0.005	-	-	-	-	-	-	-

Borehole	Aquifer	Analysis	DWS / Freshwater	Aug-13	Nov-13	Feb-14	May-14	Jul-14	Oct-15	Aug-16	Feb-17
BH106	LMH	Arsenic	**0.01**	<0.0009	<0.0009	<0.0009	**0.0022**	-	<0.0025	-	-
BH106	LMH	Boron	**1**	**0.034**	**0.028**	**0.033**	**0.032**	-	**0.042**	-	-
BH106	LMH	Antimony	**0.005**	<0.002	-	-	-	-	-	-	-
BH106	LMH	Barium	**0.1**	**0.034**	-	-	-	-	-	-	-
BH106	LMH	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH106	LMH	Cobalt	**0.003**	**0.00029**	-	-	-	-	-	-	-
BH106	LMH	Molybdenum	**0.07**	<0.0002	-	-	-	-	-	-	-
BH106	LMH	Gold	-	<0.001	-	-	-	-	-	-	-
BH106	LMH	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH106	LMH	Thorium	-	<0.01	-	-	-	-	-	-	-
BH106	LMH	Titanium	-	<0.005	-	-	-	-	-	-	-
BH106	LMH	Vanadium	**0.02**	**0.00093**	<0.0006	**0.0011**	**0.0006**	-	-	-	-
BH106	LMH	Uranium	-	<0.005	-	-	-	-	-	-	-
BH106	CHK	Arsenic	**0.01**	<0.0009	<0.0009	<0.0009	<0.0009	-	<0.0025	-	-
BH106	CHK	Boron	**1**	**0.1**	**0.049**	**0.013**	**0.016**	-	**0.02**	-	-
BH106	CHK	Antimony	**0.005**	<0.002	-	-	-	-	-	-	-
BH106	CHK	Barium	**0.1**	**0.048**	-	-	-	-	-	-	-
BH106	CHK	Beryllium	-	<0.0005	-	-	-	-	-	-	-
BH106	CHK	Cobalt	**0.003**	<0.0001	-	-	-	-	-	-	-
BH106	CHK	Molybdenum	**0.07**	<0.0002	-	-	-	-	-	-	-
BH106	CHK	Gold	-	<0.001	-	-	-	-	-	-	-
BH106	CHK	Tellurium	-	<0.005	-	-	-	-	-	-	-
BH106	CHK	Thorium	-	<0.01	-	-	-	-	-	-	-
BH106	CHK	Titanium	-	<0.005	-	-	-	-	-	-	-
BH106	CHK	Vanadium	**0.02**	<0.0006	<0.0006	**0.0007**	**0.0015**	-	-	-	-
BH106	CHK	Uranium	-	<0.005	-	-	-	-	-	-	-
BH107	UMH	Arsenic	**0.01**	-	-	-	-	-	<0.0025	-	-
BH107	UMH	Boron	**1**	-	-	-	-	-	**0.046**	-	-
BH107	LMH	Arsenic	**0.01**	-	-	-	-	-	<0.0025	-	-
BH107	LMH	Boron	**1**	-	-	-	-	-	**0.093**	-	-
BH107	CHK	Arsenic	**0.01**	-	-	-	-	-	<0.0025	-	-
BH107	CHK	Boron	**1**	-	-	-	-	-	**0.1**	-	-
BH108	UMH	Arsenic	**0.01**	-	-	-	-	-	**0.0036**	-	-
BH108	UMH	Boron	**1**	-	-	-	-	-	**0.031**	-	-
BH108	LMH	Arsenic	**0.01**	-	-	-	-	<0.0025	-	-	-
BH108	LMH	Boron	**1**	-	-	-	-	**0.044**	-	-	-
BH108	CHK	Arsenic	**0.01**	-	-	-	-	<0.0025	-	-	-
BH108	CHK	Boron	**1**	-	-	-	-	**0.028**	-	-	-
BH201 S	LMH	Arsenic	**0.01**	-	-	-	-	<0.0025	-	-	-
BH201 S	LMH	Boron	**1**	-	-	-	-	**0.025**	-	-	-
BH201 D	LMH	Arsenic	**0.01**	-	-	-	-	<0.0025	-	-	-
BH201 D	LMH	Boron	**1**	-	-	-	-	**0.031**	-	-	-
BHE	UMH	Arsenic	**0.01**	-	-	-	-	-	<0.0025	**0.0029**	-
BHE	UMH	Boron	**1**	-	-	-	-	-	**0.062**	**0.049**	-
BHF	UMH	Arsenic	**0.01**	-	-	-	-	-	**0.0027**	-	-
BHF	UMH	Boron	**1**	-	-	-	-	-	**0.025**	-	-
BHG	LMH	Arsenic	**0.01**	-	-	-	-	-	<0.0025	-	-
BHG	LMH	Boron	**1**	-	-	-	-	-	**0.034**	-	-
BHK	UMH	Arsenic	**0.01**	-	-	-	-	-	<0.0025	-	-
BHK	UMH	Boron	**1**	-	-	-	-	-	**0.048**	-	-

INORGANIC INDICATORS

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH101	UMH	Sodium	-	21	-	12	9.9	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	19	18	18	19	18	53
BH101	UMH	Potassium	-	3.3	-	5.8	2.1	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.1	5.3	7.2	5	5.1	6.1	9.5
BH101	UMH	Calcium	-	33	-	34	39	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	45	63	37	39	40	96
BH101	UMH	Magnesium	-	5.6	-	5.2	6.7	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3	3.8	5.5	3.8	3.8	3.8	8.3
BH101	UMH	Chloride	250	11	-	17	11	9	-	-	-	-	24	-	-	-	-	-	-	-	-	-	-	33	29	54	34	25	26	170
BH101	UMH	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	84	65	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	UMH	Sulphate	250	53	-	45	66	28	-	-	-	-	57	-	-	-	-	-	41	-	-	-	-	53	47	45	51	49	43	66
BH101	UMH	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-
BH101	UMH	Nitrate as NO_3	50	3.6	-	7.1	12	2.8	-	-	-	-	7.1	-	-	-	-	-	7.5	-	-	-	-	19	17	12	18	19	19	18
BH101	UMH	Nitrite as NO_2	-	0.089	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	4.2	3.8	-	-	-	-	-
BH101	UMH	Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	UMH	Total Cyanide	0.05	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	UMH	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	UMH	Ammoniacal Nitrogen as NH_4	0.30	0.11	-	0.51	<0.03	<0.03	-	-	-	-	0.05	-	-	-	-	-	0.03	-	-	-	-	0.03	-	-	-	-	-	-
BH101	UMH	Total Alkalinity as CaCO3	-	-	-	84	65	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	92	100	100	80	96	92
BH101	UMH	Total Organic Carbon	-	<2.0	-	4.6	2.4	5.8	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	5	5	-	-	-	-	-
BH101	UMH	Total Suspended Solids	-	61	-	20	31	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	UMH	Organic Nitrogen	-	0.76	-	580	1.8	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	UMH	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	<1	-	-	-	-	-
BH101	UMH	Chemical Oxygen Demand	-	<7.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-	-	-	12	-	-	-	-	-
BH101	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	390	360	400	370	380	360	800
BH101	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.2	6.3	6.4	6.8	6.9	6.7	7
BH101	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-
BH101	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-	-
BH101	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.65	3.52	4.56	3.07	3.22	3.25	8.02
BH101	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.44	3.87	4.65	4.31	3.63	3.93	8.26
BH101	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-9.77	-4.74	-0.98	-16.8	-5.99	-9.47	-1.47
BH101	UMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	0.03	<0.03	<0.03	<0.03	<0.03
BH101	LMH	Sodium	-	-	28	51	9.2	13	-	-	-	-	-	12	7.3	-	21	17	-	-	13	12	22	17	21	18	24	19	14	13
BH101	LMH	Potassium	-	-	3.7	3.5	3.8	2	-	-	-	-	-	2.4	2	-	2.4	2.4	-	-	2.9	2.4	4.1	4.5	5	5.3	6.3	5.5	5.6	5.2
BH101	LMH	Calcium	-	-	58	54	49	50	-	-	-	-	-	50	45	-	89	110	-	-	55	52	65	48	59	55	55	52	50	56
BH101	LMH	Magnesium	-	-	4.9	5.4	3.3	6	-	-	-	-	-	3.3	2	-	5.5	5	-	-	5	5	7	4.8	6.1	5.6	5.8	4.9	4.7	5.8
BH101	LMH	Chloride	250	-	16	16	8.2	10	-	-	-	-	30	11	8.9	-	27	27	20	12	13	12	60	33	41	27	46	35	22	35
BH101	LMH	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1	-	-	-	-	-	-	-	-	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH101	LMH	Bicarbonate Alkalinity as CaCO3	-	-	-	180	130	110	-	-	-	-	-	140	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	LMH	Sulphate	250	-	44	72	32	58	-	-	-	-	55	36	21	-	54	53	48	49	56	58	60	49	53	53	55	55	53	52
BH101	LMH	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
BH101	LMH	Nitrate as NO_3	50	-	3.3	7.5	3.7	8.9	-	-	-	-	22	9.3	1	-	24	24	7.5	12	11	9.7	16	14	15	12	16	16	11	14
BH101	LMH	Nitrite as NO_2	-	-	0.066	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	LMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	2.1	0.2	-	5.5	5.4	1.7	2.8	2.4	2.2	3.5	3.1	3.3	2.6	3.5	3.5	2.5	3.1
BH101	LMH	Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	-	-
BH101	LMH	Total Cyanide	0.05	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	-	-
BH101	LMH	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	-	-
BH101	LMH	Ammoniacal Nitrogen as NH_4	0.50	-	0.084	<0.03	<0.03	<0.03	-	-	-	-	0.05	0.04	0.08	-	<0.03	<0.03	<0.03	0.04	0.03	0.03	-	-	-	-	-	-	-	-
BH101	LMH	Total Alkalinity as CaCO3	-	-	-	180	130	110	-	-	-	-	-	140	100	-	220	210	170	120	150	120	110	120	100	120	150	100	130	120
BH101	LMH	Total Organic Carbon	-	-	4.8	7.1	7.6	5.1	-	-	-	-	-	7	10	-	<2	2	<2	0	<2	-	4	4	3	2	4	<2	3	4
BH101	LMH	Total Suspended Solids	-	-	27	2000	34	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	LMH	Organic Nitrogen	-	-	6.9	210	2	3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	LMH	Biological Oxygen Demand	-	-	<1.0	-	-	-	-	-	-	-	-	<1	2	-	<1	<1	<1	0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH101	LMH	Chemical Oxygen Demand	-	-	28	-	-	-	-	-	-	-	-	28	23	-	8	9	24	7	22	10	<7	30	20	21	12	22	20	13
BH101	LMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	310	310	-	610	630	470	330	360	400	510	380	420	400	420	440	380	400
BH101	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	6.7	6.9	-	7.2	7.5	7.7	6.9	7.7	7.3	7.1	6.2	6.7	6.8	7.5	7.8	7.2	8
BH101	LMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	<0.03	<0.03	<0.03	-	-	-	-	-	-	-
BH101	LMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-	-
BH101	LMH	Total Cations		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.88	3.64	4.49	4.13	4.43	3.97	3.63	3.97
BH101	LMH	Total Anions		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.3	4.68	4.5	4.56	5.6	4.39	4.5	4.8
BH101	LMH	% Cation Excess		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-4.13	-12.5	-0.11	-4.95	-11.67	-5.02	-10.7	-9.46
BH101	LMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.06	<0.03	<0.03	<0.03	<0.03

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH101	CHK	Sodium	-	25	-	18	8.1	9.7	-	-	-	-	-	10	9.8	-	11	12	-	-	15	15	14	11	16	16	14	16	18	15
BH101	CHK	Potassium	-	1.7	-	1.8	2.1	1.1	-	-	-	-	-	2.4	1.5	-	2.1	2.8	-	-	1.7	2.1	1.6	1.5	1.9	2.1	2	2.3	2.1	1.8
BH101	CHK	Calcium	-	96	-	92	100	120	-	-	-	-	-	110	110	-	110	120	-	-	130	130	130	110	140	150	120	130	140	130
BH101	CHK	Magnesium	-	3.8	-	4.6	2.9	2.7	-	-	-	-	-	3.5	3.6	-	3.7	4.2	-	-	3.7	4	3.5	3.2	3.9	4	3.3	3.8	3.9	3.7
BH101	CHK	Chloride	**250**	26	-	21	22	28	-	-	-	-	28	25	26	-	23	25	34	33	35	35	36	32	35	37	36	38	39	38
BH101	CHK	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1	-	-	-	-	-	-	-	-	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH101	CHK	Bicarbonate Alkalinity as CaCO3	-	-	-	300	280	240	-	-	-	-	-	260	270	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	CHK	Sulphate	**250**	15	-	27	12	9.3	-	-	-	-	18	25	26	-	38	31	26	23	28	30	28	25	30	30	28	34	36	30
BH101	CHK	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	-	<0.3	<0.3	<0.3	0	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
BH101	CHK	Nitrate as NO_3	**50**	17	-	14	20	28	-	-	-	-	26	26	26	-	23	23	15	30	33	32	33	30	39	32	31	29	33	34
BH101	CHK	Nitrite as NO_2	-	0.79	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	CHK	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	5.8	5.8	-	5.2	5.2	3.4	6.7	7.5	7.2	7.5	6.8	8.8	7.2	6.9	6.6	7.5	7.7
BH101	CHK	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	-	-
BH101	CHK	Total Cyanide	**0.05**	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	-	-
BH101	CHK	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	-	-
BH101	CHK	Ammoniacal Nitrogen as NH_4	**0.50**	<0.03	-	2.1	<0.03	<0.03	-	-	-	-	<0.03	<0.03	0.08	-	0.09	<0.03	<0.03	0.11	<0.03	<0.03	-	-	-	-	-	-	-	-
BH101	CHK	Total Alkalinity as CaCO3	-	-	-	300	280	240	-	-	-	-	-	260	270	-	220	390	530	510	390	660	530	310	940	560	380	390	520	810
BH101	CHK	Total Organic Carbon	-	<2.0	-	5.2	2.3	<2	-	-	-	-	-	<2	<2	-	<2	3	<2	0	<2	<2	3	<2	<2	<2	<2	<2	<2	3
BH101	CHK	Total Suspended Solids	-	140	-	280	160	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	CHK	Organic Nitrogen	-	0.7	-	11	2.1	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101	CHK	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	<1	<1	-	4	2	<1	0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH101	CHK	Chemical Oxygen Demand	-	<7.0	-	-	-	-	-	-	-	-	-	<7	9	-	11	8	14	0	<7	<7	22	10	<7	9	<7	<7	<7	18
BH101	CHK	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	570	590	-	540	570	700	620	680	650	740	680	710	670	610	690	720	650
BH101	CHK	pH	-	-	-	-	-	-	-	-	-	-	-	7.4	7.5	-	7.4	7.5	7.3	7	7.2	7.2	7.2	6.6	6.9	7	7.7	7.7	7.3	7.7
BH101	CHK	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	<0.03	<0.03	<0.03	-	-	-	-	-	-	-
BH101	CHK	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-	-
BH101	CHK	Total Cations		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.43	6.27	8.05	8.56	6.92	7.56	8.14	7.49
BH101	CHK	Total Anions		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.13	8.11	20.24	13.19	9.6	10.15	12.38	18.25
BH101	CHK	% Cation Excess		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-27.72	-12.8	-43.09	-21.29	-16.22	-14.62	-20.66	-41.8
BH101	CHK	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03
BH102	UMH	Sodium	-	23	-	12	24	24	-	-	-	-	-	16	29	14	-	12	-	-	12	12	14	19	13	14	14	14	15	15
BH102	UMH	Potassium	-	3.2	-	3.3	2.9	2.8	-	-	-	-	-	5.5	3.5	4.4	-	4.9	-	-	6.7	8.2	7	6.1	7.6	10	7.9	8.5	10	10
BH102	UMH	Calcium	-	120	-	110	110	110	-	-	-	-	-	100	97	85	-	90	-	-	91	94	110	98	110	120	110	110	120	120
BH102	UMH	Magnesium	-	16	-	12	14	16	-	-	-	-	-	14	14	14	-	13	-	-	15	16	18	17	18	20	17	19	19	20
BH102	UMH	Chloride	**250**	42	-	31	37	61	-	-	-	-	31	53	41	36	-	32	35	36	40	40	42	45	48	52	49	48	50	52
BH102	UMH	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1	-	-	-	-	-	-	-	<1	-	<1	<1	-	-	-	-	-	-	-	-	-	-	-
BH102	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	180	170	150	-	-	-	-	-	150	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	UMH	Sulphate	**250**	85	-	88	120	110	-	-	-	-	69	84	92	83	-	77	71	78	78	86	90	94	99	97	98	100	100	110
BH102	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	1.7	<0.3	1.6	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
BH102	UMH	Nitrate as NO_3	**50**	53	-	58	53	62	-	-	-	-	89	80	89	93	-	100	110	53	140	89	160	130	190	190	170	180	190	200
BH102	UMH	Nitrite as NO_2	-	0.43	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	18	20	21	-	23	25	12	32	20	37	30	42	42	39	40	43	45
BH102	UMH	Free Cyanide	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
BH102	UMH	Total Cyanide	**0.05**	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
BH102	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
BH102	UMH	Ammoniacal Nitrogen as NH_4	**0.30**	<0.03	-	0.085	<0.03	0.05	-	-	-	-	0.05	<0.03	0.04	0.05	-	<0.03	0.05	0	<0.03	<0.03	<0.03	-	0.04	-	-	-	-	-
BH102	UMH	Total Alkalinity as CaCO3	-	-	-	180	170	150	-	-	-	-	-	150	130	98	-	150	120	130	110	120	140	98	90	92	120	88	96	90
BH102	UMH	Total Organic Carbon	-	<2.0	-	4.7	<2.0	3.7	-	-	-	-	-	<2	<2	<2	-	3	<2	0	<2	<2	<2	<2	<2	<2	<2	<2	<2	2
BH102	UMH	Total Suspended Solids	-	250	-	23	31	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19000	-	-	-	-	-	-	-
BH102	UMH	Organic Nitrogen	-	2.9	-	77	2.2	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	UMH	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	<1	1	<1	-	<1	<1	0	<1	<1	-	<1	<1	<1	<1	<1	<1	<1
BH102	UMH	Chemical Oxygen Demand	-	<7.0	-	-	-	-	-	-	-	-	-	11	25	10	-	14	<7	0	10	<7	9	17	19	14	10	<7	17	11
BH102	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	640	690	610	-	640	670	580	660	680	750	780	760	890	820	750	880	830
BH102	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	7.1	7	6.7	-	6.7	6.6	6.2	6.5	6.2	6.5	6	6.2	6.3	6.7	6.5	7.1	6.9
BH102	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	<0.03	<0.03	<0.03	<0.03	-	0.04	-	-	-	-	-
BH102	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.76	7.27	7.73	8.5	7.7	7.88	8.46	8.54
BH102	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.44	7.32	8.28	8.35	8.66	8.14	8.56	8.78
BH102	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-4.2	-0.34	-3.44	0.89	-5.87	-1.62	-0.59	-1.39
BH102	UMH	Ammoniacal Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH102	LMH	Sodium	-	-	22	13	23	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	15	15	15	16	16	16
BH102	LMH	Potassium	-	-	5.8	8.3	5.7	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.3	8.9	8.2	7.2	6.9	7.2	6.5
BH102	LMH	Calcium	-	-	160	170	120	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	140	200	150	140	160	150	150
BH102	LMH	Magnesium	-	-	16	17	12	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	24	24	22	23	23	24
BH102	LMH	Chloride	**250**	-	37	38	31	54	-	-	-	-	34	-	-	-	-	-	40	-	-	52	59	58	59	60	62	56	59	60
BH102	LMH	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Bicarbonate Alkalinity as CaCO3	-	-	-	290	210	330	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Sulphate	**250**	-	96	110	110	110	-	-	-	-	100	-	-	-	-	-	100	-	-	110	130	140	140	140	140	140	150	160
BH102	LMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Nitrate as NO_3	**50**	-	93	120	49	62	-	-	-	-	66	-	-	-	-	-	84	-	-	130	200	170	230	200	210	200	210	210
BH102	LMH	Nitrite as NO_2	-	-	2.7	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	-	-	29	46	38	51	-	-	-	-	-
BH102	LMH	Free Cyanide	**0.001**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Total Cyanide	**0.05**	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Ammoniacal Nitrogen as NH_4	**0.50**	-	0.1	1.7	0.032	<0.03	-	-	-	-	0.07	-	-	-	-	-	-	-	-	0.12	0.08	0.07	0.07	-	-	-	-	-
BH102	LMH	Total Alkalinity as CaCO3	-	-	-	290	210	330	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130	160	130	140	180	150	150
BH102	LMH	Total Organic Carbon	-	-	<2.0	6.5	<2.0	6.3	-	-	-	-	-	-	-	-	-	-	<2	-	-	2	<2	<2	<2	-	-	-	-	-
BH102	LMH	Total Suspended Solids	-	-	1400	73	21	320	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Organic Nitrogen	-	-	8.7	4.4	1.7	4.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Biological Oxygen Demand	-	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Chemical Oxygen Demand	-	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1000	1100	1000	970	990	1100	1000
BH102	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.1	7.2	6.4	6.8	7.1	6.6	7.5
BH102	LMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.09	-	-	0.11	0.08	0.07	0.07	-	-	-	-	-
BH102	LMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Total Cations		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.86	12.83	10.32	9.63	10.75	10.26	10.32
BH102	LMH	Total Anions		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.89	11.59	10.43	10.85	11.32	11.07	11.31
BH102	LMH	% Cation Excess		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-0.15	5.08	-0.53	-5.96	-2.58	-3.8	-4.58
BH102	LMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.03	0.03	<0.03	13
BH102	CHK	Sodium	-	38	-	54	24	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.8	8.5	8.8	8.2	8.4	8.3	8.3
BH102	CHK	Potassium	-	2.8	-	7.3	8.5	6.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	2.1	2.1	1.6	1.7	1.8	1.7
BH102	CHK	Calcium	-	100	-	140	120	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	120	120	110	120	120	110
BH102	CHK	Magnesium	-	6.4	-	14	12	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.1	3.8	3.9	3.1	3.6	3.3	3.4
BH102	CHK	Chloride	**250**	23	-	31	30	27	-	-	-	-	22	-	-	-	-	-	22	-	-	23	45	20	21	22	21	20	21	22
BH102	CHK	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Bicarbonate Alkalinity as CaCO3	-	-	-	350	420	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Sulphate	**250**	29	-	86	95	98	-	-	-	-	44	-	-	-	-	-	22	-	-	22	94	19	17	15	13	15	13	12
BH102	CHK	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Nitrate as NO_3	**50**	40	-	75	49	41	-	-	-	-	36	-	-	-	-	-	33	-	-	49	170	14	32	31	31	31	31	31
BH102	CHK	Nitrite as NO_2	-	0.29	-	0.079	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.4	-	-	11	38	3.1	7.4	-	-	-	-	-
BH102	CHK	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Total Cyanide	**0.05**	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Ammoniacal Nitrogen as NH_4	**0.50**	0.053	-	0.76	0.07	0.21	-	-	-	-	0.04	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	0.05	-	-	-	-	-
BH102	CHK	Total Alkalinity as CaCO3	-	-	-	350	420	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	370	1400	920	350	510	610	300
BH102	CHK	Total Organic Carbon	-	<2.0	-	6.9	<2.0	3.5	-	-	-	-	-	-	-	-	-	-	<2	-	-	<2	<2	<2	<2	-	-	-	-	-
BH102	CHK	Total Suspended Solids	-	100	-	230	810	490	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Organic Nitrogen	-	1.1	-	28	1.8	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Chemical Oxygen Demand	-	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	590	610	650	540	540	600	530
BH102	CHK	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.5	6.9	7.1	7.7	7.5	7.5	8
BH102	CHK	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	-	-	<0.03	<0.03	<0.03	0.05	-	-	-	-	-
BH102	CHK	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Total Cations		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.27	6.73	6.75	6.14	6.69	6.67	6.17
BH102	CHK	Total Anions		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.59	29.46	19.43	8.36	11.38	13.36	7.47
BH102	CHK	% Cation Excess		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-15.61	-62.81	-48.43	-15.31	-25.95	-33.4	-9.53
BH102	CHK	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.49	0.03	0.08	0.05	<0.03

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH103	UMH	Sodium	-	38	-	13	15	14	-	-	-	-	-	11	7.9	7.3	-	9	-	-	-	-	-	13	8.1	9	18	7.3	12	DRY
BH103	UMH	Potassium	-	1.5	-	1.1	0.61	0.52	-	-	-	-	-	0.5	0.4	0.4	-	0.9	-	-	-	-	-	0.5	1.2	1	1.4	1	1.6	DRY
BH103	UMH	Calcium	-	79	-	93	55	62	-	-	-	-	-	56	61	64	-	110	-	-	-	-	-	51	130	140	170	110	150	DRY
BH103	UMH	Magnesium	-	5.7	-	5.3	3.2	3.4	-	-	-	-	-	3.6	3.2	3.2	-	5.1	-	-	-	-	-	3.2	6.3	6.2	8.3	5.2	7.3	DRY
BH103	UMH	Chloride	**250**	12	-	9.5	9.3	9.1	-	-	-	-	13	12	11	8.8	-	9.9	9.8	9.2	10	12	13	16	11	11	14	15	12	DRY
BH103	UMH	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	<1	-	<1	-	-	-	-	-	-	-	-	-	-	-	DRY
BH103	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	220	170	160	-	-	-	-	-	140	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DRY
BH103	UMH	Sulphate	**250**	94	-	60	33	32	-	-	-	-	78	28	26	26	-	61	96	120	130	66	65	34	120	120	210	90	170	DRY
BH103	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	-	<0.3	-	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	DRY
BH103	UMH	Nitrate as NO_3	**50**	0.97	-	1.6	2.3	2.5	-	-	-	-	1	3.5	2.8	3.5	-	1	3.9	1.6	4.3	3.2	8.4	2.2	2.4	3.2	4.3	2.8	3.5	DRY
BH103	UMH	Nitrite as NO_2	-	<0.02	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DRY
BH103	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	0.8	0.6	0.8	-	0.2	0.9	0.4	1	0.8	1.9	0.5	0.5	0.7	1	0.6	0.8	DRY
BH103	UMH	Free Cyanide	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DRY
BH103	UMH	Total Cyanide	**0.05**	<0.01	-	<0.01	0.022	<0.01	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DRY
BH103	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DRY
BH103	UMH	Ammoniacal Nitrogen as NH_4	**0.30**	0.046	-	<0.03	<0.03	<0.03	-	-	-	-	0.05	<0.03	0.06	0.04	-	0.04	-	0.08	0.37	7.3	0.07	<0.03	0.1	-	-	-	-	DRY
BH103	UMH	Total Alkalinity as CaCO3	-	-	-	220	170	160	-	-	-	-	-	140	140	150	-	290	-	-	-	-	-	150	240	380	250	220	260	DRY
BH103	UMH	Total Organic Carbon	-	2.3	-	6.1	<2.0	5	-	-	-	-	-	<2	3	<2	-	<2	<2	0	3	66	5	<2	<2	<2	4	<2	<2	DRY
BH103	UMH	Total Suspended Solids	-	290	-	81	90	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DRY
BH103	UMH	Organic Nitrogen	-	2	-	15	0.81	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DRY
BH103	UMH	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	<1	3	2	-	<1	-	-	-	-	-	1	<1	<1	<1	<1	-	DRY
BH103	UMH	Chemical Oxygen Demand	-	8.8	-	-	-	-	-	-	-	-	-	<7	36	<7	-	17	-	-	-	-	-	38	<7	70	<7	15	26	DRY
BH103	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	340	370	440	-	560	-	-	-	-	-	340	630	650	890	630	780	DRY
BH103	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	6.9	7	6.8	-	7.6	-	-	-	-	-	6.3	7	7	7.7	7.2	7.8	DRY
BH103	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	0.08	0.35	6.9	0.07	-	0.09	-	-	-	-	DRY
BH103	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DRY
BH103	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.39	7.39	7.91	9.99	6.26	8.65	DRY
BH103	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.09	7.65	10.36	9.94	6.74	9.13	DRY
BH103	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-9.36	-1.73	-13.41	0.25	-3.69	-2.7	DRY
BH103	UMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.21	0.37	<0.03	0.25	DRY
BH103	LMH	Sodium	-	32	-	21	22	21	-	-	-	-	-	28	25	26	-	30	-	-	-	-	-	30	27	31	31	30	31	28
BH103	LMH	Potassium	-	5.6	-	2.1	2.2	2.1	-	-	-	-	-	4.8	3.1	3.4	-	4.8	-	-	-	-	-	5.9	5	6.4	6.2	6.2	6.4	5.7
BH103	LMH	Calcium	-	130	-	150	130	140	-	-	-	-	-	130	140	140	-	140	-	-	-	-	-	130	140	170	150	140	140	130
BH103	LMH	Magnesium	-	12	-	5.1	5.2	5.4	-	-	-	-	-	10	6.9	7.1	-	10	-	-	-	-	-	12	11	14	13	12	13	11
BH103	LMH	Chloride	**250**	49	-	36	36	35	-	-	-	-	40	37	39	39	-	40	42	38	44	38	43	40	41	43	45	44	43	43
BH103	LMH	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	<1	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Bicarbonate Alkalinity as CaCO3	-	-	-	310	340	310	-	-	-	-	-	370	330	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Sulphate	**250**	21	-	32	32	31	-	-	-	-	31	24	31	30	-	25	23	27	20	35	21	22	23	23	22	22	22	22
BH103	LMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	-	<0.3	-	-	-	-	-	<0.3	-	<0.3	<0.3	<0.3	<0.3	<0.3
BH103	LMH	Nitrate as NO_3	**50**	0.66	-	22	19	19	-	-	-	-	11	8.4	16	15	-	8.4	3.6	11	1.4	21	0.8	0.4	3.2	1	1.6	0.5	1	<0.2
BH103	LMH	Nitrite as NO_2	-	<0.02	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	1.9	3.5	3.3	-	1.9	0.8	2.4	0.3	4.8	<0.2	<0.2	0.7	0.3	0.3	<0.2	0.2	<0.2
BH103	LMH	Free Cyanide	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Total Cyanide	**0.05**	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Ammoniacal Nitrogen as NH_4	**0.50**	11	-	0.46	0.85	0.48	-	-	-	-	4.3	6	2	2.9	-	5.2	-	4.76	10.02	0.3	10.23	10.36	8.22	-	-	-	-	-
BH103	LMH	Total Alkalinity as CaCO3	-	-	-	310	340	310	-	-	-	-	-	370	330	350	-	400	-	-	-	-	-	420	460	460	450	450	440	430
BH103	LMH	Total Organic Carbon	-	<2.0	-	6.4	<2.0	<2.0	-	-	-	-	-	<2	3	<2	-	<2	5	-	9	9	8	6	<2	<2	140	<2	<2	<2
BH103	LMH	Total Suspended Solids	-	<10	-	11	13	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Organic Nitrogen	-	1.2	-	17	2.4	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	3	1	<1	-	2	-	-	-	-	-	<1	-	<1	3	<1	<1	2
BH103	LMH	Chemical Oxygen Demand	-	32	-	-	-	-	-	-	-	-	-	12	13	<7	-	24	-	-	-	-	-	28	-	25	25	27	16	26
BH103	LMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	820	800	820	-	860	-	-	-	-	-	910	830	940	950	980	900	890
BH103	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	7.2	7.4	7.4	-	7.3	-	-	-	-	-	6.5	7	7.3	7.4	7.8	7.3	7.2
BH103	LMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.6	4.5	9.5	0.28	9.7	-	7.8	-	-	-	-	-
BH103	LMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Total Cations		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.93	9.19	11.15	10.06	9.44	9.57	8.76
BH103	LMH	Total Anions		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.99	10.89	10.91	10.75	10.71	10.49	10.17
BH103	LMH	% Cation Excess		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-5.6	-8.47	1.09	-3.32	-6.3	-4.59	-7.45
BH103	LMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	7.3	7.6	7.8	7.7

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH103	CHK	Sodium	-	21	-	20	22	20	-	-	-	-	-	22	23	23	-	7.2	-	-	-	-	-	24	21	22	21	24	23	21
BH103	CHK	Potassium	-	2.2	-	2	2.1	2	-	-	-	-	-	2.1	2.2	2.2	-	1	-	-	-	-	-	2.1	1.9	2	2	2.2	2.2	2.1
BH103	CHK	Calcium	-	140	-	140	130	130	-	-	-	-	-	140	150	140	-	61	-	-	-	-	-	130	130	150	130	140	150	130
BH103	CHK	Magnesium	-	5.3	-	5	5	5.2	-	-	-	-	-	5.8	5.5	5.1	-	6.1	-	-	-	-	-	5.6	5.5	5.7	5.2	5.6	5.7	5.3
BH103	CHK	Chloride	250	37	-	35	36	34	-	-	-	-	38	35	38	37	-	13	39	15	37	41	41	38	34	37	41	40	39	38
BH103	CHK	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	<1	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Bicarbonate Alkalinity as CaCO3	-	-	-	320	320	280	-	-	-	-	-	330	310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Sulphate	250	30	-	33	32	31	-	-	-	-	39	32	35	34	-	41	33	34	36	23	43	34	34	39	36	36	35	34
BH103	CHK	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	-	<0.3	-	-	-	-	-	-	-	-	<0.3	-	-	-
BH103	CHK	Nitrate as NO_3	50	21	-	22	22	20	-	-	-	-	23	21	19	21	-	10	22	10	21	2.4	21	16	18	20	20	21	21	19
BH103	CHK	Nitrite as NO_2	-	<0.02	-	0.046	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	4.7	4.4	4.7	-	2.3	4.9	2.3	4.7	0.5	4.7	3.6	4.1	-	4.5	-	-	-
BH103	CHK	Free Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Total Cyanide	0.05	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Ammoniacal Nitrogen as NH_4	0.50	0.7	-	0.46	0.49	0.4	-	-	-	-	0.22	0.43	0.43	0.36	-	<0.03	-	0.07	0.28	10.26	0.47	0.44	0.38	-	-	-	-	-
BH103	CHK	Total Alkalinity as CaCO3	-	-	-	320	320	280	-	-	-	-	-	330	310	320	-	150	-	-	-	-	-	310	310	330	330	330	340	310
BH103	CHK	Total Organic Carbon	-	<2.0	-	5.9	<2.0	2.7	-	-	-	-	-	<2	<2	<2	-	2	<2	-	<2	4	5	<2	<2	-	3	-	-	-
BH103	CHK	Total Suspended Solids	-	<10	-	16	17	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Organic Nitrogen	-	0.86	-	5.9	1.9	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Biological Oxygen Demand	-	1.4	-	-	-	-	-	-	-	-	-	<1	<1	<1	-	<1	-	-	-	-	-	-	-	-	<1	-	-	-
BH103	CHK	Chemical Oxygen Demand	-	<7.0	-	-	-	-	-	-	-	-	-	<7	11	<7	-	14	-	-	-	-	-	-	-	-	<7	-	-	-
BH103	CHK	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	750	740	770	-	390	-	-	-	-	-	750	660	760	770	850	780	780
BH103	CHK	pH	-	-	-	-	-	-	-	-	-	-	-	7	7.3	7	-	6.9	-	-	-	-	-	6.5	6.9	7.6	7.4	7.2	7.3	7.3
BH103	CHK	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.24	0.07	0.26	9.7	0.44	0.42	0.36	-	-	-	-	-
BH103	CHK	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Total Cations		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.9	8.96	7.88	8.55	9.01	7.89
BH103	CHK	Total Anions		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.24	8.16	8.78	8.83	8.82	8.87	8.29
BH103	CHK	% Cation Excess		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-1.17	-1.62	1.01	-5.69	-1.55	0.78	-2.47
BH103	CHK	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.21	0.42	0.39	0.33	0.36
BH104	UMH	Sodium	-	7.3	-	8.7	4.2	10	-	-	-	-	-	-	-	-	-	20	-	-	-	-	13	15	14	10	6.7	8.5	9.2	6.8
BH104	UMH	Potassium	-	0.45	-	0.84	0.52	0.55	-	-	-	-	-	-	-	-	-	3.9	-	-	-	-	0.4	0.8	1.4	0.9	0.3	0.7	0.9	0.8
BH104	UMH	Calcium	-	62	-	69	37	49	-	-	-	-	-	-	-	-	-	200	-	-	-	-	63	64	120	73	47	66	66	49
BH104	UMH	Magnesium	-	2.3	-	5.2	2	2.2	-	-	-	-	-	-	-	-	-	16	-	-	-	-	2.8	3	3.8	5.4	1.8	4.6	4.9	3.8
BH104	UMH	Chloride	250	18	-	19	6.5	20	-	-	-	-	21	-	-	-	-	15	17	16	15	17	43	44	16	15	25	17	16	16
BH104	UMH	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH104	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	120	100	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	UMH	Sulphate	250	34	-	69	7.8	28	-	-	-	-	66	-	-	-	-	130	35	55	58	60	35	35	56	54	23	54	54	54
BH104	UMH	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	0.6	-	-	<0.3	<0.3	<0.3	<0.3	1.1
BH104	UMH	Nitrate as NO_3	50	7.1	-	7.1	1.2	3.7	-	-	-	-	3.5	-	-	-	-	1.1	19	1.2	3.9	5.8	53	49	4.4	5.8	49	12	10	12
BH104	UMH	Nitrite as NO_2	-	<0.02	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	4.2	0.3	0.9	1.3	12	-	-	1.3	11	2.8	2.3	2.6
BH104	UMH	Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
BH104	UMH	Total Cyanide	0.05	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
BH104	UMH	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
BH104	UMH	Ammoniacal Nitrogen as NH_4	0.30	<0.03	-	<0.03	0.039	0.03	-	-	-	-	0.09	-	-	-	-	0.37	<0.03	0	<0.03	0.08	-	-	-	-	-	-	-	-
BH104	UMH	Total Alkalinity as CaCO3	-	-	-	120	100	97	-	-	-	-	-	-	-	-	-	6700	-	-	-	-	100	100	130	150	86	130	140	160
BH104	UMH	Total Organic Carbon	-	3.4	-	4.5	6.2	8.5	-	-	-	-	-	-	-	-	-	9	3	0	<2	<2	4	-	-	<2	5	<2	<2	83
BH104	UMH	Total Suspended Solids	-	75	-	14	19	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	UMH	Organic Nitrogen	-	<0.5	-	5.2	2.2	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	UMH	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	<1	-	-	<1	<1	<1	<1	<1
BH104	UMH	Chemical Oxygen Demand	-	<7.0	-	-	-	-	-	-	-	-	-	-	-	-	-	22	-	-	-	-	31	-	-	15	20	9	18	15
BH104	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	960	-	-	-	-	450	220	370	420	300	440	420	330
BH104	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.1	-	-	-	-	7.2	6.3	6.4	6.6	6.9	7.9	7	7.8
BH104	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	0	<0.03	0.08	<0.03	-	-	-	-	-	-	-
BH104	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.95	4.11	6.95	4.55	2.79	4.06	4.12	3.07
BH104	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	4.76	4.29	4.54	3.57	4.4	4.54	5.07
BH104	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-9.71	-7.33	23.67	0.11	-12.26	-4.02	-4.85	-24.57
BH104	UMH	Ammoniacal Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	0.05	<0.03	10

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH104	LMH	Sodium	-	-	8.8	8	6.4	7.8	-	-	-	-	-	7.8	7.9	8.5	-	8.9	-	-	9	9.9	9.9	10	9.3	9.7	10	9.4	9.9	8.5
BH104	LMH	Potassium	-	-	1	0.88	0.69	0.8	-	-	-	-	-	0.8	0.8	0.8	-	1	-	-	1	1	0.8	0.9	1	1.2	1.1	1.1	1.2	1
BH104	LMH	Calcium	-	-	110	100	64	75	-	-	-	-	-	69	66	70	-	91	-	-	86	94	79	70	93	97	84	92	98	86
BH104	LMH	Magnesium	-	-	4.2	3.9	2.8	3.3	-	-	-	-	-	3.3	3	3.6	-	3.8	-	-	3.8	3.7	3.8	3.5	3.8	4.2	3.5	3.6	3.8	3.4
BH104	LMH	Chloride	**250**	-	20	17	12	16	-	-	-	-	18	17	20	15	-	16	20	20	20	24	29	25	18	19	24	20	22	21
BH104	LMH	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	LMH	Bicarbonate Alkalinity as CaCO3	-	-	-	210	150	150	-	-	-	-	-	160	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	LMH	Sulphate	**250**	-	47	59	32	42	-	-	-	-	54	31	35	48	-	50	41	41	42	38	40	38	46	43	50	49	45	49
BH104	LMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	0	1.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
BH104	LMH	Nitrate as NO_3	**50**	-	12	8	4.4	4.9	-	-	-	-	8	21	16	10	-	6.6	12	11	12	12	28	22	12	11	22	13	13	12
BH104	LMH	Nitrite as NO_2	-	-	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	LMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	4.6	3.5	2.3	-	1.5	2.7	2.3	2.7	2.8	6.3	5	2.6	2.5	4.9	3	2.9	2.7
BH104	LMH	Free Cyanide	**0.001**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.001	-	-	-	<0.01	-	-	-	-	-	-	-
BH104	LMH	Total Cyanide	**0.05**	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	<0.01	-	-	-	-	0.002	-	-	-	<0.01	-	-	-	-	-	-	-
BH104	LMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	0.002	-	-	-	<0.01	-	-	-	-	-	-	-
BH104	LMH	Ammoniacal Nitrogen as NH_4	**0.50**	-	0.035	<0.03	<0.03	<0.03	-	-	-	-	0.04	<0.03	<0.03	0.04	-	<0.03	<0.03	0	0.04	-	-	-	-	-	-	-	-	-
BH104	LMH	Total Alkalinity as CaCO3	-	-	-	210	150	150	-	-	-	-	-	160	120	120	-	160	230	230	230	250	170	170	170	200	180	180	210	220
BH104	LMH	Total Organic Carbon	-	-	<2.0	6.1	2.9	5.6	-	-	-	-	-	4	4	<2	-	-	<2	0	<2	<2	2	<2	<2	<2	2	<2	<2	3
BH104	LMH	Total Suspended Solids	-	-	35	<10	14	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	LMH	Organic Nitrogen	-	-	3.8	2.2	2	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	LMH	Biological Oxygen Demand	-	-	<1.0	-	-	-	-	-	-	-	-	<1	<1	<1	-	<1	-	0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH104	LMH	Chemical Oxygen Demand	-	-	25	-	-	-	-	-	-	-	-	24	18	<7	-	12	<7	0	<7	<7	8	11	<7	16	18	<7	13	<7
BH104	LMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	400	400	440	-	490	520	510	490	590	460	440	420	530	460	540	540	490
BH104	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	6.9	7	6.7	-	6.8	7.3	7.4	7.4	7.4	6.8	6.3	6.6	6.7	7.3	7.7	7.3	7.8
BH104	LMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	0	0.04	<0.03	<0.03	-	-	-	-	-	-	-
BH104	LMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	LMH	Total Cations		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.71	4.24	5.39	5.64	4.94	5.32	5.67	4.97
BH104	LMH	Total Anions		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.5	5.25	5.06	5.51	5.67	5.39	6.07	6.21
BH104	LMH	% Cation Excess		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-7.74	-10.64	3.16	1.17	-6.88	-0.65	-3.41	-11.09
BH104	LMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03
BH104	CHK	Sodium	-	11	-	11	11	9.6	-	-	-	-	-	9.1	11	12	-	9.6	-	-	12	12	12	13	12	13	12	12	12	11
BH104	CHK	Potassium	-	1.3	-	1.3	1.1	0.91	-	-	-	-	-	0.9	1.4	1.3	-	1.2	-	-	1.4	1.3	1.2	1.3	1.3	1.5	1.4	1.2	1.4	1.2
BH104	CHK	Calcium	-	110	-	120	100	88	-	-	-	-	-	76	120	130	-	94	-	-	120	120	120	120	120	140	120	130	130	110
BH104	CHK	Magnesium	-	3.8	-	3.9	3	3.2	-	-	-	-	-	3.5	3.3	3.7	-	4	-	-	3.5	3.6	3.7	3.6	3.6	4.1	3.6	3.7	3.8	3.5
BH104	CHK	Chloride	**250**	24	-	24	23	21	-	-	-	-	25	19	26	25	-	18	26	16	26	28	29	27	26	26	28	26	28	28
BH104	CHK	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	<1	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH104	CHK	Bicarbonate Alkalinity as CaCO3	-	-	-	250	240	200	-	-	-	-	-	200	270	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	CHK	Sulphate	**250**	39	-	41	28	33	-	-	-	-	29	29	30	31	-	54	29	42	32	32	31	32	31	35	36	34	33	38
BH104	CHK	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	0	0.6	<0.3	**1.5**	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
BH104	CHK	Nitrate as NO_3	**50**	15	-	12	11	8.4	-	-	-	-	16	23	15	16	-	6.2	15	9.3	14	14	17	16	15	14	16	15	15	15
BH104	CHK	Nitrite as NO_2	-	<0.02	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	CHK	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	5.1	3.4	3.7	-	1.4	3.4	2.1	3.1	3.2	3.9	3.7	3.4	3.2	3.7	3.4	3.3	3.3
BH104	CHK	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.001	-	-	-	<0.01	-	-	-	-	-	-	-
BH104	CHK	Total Cyanide	**0.05**	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	<0.01	-	-	-	-	0.002	-	-	-	<0.01	-	-	-	-	-	-	-
BH104	CHK	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	0.002	-	-	-	<0.01	-	-	-	-	-	-	-
BH104	CHK	Ammoniacal Nitrogen as NH_4	**0.50**	0.034	-	<0.03	0.032	0.11	-	-	-	-	0.04	0.05	<0.03	<0.03	-	<0.03	<0.03	0.03	<0.03	<0.03	-	-	-	-	-	-	-	-
BH104	CHK	Total Alkalinity as CaCO3	-	-	-	250	240	200	-	-	-	-	-	200	270	280	-	170	890	240	280	530	590	360	440	300	2200	1100	1400	350
BH104	CHK	Total Organic Carbon	-	<2.0	-	6.4	<2.0	5.7	-	-	-	-	-	4	3	<2	-	-	<2	0	<2	-	2	<2	<2	<2	<2	<2	<2	3
BH104	CHK	Total Suspended Solids	-	350	-	31	220	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	CHK	Organic Nitrogen	-	0.7	-	4.8	2.2	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	CHK	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	2	<1	<1	-	<1	-	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH104	CHK	Chemical Oxygen Demand	-	51	-	-	-	-	-	-	-	-	-	19	14	<7	-	8	11	16	<7	12	29	<7	<7	16	<7	<7	<7	<7
BH104	CHK	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	430	610	660	-	450	610	490	560	630	630	620	580	640	580	660	650	610
BH104	CHK	pH	-	-	-	-	-	-	-	-	-	-	-	7.3	7.4	7.1	-	7.1	7.3	7.2	7.2	7.5	7.2	6.5	7	7.2	7.4	7.7	7.3	7.6
BH104	CHK	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	0	<0.03	<0.03	<0.03	-	-	-	-	-	-	-
BH104	CHK	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	CHK	Total Cations		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.85	6.88	6.84	7.93	6.84	7.34	7.36	6.29
BH104	CHK	Total Anions		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.74	8.89	10.42	7.79	45.8	22.68	29.72	8.82
BH104	CHK	% Cation Excess		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-33.46	-12.75	-20.74	0.89	-74.01	-51.1	-60.3	-16.74
BH104	CHK	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH105	UMH	Sodium	-	-	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Potassium	-	-	-	-	-	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Calcium	-	-	-	-	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Magnesium	-	-	-	-	-	-	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Chloride	250	-	-	-	-	-	13	-	-	16	-	-	-	-	-	-	22	-	-	18	-	-	-	-	-	-	-	-
BH105	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	330	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Sulphate	250	-	-	-	-	-	74	-	-	100	-	-	-	-	-	-	100	-	-	97	-	-	-	-	-	-	-	-
BH105	UMH	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Nitrate as NO_3	50	-	-	-	-	-	6.6	-	-	14	-	-	-	-	-	-	16	-	-	19	-	-	-	-	-	-	-	-
BH105	UMH	Nitrite as NO_2	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.5	-	-	4.3	-	-	-	-	-	-	-	-
BH105	UMH	Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Total Cyanide	0.05	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Ammoniacal Nitrogen as NH_4	0.30	-	-	-	-	-	<0.03	-	-	0.04	-	-	-	-	-	-	-	-	-	0.04	-	-	-	-	-	-	-	-
BH105	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	330	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Total Organic Carbon	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-	-	<2	-	-	3	-	-	-	-	-	-	-	-
BH105	UMH	Total Suspended Solids	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Organic Nitrogen	-	-	-	-	-	-	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	0.04	-	-	-	-	-	-	-	-
BH105	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Sodium		15	-	19	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Potassium	-	1.8	-	1.7	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Calcium	-	120	-	110	99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Magnesium	-	2.9	-	4	4.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Chloride	-	29	-	26	31	-	-	-	-	32	-	-	-	-	-	-	-	-	-	31	-	-	-	-	-	-	-	-
BH105	LMH	Carbonate Alkalinity as CaCO3	250	-	-	<1.0	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Bicarbonate Alkalinity as CaCO3	-	-	-	230	260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Sulphate	-	120	-	82	42	-	-	-	-	44	-	-	-	-	-	-	-	-	-	47	-	-	-	-	-	-	-	-
BH105	LMH	Fluoride	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Nitrate as NO_3	1.5	21	-	20	18	-	-	-	-	28	-	-	-	-	-	-	-	-	-	28	-	-	-	-	-	-	-	-
BH105	LMH	Nitrite as NO_2	50	0.49	-	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.3	-	-	-	-	-	-	-	-
BH105	LMH	Free Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Total Cyanide	0.001	<0.01	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Ammoniacal Nitrogen as NH_4	0.05	0.19	-	0.046	0.033	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-
BH105	LMH	Total Alkalinity as CaCO3	0.50	-	-	230	260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Total Organic Carbon	-	2.2	-	<2.0	<2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-
BH105	LMH	Total Suspended Solids	-	82	-	220	91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Organic Nitrogen	-	3	-	1.3	2.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Biological Oxygen Demand	-	<1.0	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Chemical Oxygen Demand	-	16	-	7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-
BH105	LMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	Total Anions		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	LMH	% Cation Excess		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH105	CHK	Sodium		63	-	25	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Potassium		2	-	2	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Calcium	-	120	-	96	91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Magnesium	-	4.2	-	4.8	4.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Chloride	-	33	-	23	24	-	-	-	-	-	24	-	-	-	-	-	28	-	-	30	-	-	-	-	-	-	-	-
BH105	CHK	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Bicarbonate Alkalinity as CaCO3	**250**	-	-	160	950	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Sulphate	-	32	-	130	97	-	-	-	-	-	110	-	-	-	-	-	100	-	-	46	-	-	-	-	-	-	-	-
BH105	CHK	Fluoride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Nitrate as NO_3	**250**	28	-	12	17	-	-	-	-	-	21	-	-	-	-	-	20	-	-	28	-	-	-	-	-	-	-	-
BH105	CHK	Nitrite as NO_2	**1.5**	<0.02	-	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Total Oxidised Nitrogen as N	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	-	-	6.2	-	-	-	-	-	-	-	-
BH105	CHK	Free Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Total Cyanide	-	<0.01	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Ammoniacal Nitrogen as NH_4	**0.05**	0.069	-	0.096	0.048	-	-	-	-	-	0.03	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-
BH105	CHK	Total Alkalinity as CaCO3	**0.05**	-	-	160	950	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Total Organic Carbon	**0.50**	<2.0	-	4.1	<2.0	-	-	-	-	-	-	-	-	-	-	-	<2	-	-	2	-	-	-	-	-	-	-	-
BH105	CHK	Total Suspended Solids	-	880	-	74	1900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Organic Nitrogen	-	1.3	-	2.5	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Biological Oxygen Demand	-	<1.0	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Chemical Oxygen Demand	-	12	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-	<0.03	-	-	-	-	-	-	-	-
BH105	CHK	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH105	CHK	% Cation Excess		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Sodium		7	-	6.5	11	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.4	6.9	7.2	7.2	7.1	7.5	6.5
BH106	UMH	Potassium		0.62	-	0.46	0.96	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7	0.4	0.4	0.3	0.3	0.5	0.3
BH106	UMH	Calcium		67	-	62	62	58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47	72	79	66	69	74	66
BH106	UMH	Magnesium	-	6	-	6.8	4.8	4.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.5	6.4	7.5	6.4	6.6	7.3	6.1
BH106	UMH	Chloride	-	8.8	-	8.5	8.7	10	-	-	-	-	10	-	-	-	-	-	9.6	-	-	-	10	14	9.5	10	9.9	10	10	11
BH106	UMH	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	130	180	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Sulphate	**250**	42	-	49	32	26	-	-	-	-	53	-	-	-	-	-	46	-	-	-	63	24	49	73	61	46	55	62
BH106	UMH	Fluoride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Nitrate as NO_3	-	4.2	-	5.8	2.9	2.4	-	-	-	-	7.5	-	-	-	-	-	6.6	-	-	-	8.4	1.1	5.8	8.9	8.4	8	8.4	8.4
BH106	UMH	Nitrite as NO_2	**250**	<0.02	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Total Oxidised Nitrogen as N	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	1.9	0.2	-	-	-	-	-	-
BH106	UMH	Free Cyanide	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Total Cyanide	-	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Complex Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Ammoniacal Nitrogen as NH_4	**0.001**	<0.03	-	0.046	<0.03	0.04	-	-	-	-	<0.03	-	-	-	-	-	<0.03	-	-	-	<0.03	<0.03	-	-	-	-	-	-
BH106	UMH	Total Alkalinity as CaCO3	**0.05**	-	-	130	180	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	140	150	160	180	170	160	150
BH106	UMH	Total Organic Carbon	**0.05**	<2.0	-	4.4	2.6	4.1	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	4	<2	-	-	-	-	-	-
BH106	UMH	Total Suspended Solids	**0.30**	30	-	13	31	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Organic Nitrogen	-	10	-	<0.5	2.2	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Biological Oxygen Demand	-	<1.0	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Chemical Oxygen Demand	-	<7.0	-	9.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300	400	420	400	440	420	400
BH106	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.3	6.6	7.2	7.1	6.8	6.9	7
BH106	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	<0.03	<0.03	-	-	-	-	-	-
BH106	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.93	4.43	4.88	4.14	4.3	4.63	4.09
BH106	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.71	4.28	5.25	5.28	4.77	4.86	4.64
BH106	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-11.75	1.72	-3.65	-12.1	-5.18	-2.42	-6.3
BH106	UMH	Ammoniacal Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH106	LMH	Sodium	-	23	-	18	18	18	-	-	-	-	-	16	16.1	17	-	17	-	-	16	16	15	15	16	17	15	16	12	14
BH106	LMH	Potassium	-	1.5	-	1.7	1.6	1.6	-	-	-	-	-	1.8	1.6	1.8	-	1.7	-	-	1.7	1.4	1.5	1.5	1.6	1.7	1.5	1.7	1.3	1.4
BH106	LMH	Calcium		120	-	140	130	130	-	-	-	-	-	140	134.7	150	-	140	-	-	130	120	120	120	130	150	120	130	96	130
BH106	LMH	Magnesium	-	5.6	-	4.8	5.2	4.9	-	-	-	-	-	4.7	4.3	4.3	-	4.3	-	-	4.3	4.2	3.9	4.3	4.3	4.7	3.9	4.2	3.9	3.9
BH106	LMH	Chloride	-	23	-	30	26	30	-	-	-	-	35	32	33.3	36	-	34	35	35	34	32	33	31	31	34	34	31	32	35
BH106	LMH	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1	-	-	-	-	-	-	-	<1	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH106	LMH	Bicarbonate Alkalinity as CaCO3	-	-	-	270	300	280	-	-	-	-	-	310	279	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	LMH	Sulphate	**250**	53	-	57	55	54	-	-	-	-	47	42	45.75	44	-	58	39	36	38	40	40	42	41	43	46	52	45	45
BH106	LMH	Fluoride	-	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	0	<0.3	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
BH106	LMH	Nitrate as NO_3	-	19	-	20	18	23	-	-	-	-	26	25	25.4	28	-	25	24	26	22	23	22	20	17	23	23	22	7.5	23
BH106	LMH	Nitrite as NO_2	**250**	0.12	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	LMH	Total Oxidised Nitrogen as N	**1.5**	-	-	-	-	-	-	-	-	-	-	5.7	5.7	6.4	-	5.7	5.5	5.8	4.9	5.2	5	4.4	3.9	5.1	5.1	4.9	1.7	5.1
BH106	LMH	Free Cyanide	**50**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.001	-	-	-	<0.01	-	-	-	-	-	-	-
BH106	LMH	Total Cyanide	-	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	<0.01	-	-	-	-	0.001	-	-	-	<0.01	-	-	-	-	-	-	-
BH106	LMH	Complex Cyanide	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	0.001	-	-	-	<0.01	-	-	-	-	-	-	-
BH106	LMH	Ammoniacal Nitrogen as NH_4	**0.001**	<0.03	-	<0.03	<0.03	<0.03	-	-	-	-	0.09	0.04	0.04	<0.03	-	<0.03	0.04	0.12	0.06	<0.03	<0.03	-	-	-	-	-	-	-
BH106	LMH	Total Alkalinity as CaCO3	**0.05**	-	-	270	300	280	-	-	-	-	-	310	279	330	-	290	380	530	690	440	350	450	290	310	570	250	310	320
BH106	LMH	Total Organic Carbon	**0.05**	<2.0	-	6.7	<2.0	<2.0	-	-	-	-	-	<2	<2	<2	-	2	<2	0	<2	3	<2	<2	<2	<2	<2	<2	<2	2
BH106	LMH	Total Suspended Solids	**0.50**	41	-	26	26	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	LMH	Organic Nitrogen	-	1.9	-	<0.5	2.7	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	LMH	Biological Oxygen Demand	-	<1.0	-	<1.0	-	-	-	-	-	-	-	1	<1	<1	-	<1	-	0	<1	<1	<1	<1	<1	<1	<1	<1	1	<1
BH106	LMH	Chemical Oxygen Demand	-	<7.0	-	<7.0	-	-	-	-	-	-	-	<7	14	<7	-	27	26	0	7	<7	12	13	<7	12	16	<7	11	7
BH106	LMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	720	736	750	-	670	700	650	680	570	690	600	610	660	670	710	660	660
BH106	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	7.5	7.47	7.6	-	7.4	7.5	7.1	7.3	7.4	7.3	6.6	7.1	7.1	7.5	7.3	7.6	7.6
BH106	LMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	0.11	0.06	<0.03	<0.03	-	-	-	-	-	-	-
BH106	LMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	LMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	7.03	7.58	8.65	7	7.57	5.67	7.45
BH106	LMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.12	11.07	7.7	8.43	13.29	7.41	8.16	8.7
BH106	LMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-13.15	-22.32	-0.79	1.29	-31	1.07	-18	-7.74
BH106	LMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	0.03	<0.03	<0.03	<0.03
BH106	CHK	Sodium		56	-	90	16	6.7	-	-	-	-	-	13	13.9	16	-	15	-	-	16	23	18	13	15	17	12	14	16	14
BH106	CHK	Potassium		2.7	-	2	1.2	0.57	-	-	-	-	-	1.6	1	1.1	-	1.2	-	-	1.3	1.1	1.3	1	1.1	1.4	1	1.2	1.3	1
BH106	CHK	Calcium		65	-	65	76	62	-	-	-	-	-	130	92.9	120	-	100	-	-	88	83	91	82	90	96	89	92	98	89
BH106	CHK	Magnesium	-	5	-	3.6	6.6	7.3	-	-	-	-	-	4.8	4	3.9	-	4	-	-	3.8	3.5	3.5	3.6	3.7	3.7	2.9	3.5	3.7	3.3
BH106	CHK	Chloride	-	14	-	13	9.7	9.3	-	-	-	-	11	7.8	10.3	12	-	9.8	10	10	11	11	11	15	11	10	10	11	10	10
BH106	CHK	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1	-	-	-	-	-	-	-	<1	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH106	CHK	Bicarbonate Alkalinity as CaCO3	-	-	-	350	230	120	-	-	-	-	-	260	244	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	CHK	Sulphate	**250**	26	-	69	55	52	-	-	-	-	38	37	31.42	32	-	30	29	21	21	22	24	24	22	21	17	22	21	21
BH106	CHK	Fluoride	-	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	0	<0.3	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
BH106	CHK	Nitrate as NO_3	-	11	-	1.7	4.9	9.7	-	-	-	-	9.7	13	11.2	14	-	12	11	14	14	15	16	12	11	15	16	14	12	15
BH106	CHK	Nitrite as NO_2	**250**	0.36	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	CHK	Total Oxidised Nitrogen as N	**1.5**	-	-	-	-	-	-	-	-	-	-	2.9	2.5	3.2	-	2.7	2.4	3.1	3.2	3.3	3.5	2.7	2.5	3.4	3.6	3.1	2.6	3.4
BH106	CHK	Free Cyanide	**50**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.001	-	-	-	<0.01	-	-	-	-	-	-	-
BH106	CHK	Total Cyanide	-	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	<0.01	-	-	-	-	0.001	-	-	-	<0.01	-	-	-	-	-	-	-
BH106	CHK	Complex Cyanide	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	0.001	-	-	-	<0.01	-	-	-	-	-	-	-
BH106	CHK	Ammoniacal Nitrogen as NH_4	**0.05**	0.036	-	0.058	0.053	0.06	-	-	-	-	0.05	0.05	<0.03	<0.03	-	<0.03	<0.03	0.17	0.04	<0.03	<0.03	-	-	-	-	-	-	-
BH106	CHK	Total Alkalinity as CaCO3	**0.05**	-	-	350	230	120	-	-	-	-	-	260	244	330	-	640	1300	400	840	580	840	1300	240	340	860	640	550	620
BH106	CHK	Total Organic Carbon	**0.05**	<2.0	-	8.7	<2.0	2.8	-	-	-	-	-	3	<2	<2	-	<2	<2	0	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
BH106	CHK	Total Suspended Solids	**0.50**	4900	-	230	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	CHK	Organic Nitrogen	-	2	-	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	CHK	Biological Oxygen Demand	-	<1.0	-	<1.0	-	-	-	-	-	-	-	<1	<1	<1	-	3	<1	0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH106	CHK	Chemical Oxygen Demand	-	19	-	16	-	-	-	-	-	-	-	13	<7	<7	-	21	10	0	10	<7	<7	15	<7	8	<7	<7	8	<7
BH106	CHK	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	500	542	560	-	540	480	460	500	430	510	470	510	520	430	500	450	490
BH106	CHK	pH	-	-	-	-	-	-	-	-	-	-	-	7.1	7.58	7.7	-	7.4	7.5	7.3	7.3	7.5	7.4	6.7	7.1	7.2	7.5	7.2	7.4	7.7
BH106	CHK	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	0.16	0.04	<0.03	<0.03	-	-	-	-	-	-	-
BH106	CHK	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	CHK	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.65	4.98	5.48	5.87	5.23	5.52	5.92	5.35
BH106	CHK	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17.07	27.12	5.75	7.66	16.89	13.99	11.91	12.96
BH106	CHK	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-50.26	-68.97	-2.4	-13.23	-52.71	-43.41	-33.6	-41.56
BH106	CHK	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH107	UMH	Sodium		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Potassium		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Calcium		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Chloride	-	-	-	-	-	-	-	-	-	-	13	-	-	-	-	-	8.8	-	-	10	-	-	-	-	-	-	-	-
BH107	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	260	-	-	-	-	-	230	-	-	290	-	-	-	-	-	-	-	-
BH107	UMH	Fluoride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Nitrate as NO_3	-	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-	34	-	-	10	-	-	-	-	-	-	-	-
BH107	UMH	Nitrite as NO_2	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Total Oxidised Nitrogen as N	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.6	-	-	2.3	-	-	-	-	-	-	-	-
BH107	UMH	Free Cyanide	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Total Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Complex Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Ammoniacal Nitrogen as NH_4	**0.001**	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	0.04	-	-	0.03	-	-	-	-	-	-	-	-
BH107	UMH	Total Alkalinity as CaCO3	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Total Organic Carbon	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	3	-	-	-	-	-	-	-	-
BH107	UMH	Total Suspended Solids	**0.30**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-	<0.03	-	-	-	-	-	-	-	-
BH107	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Magnesium		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Chloride	-	-	-	-	-	-	-	-	-	-	43	-	-	-	-	-	-	-	-	42	-	-	-	-	-	-	-	-
BH107	LMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Sulphate	-	-	-	-	-	-	-	-	-	-	59	-	-	-	-	-	-	-	-	55	-	-	-	-	-	-	-	-
BH107	LMH	Fluoride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Nitrate as NO_3	-	-	-	-	-	-	-	-	-	-	38	-	-	-	-	-	-	-	-	37	-	-	-	-	-	-	-	-
BH107	LMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Total Oxidised Nitrogen as N	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.3	-	-	-	-	-	-	-	-
BH107	LMH	Free Cyanide	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Total Cyanide	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Complex Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Ammoniacal Nitrogen as NH_4	-	-	-	-	-	-	-	-	-	-	0.04	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-
BH107	LMH	Total Alkalinity as CaCO3	**0.001**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Total Organic Carbon	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-
BH107	LMH	Total Suspended Solids	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Organic Nitrogen	**0.50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-
BH107	LMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	LMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH107	CHK	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Potassium		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Calcium		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Magnesium		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Chloride		-	-	-	-	-	-	-	-	-	28	-	-	-	-	-	-	-	-	38	-	-	-	-	-	-	-	-
BH107	CHK	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Sulphate	-	-	-	-	-	-	-	-	-	-	110	-	-	-	-	-	-	-	-	41	-	-	-	-	-	-	-	-
BH107	CHK	Fluoride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Nitrate as NO_3	**250**	-	-	-	-	-	-	-	-	-	28	-	-	-	-	-	-	-	-	37	-	-	-	-	-	-	-	-
BH107	CHK	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.4	-	-	-	-	-	-	-	-
BH107	CHK	Free Cyanide	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Total Cyanide	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Complex Cyanide	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Ammoniacal Nitrogen as NH_4	-	-	-	-	-	-	-	-	-	-	0.03	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-
BH107	CHK	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Total Organic Carbon	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-
BH107	CHK	Total Suspended Solids	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Organic Nitrogen	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Biological Oxygen Demand	**0.50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-
BH107	CHK	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH107	CHK	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Calcium		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Magnesium		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Chloride		-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	23	-	-	19	20	19	22	-	-	-	-	-
BH108	UMH	Carbonate Alkalinity as CaCO3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Sulphate	-	-	-	-	-	-	-	-	-	-	96	-	-	-	-	-	110	-	-	120	120	99	92	-	-	-	-	-
BH108	UMH	Fluoride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Nitrate as NO_3	-	-	-	-	-	-	-	-	-	-	7.5	-	-	-	-	-	21	-	-	17	17	13	14	-	-	-	-	-
BH108	UMH	Nitrite as NO_2	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	-	-	3.9	3.8	2.9	3.2	-	-	-	-	-
BH108	UMH	Free Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Total Cyanide	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Complex Cyanide	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Ammoniacal Nitrogen as NH_4	**50**	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	0.41	-	-	0.04	0.06	0.05	0.04	-	-	-	-	-
BH108	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	-	-	6	2	2	<2	-	-	-	-	-
BH108	UMH	Total Suspended Solids	**0.001**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Organic Nitrogen	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Biological Oxygen Demand	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Chemical Oxygen Demand	**0.30**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.39	-	-	0.04	0.06	0.05	0.04	-	-	-	-	-
BH108	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH108	LMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Chloride	-	-	-	-	-	-	-	-	-	-	15	-	-	-	-	-	25	-	17	23	-	19	-	-	-	-	-	-
BH108	LMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Bicarbonate Alkalinity as CaCO3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Sulphate	-	-	-	-	-	-	-	-	-	-	180	-	-	-	-	-	150	-	170	180	-	190	-	-	-	-	-	-
BH108	LMH	Fluoride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Nitrate as NO_3	-	-	-	-	-	-	-	-	-	-	8.9	-	-	-	-	-	15	-	11	16	-	9.3	-	-	-	-	-	-
BH108	LMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Total Oxidised Nitrogen as N	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	-	2.4	3.5	-	2.1	-	-	-	-	-	-
BH108	LMH	Free Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Total Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Complex Cyanide	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Ammoniacal Nitrogen as NH_4	1.5	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	0.32	0.25	-	0.39	-	-	-	-	-	-
BH108	LMH	Total Alkalinity as CaCO3	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	-	<2	5	-	3	-	-	-	-	-	-
BH108	LMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Organic Nitrogen	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Biological Oxygen Demand	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Chemical Oxygen Demand	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Electric Conductivity at 25C	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	0.3	0.24	-	0.37	-	-	-	-	-	-
BH108	LMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	LMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Chloride		-	-	-	-	-	-	-	-	-	29	-	-	-	-	-	30	-	28	29	-	29	26	-	-	-	-	-
BH108	CHK	Carbonate Alkalinity as CaCO3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Bicarbonate Alkalinity as CaCO3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Sulphate		-	-	-	-	-	-	-	-	-	16	-	-	-	-	-	19	-	19	20	-	22	180	-	-	-	-	-
BH108	CHK	Fluoride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Nitrate as NO_3	-	-	-	-	-	-	-	-	-	-	32	-	-	-	-	-	33	-	31	32	-	27	21	-	-	-	-	-
BH108	CHK	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.4	-	7	7.1	-	6.1	4.7	-	-	-	-	-
BH108	CHK	Free Cyanide	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Total Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Complex Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Ammoniacal Nitrogen as NH_4	250	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	<0.03	<0.03	-	<0.03	0.3	-	-	-	-	-
BH108	CHK	Total Alkalinity as CaCO3	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Total Organic Carbon	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	-	<2	2	-	<2	4	-	-	-	-	-
BH108	CHK	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Biological Oxygen Demand	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Chemical Oxygen Demand	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Electric Conductivity at 25C	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	pH	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.21	-	<0.03	<0.03	-	<0.03	0.28	-	-	-	-	-
BH108	CHK	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	CHK	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH201	LMH-S	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Chloride	250	-	-	-	-	-	-	-	-	-	34	-	-	-	-	-	34	-	-	33	-	-	-	-	-	-	-	-
BH201	LMH-S	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Sulphate	250	-	-	-	-	-	-	-	-	-	91	-	-	-	-	-	90	-	-	120	-	-	-	-	-	-	-	-
BH201	LMH-S	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Nitrate as NO_3	50	-	-	-	-	-	-	-	-	-	29	-	-	-	-	-	22	-	-	26	-	-	-	-	-	-	-	-
BH201	LMH-S	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.9	-	-	5.8	-	-	-	-	-	-	-	-
BH201	LMH-S	Free Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Ammoniacal Nitrogen as NH_4	0.39	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	0.04	-	-	<0.03	-	-	-	-	-	-	-	-
BH201	LMH-S	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	-	-	3	-	-	-	-	-	-	-	-
BH201	LMH-S	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-	<0.03	-	-	-	-	-	-	-	-
BH201	LMH-S	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-S	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Chloride	250	-	-	-	-	-	-	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Sulphate	250	-	-	-	-	-	-	-	-	-	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Nitrate as NO_3	50	-	-	-	-	-	-	-	-	-	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Free Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Ammoniacal Nitrogen as NH_4	0.39	-	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201	LMH-D	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
FT101	UMH	Sodium	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Potassium	-	3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Calcium	-	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Magnesium	-	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Chloride	250	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.3	-	-	-	5.2	12	10	-	-	-	-	-
FT101	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Sulphate	250	93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130	-	-	-	36	99	84	-	-	-	-	-
FT101	UMH	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Nitrate as NO_3	50	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	-	-	11	14	13	-	-	-	-	-
FT101	UMH	Nitrite as NO_2	-	0.023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.1	-	-	-	2.4	3.2	3	-	-	-	-	-
FT101	UMH	Free Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Total Cyanide	0.05	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Ammoniacal Nitrogen as NH_4	0.39	0.044	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	0.1	0.03	<0.03	-	-	-	-	-
FT101	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Total Organic Carbon	-	<2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	9	3	3	-	-	-	-	-
FT101	UMH	Total Suspended Solids	-	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Organic Nitrogen	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Chemical Oxygen Demand	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	0.09	<0.03	<0.03	-	-	-	-	-
FT101	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Sodium	-	6.1	-	5.2	5.2	3.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Potassium	-	1.4	-	1.4	0.38	0.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Calcium	-	45	-	47	23	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Magnesium	-	3.7	-	3.1	1	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Chloride	250	6.4	-	5.1	5.2	6.5	-	-	-	-	5.1	-	-	-	-	-	-	33	5.5	4.8	-	-	-	-	-	-	-	-
FT102	UMH	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	91	60	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Sulphate	250	44	-	53	13	15	-	-	-	-	48	-	-	-	-	-	-	35	54	63	-	-	-	-	-	-	-	-
FT102	UMH	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Nitrate as NO_3	50	4.4	-	7.1	1.6	2.3	-	-	-	-	89	-	-	-	-	-	-	22	6.6	7.1	-	-	-	-	-	-	-	-
FT102	UMH	Nitrite as NO_2	-	0.043	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1.5	1.6	-	-	-	-	-	-	-	-
FT102	UMH	Free Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Total Cyanide	0.05	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Ammoniacal Nitrogen as NH_4	0.39	0.12	-	<0.03	0.075	<0.03	-	-	-	-	0.05	-	-	-	-	-	-	0.1	-	<0.03	-	-	-	-	-	-	-	-
FT102	UMH	Total Alkalinity as CaCO3	-	-	-	91	60	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Total Organic Carbon	-	<2.0	-	3.3	3.6	5.6	-	-	-	-	-	-	-	-	-	-	-	4	3	<2	-	-	-	-	-	-	-	-
FT102	UMH	Total Suspended Solids	-	110	-	170	77	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Organic Nitrogen	-	6.9	-	2.9	1.7	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Chemical Oxygen Demand	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.09	-	<0.03	-	-	-	-	-	-	-	-
FT102	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
FT103	UMH	Sodium	-	4.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Potassium	-	0.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Calcium	-	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Magnesium	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Chloride	**250**	9.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Sulphate	**250**	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Nitrate as NO_3	**50**	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Nitrite as NO_2	-	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Total Cyanide	**0.05**	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Ammoniacal Nitrogen as NH_4	**0.39**	<0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Total Organic Carbon	-	<2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Total Suspended Solids	-	84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Organic Nitrogen	-	0.91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Chemical Oxygen Demand	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39	-	-	-	-	-	-	-	25	23	20	25	22
BH301	LMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.9	-	-	-	-	-	-	-	1.7	1.5	1.3	1.4	1.3
BH301	LMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130	-	-	-	-	-	-	-	160	130	130	130	130
BH301	LMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.4	-	-	-	-	-	-	-	8.7	7.1	6.5	7	7.2
BH301	LMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33	32	32	32	35	32	31	33	37	37	38	30	34
BH301	LMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	88	90	91	93	99	100	110	100	89	84	100	99
BH301	LMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	0	0.8	<0.2	1	0.5	0.4	0.3	1.4	1	0.7	0.9
BH301	LMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	0	<0.2	<0.2	0.2	<0.2	<0.2	-	-	-	-	-
BH301	LMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.06	0.04	0.03	0.03	<0.03	0.04	<0.03	-	-	-	-	-
BH301	LMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1900	-	-	-	-	-	-	-	370	300	580	620	750
BH301	LMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	<2	0	7	2	<2	<2	<2	-	-	-	-	-
BH301	LMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	790	-	-	-	-	-	-	-	810	700	580	680	700
BH301	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5	-	-	-	-	-	-	-	7.5	7.6	7.3	7.2	7.6
BH301	LMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.06	0.04	<0.03	<0.03	<0.03	0.04	<0.03	-	-	-	-	-
BH301	LMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.83	8.11	7.93	8.19	8.07
BH301	LMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.53	9.02	14.84	14.94	18.04
BH301	LMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-3.44	-5.31	-30.35	-29.18	-38.18
BH301	LMH	Ammoniacal Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	0.05	<0.03	<0.03	0.03

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH301	CHK	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	-	-	-	-	-	-	-	25	25	24	23	29
BH301	CHK	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	1.6	1.5	1.5	1.4	1.4
BH301	CHK	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130	-	-	-	-	-	-	-	150	130	130	130	130
BH301	CHK	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.5	-	-	-	-	-	-	-	5.7	5.3	6.1	5.6	5.4
BH301	CHK	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47	41	44	45	46	44	34	40	42	41	39	40	41
BH301	CHK	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH301	CHK	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	CHK	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	74	70	69	73	76	64	82	79	77	79	83	79	86
BH301	CHK	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-
BH301	CHK	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	5.8	0.5	0.7	1.6	0.7	0.7	0.5	1.5	1.2	1.1	1
BH301	CHK	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	CHK	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	1.3	<0.2	<0.2	0.4	<0.2	<0.2	-	-	-	-	-
BH301	CHK	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	CHK	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	CHK	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	CHK	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	0.04	0.04	0.03	<0.03	0.04	<0.03	-	-	-	-	-
BH301	CHK	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1200	-	-	-	-	-	-	-	3700	310	1800	2000	1200
BH301	CHK	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	<2	0	4	4	2	<2	<2	-	-	-	-	-
BH301	CHK	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	CHK	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	CHK	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH301	CHK	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	-	-	-	-	-	-	-	-	-	-
BH301	CHK	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	730	-	-	-	-	-	-	-	720	710	690	690	610
BH301	CHK	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.6	-	-	-	-	-	-	-	7.6	7.6	7.2	7.2	7.5
BH301	CHK	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	0.04	0.04	<0.03	<0.03	0.04	<0.03	-	-	-	-	-
BH301	CHK	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	CHK	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.08	8.05	8.07	7.98	8.23
BH301	CHK	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76.8	9.03	38.85	41.79	27.96
BH301	CHK	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-78.85	-5.74	-65.6	-67.93	-54.52
BH301	CHK	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	0.05	<0.03	<0.03	<0.03
BH302	LMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	55	-	-	-	-	-	-	-	55	53	61	53	52
BH302	LMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.9	-	-	-	-	-	-	-	9.5	9.3	10	8.9	8.6
BH302	LMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	160	-	-	-	-	-	-	-	180	180	190	170	170
BH302	LMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	15	15	16	15	15
BH302	LMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	79	76	48	79	61	77	81	67	93	92	89	88	92
BH302	LMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH302	LMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	LMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	26	41	25	33	24	25	24	26	26	23	24	23
BH302	LMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-
BH302	LMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	<0.2	0.6	<0.2	0.4	0.4	<0.2	0.5	<0.2	<0.2	0.9	<0.2	<0.2
BH302	LMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	LMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	0	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	-	-
BH302	LMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	LMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	LMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	LMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.08	6.22	11.66	10.8	12.23	12.49	11.16	-	-	-	-	-
BH302	LMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	680	-	-	-	-	-	-	-	1400	570	850	750	760
BH302	LMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	6	0	4	12	11	12	<2	-	-	-	-	-
BH302	LMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	LMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	LMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
BH302	LMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-
BH302	LMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1100	-	-	-	-	-	-	-	1100	1100	1000	1100	1200
BH302	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.3	-	-	-	-	-	-	-	7.4	7.3	7.3	7.3	7.3
BH302	LMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	5.9	11	10	12	12	11	-	-	-	-	-
BH302	LMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	LMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.85	12.76	13.71	12.25	12.2
BH302	LMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.16	14.14	19.01	17.98	18.07
BH302	LMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-41.6	-5.13	-16.2	-18.95	-19.39
BH302	LMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.7	9.2	10	10	10

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH302	CHK	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	-	-	-	-	-	-	-	46	45	41	41	40
BH302	CHK	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	-	-	3.8	4	3.6	3.4	3.2
BH302	CHK	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99	-	-	-	-	-	-	-	150	160	160	150	140
BH302	CHK	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	-	-	-	-	-	-	-	12	12	12	11	11
BH302	CHK	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	60	15	67	72	70	66	65	83	75	66	69	73
BH302	CHK	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH302	CHK	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	CHK	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63	32	47	29	26	27	26	25	22	26	27	24	24
BH302	CHK	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-
BH302	CHK	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8	<0.2	0.9	<0.2	0.2	0.4	<0.2	6.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH302	CHK	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	CHK	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	0	<0.2	<0.2	<0.2	<0.2	1.4	-	-	-	-	-
BH302	CHK	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	CHK	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	CHK	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	CHK	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.33	0.59	6.08	6.47	6.84	7.04	6.47	-	-	-	-	-
BH302	CHK	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	710	-	-	-	-	-	-	-	1400	490	470	2700	2300
BH302	CHK	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	3	3	<2	8	8	3	<2	-	-	-	-	-
BH302	CHK	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	CHK	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	CHK	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
BH302	CHK	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	-	-	-	-	-	-	-	-	-	-	-	-
BH302	CHK	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	600	-	-	-	-	-	-	-	1000	1000	820	910	840
BH302	CHK	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.4	-	-	-	-	-	-	-	7.4	7.3	7.5	7.2	7.3
BH302	CHK	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	0.56	5.7	6.1	6.5	6.6	6.1	-	-	-	-	-
BH302	CHK	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302	CHK	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.57	11.03	10.85	10.26	9.71
BH302	CHK	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30.8	12.46	11.72	56.45	48.56
BH302	CHK	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-48.9	-6.09	-3.85	-69.24	-66.67
BH302	CHK	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.8	5.7	4.9	5.4	5.8
BH305	LMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	-	-	-	-	-	-	-	-	15	18	16	16
BH305	LMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	-	-	-	-	-	-	-	-	2	1.8	2	1.8
BH305	LMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	-	-	-	-	-	-	-	-	120	140	130	120
BH305	LMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.9	-	-	-	-	-	-	-	-	3.4	4.2	3.7	3.7
BH305	LMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31	32	-	33	30	-	-	-	-	32	31	31	32
BH305	LMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	44	35	-	39	38	-	-	-	-	43	41	41	44
BH305	LMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.3	4.2	-	27	29	-	-	-	-	27	27	25	27
BH305	LMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.1	0.9	-	6.2	6.5	-	-	-	-	-	-	-	-
BH305	LMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.15	-	<0.03	<0.03	-	-	-	-	-	-	-	-
BH305	LMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	640	-	-	-	-	-	-	-	-	2100	850	850	2500
BH305	LMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	<2	-	<2	3	-	-	-	-	-	-	-	-
BH305	LMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	670	-	-	-	-	-	-	-	-	700	690	710	640
BH305	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5	-	-	-	-	-	-	-	-	7.5	7.1	7.3	7.5
BH305	LMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.14	-	<0.03	<0.03	-	-	-	-	-	-	-	-
BH305	LMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.97	8.16	7.54	7.03
BH305	LMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45.23	18.16	18.13	53.25
BH305	LMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-73.3	-37.99	-41.25	-76.68
BH305	LMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH305	CHK	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-	-	-	-	-	17	-	24	18	20
BH305	CHK	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-	-	-	2.1	-	3.2	2.2	2.1
BH305	CHK	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	-	-	-	-	-	-	-	130	-	150	130	130
BH305	CHK	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2	-	-	-	-	-	-	-	3.3	-	4.6	3.3	3.4
BH305	CHK	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	25	-	30	32	-	-	-	32	-	31	31	33
BH305	CHK	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42	25	-	35	36	-	-	-	42	-	40	37	41
BH305	CHK	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	6.6	-	30	32	-	-	-	27	-	28	27	29
BH305	CHK	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1.5	-	6.8	7.2	-	-	-	-	-	-	-	-
BH305	CHK	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	0.11	<0.03	-	-	-	-	-	-	-	-
BH305	CHK	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	960	-	-	-	-	-	-	-	1300	-	690	920	1900
BH305	CHK	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	<2	-	<2	3	-	-	-	-	-	-	-	-
BH305	CHK	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	680	-	-	-	-	-	-	-	690	-	580	660	550
BH305	CHK	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5	-	-	-	-	-	-	-	7	-	7.3	7.3	7.5
BH305	CHK	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	0.1	<0.03	-	-	-	-	-	-	-	-
BH305	CHK	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.55	-	8.99	7.6	7.69
BH305	CHK	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28.21	-	16.16	20.08	40.25
BH305	CHK	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-57.77	-	-28.51	-45.09	-67.92
BH305	CHK	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	0.03	<0.03	<0.03
BH306	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.1	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	81	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.8	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	20	17	18	17	-	-	-	-	-	-	-	-
BH306	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60	49	69	76	75	-	-	-	-	-	-	-	-
BH306	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	12	14	23	22	-	-	-	-	-	-	-	-
BH306	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	2.7	3.2	5.3	4.9	-	-	-	-	-	-	-	-
BH306	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	0	0.04	0.03	-	-	-	-	-	-	-	-
BH306	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	240	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	2	5	4	-	-	-	-	-	-	-	-
BH306	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<7	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	520	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	0	0.04	<0.03	-	-	-	-	-	-	-	-
BH306	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BH307	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.4	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.4	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Chloride	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	25	25	26	28	-	-	-	-	-	-	-	-
BH307	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Sulphate	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	53	47	50	54	70	-	-	-	-	-	-	-	-
BH307	UMH	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Nitrate as NO_3	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	23	24	25	19	-	-	-	-	-	-	-	-
BH307	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	5.2	5.4	5.7	4.4	-	-	-	-	-	-	-	-
BH307	UMH	Free Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Ammoniacal Nitrogen as NH_4	0.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.26	0.16	0.14	0.07	-	-	-	-	-	-	-	-
BH307	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	220	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	<2	0	3	10	-	-	-	-	-	-	-	-
BH307	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	540	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.4	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.25	0.15	0.13	0.07	-	-	-	-	-	-	-	-
BH307	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Chloride	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.1	-	-	-	-	-	-
GMW 101	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Sulphate	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29	-	-	-	-	-	-
GMW 101	UMH	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Nitrate as NO3	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5	-	-	-	-	-	-
GMW 101	UMH	Nitrite as NO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-
GMW 101	UMH	Free Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Ammoniacal Nitrogen as NH4	0.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-	-	-	-	-
GMW 101	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-
GMW 101	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-	-	-	-	-
GMW 101	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 101	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
GMW 102	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Chloride	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	14	-	-	-	9.1	-	-	-	-	-	-
GMW 102	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Sulphate	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51	48	-	-	-	34	-	-	-	-	-	-
GMW 102	UMH	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Nitrate as NO3	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	0	-	-	-	4.3	-	-	-	-	-	-
GMW 102	UMH	Nitrite as NO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0	-	-	-	1	-	-	-	-	-	-
GMW 102	UMH	Free Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Ammoniacal Nitrogen as NH4	0.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.07	0.09	-	-	-	0.04	-	-	-	-	-	-
GMW 102	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	15	-	-	-	<2	-	-	-	-	-	-
GMW 102	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.07	0.09	-	-	-	0.04	-	-	-	-	-	-
GMW 102	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 102	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	69	-	-	-	-	-	-	-	28	29	30	27	6.8
GMW 103	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.9	-	-	-	-	-	-	-	1.3	1.2	1.1	1	0.4
GMW 103	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	-	-	-	-	-	150	160	160	140	110
GMW 103	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-	-	-	-	-	8.5	8.9	8.9	8.2	8.1
GMW 103	UMH	Chloride	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78	65	13	11	-	85	-	-	35	32	31	31	35
GMW 103	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	UMH	Sulphate	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52	69	55	45	-	170	-	-	83	92	88	88	84
GMW 103	UMH	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	UMH	Nitrate as NO_3	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7	<0.2	3.9	8.4	-	0.3	-	-	0.9	3.2	0.5	0.6	<0.2
GMW 103	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	610	<0.2	0.9	1.8	-	<0.2	-	-	-	-	-	-	-
GMW 103	UMH	Free Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	UMH	Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	UMH	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	UMH	Ammoniacal Nitrogen as NH_4	0.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	3.26	0.1	0.04	-	1.97	-	-	-	-	-	-	-
GMW 103	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5100	-	-	-	-	-	-	-	530	350	700	900	2500
GMW 103	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	9	3	<2	-	11	-	-	-	-	-	-	-
GMW 103	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1200	-	-	-	-	-	-	-	850	800	760	860	830
GMW 103	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	-	-	-	-	-	-	-	7.7	7.6	7.3	7.4	7.4
GMW 103	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.1	0.09	0.04	-	1.9	-	-	-	-	-	-	-
GMW 103	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.44	10.01	10.05	8.86	6.46
GMW 103	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.73	9.87	16.71	20.72	53.74
GMW 103	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-18.52	0.7	-24.89	-40.09	-78.54
GMW 103	UMH	Ammoniacal Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.34	0.3	0.19	0.15	0.23

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
GMW 103	LMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60	-	-	-	-	-	-	-	9	8.9	7.8	7	27
GMW 103	LMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	0.6	0.6	0.6	0.6	0.9
GMW 103	LMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	-	-	-	-	-	120	120	120	110	140
GMW 103	LMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	8.7	8.7	8.3	7.9	8.3
GMW 103	LMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	54	-	-	9.9	11	-	11	12	16	12	11	11
GMW 103	LMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	LMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	LMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	62	64	-	-	45	41	-	40	41	47	42	39	39
GMW 103	LMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	LMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7	2.4	-	-	7.5	7.5	-	7.5	8	6.6	11	6.6	7.5
GMW 103	LMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	LMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	530	0.6	-	-	1.7	1.7	-	1.7	-	-	-	-	-
GMW 103	LMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	LMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	LMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	LMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	0.04	<0.03	-	<0.03	-	-	-	-	-
GMW 103	LMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	980	-	-	-	-	-	-	-	320	320	320	320	340
GMW 103	LMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	5	-	-	3	<2	-	<2	-	-	-	-	-
GMW 103	LMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	LMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	LMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	LMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	LMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1200	-	-	-	-	-	-	-	600	590	480	590	600
GMW 103	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.4	-	-	-	-	-	-	-	7.9	7.7	7.4	7.5	7.7
GMW 103	LMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	0.04	<0.03	-	<0.03	-	-	-	-	-
GMW 103	LMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 103	LMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.11	7.11	7.03	6.46	8.87
GMW 103	LMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.72	7.94	7.79	7.63	7.94
GMW 103	LMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-4.11	-5.51	-5.13	-8.3	5.53
GMW 103	LMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	<0.03	<0.03	<0.03	<0.03
GMW104	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.3	9.5	11	-	9.5	9	-	-	-	-	-
GMW104	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	92	97	150	-	110	62	-	-	-	-	-
GMW104	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5	0.3	<0.2	-	7.1	7.1	-	-	-	-	-
GMW104	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6	<0.2	<0.2	-	1.6	1.6	-	-	-	-	-
GMW104	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.13	0.19	0.31	-	0.03	<0.03	-	-	-	-	-
GMW104	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	<2	28	-	2	<2	-	-	-	-	-
GMW104	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.12	0.18	0.29	-	<0.03	<0.03	-	-	-	-	-
GMW104	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
GMW105	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	90	31	28	-	56
GMW105	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	10	11	-	7.6
GMW105	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	92	91	-	88
GMW105	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	8.6	8.2	-	6.9
GMW105	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	3.3	-	-	-	-	5.1	10	8.5	-	3.7
GMW105	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130	-	140	-	-	-	-	87	140	130	-	30
GMW105	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	39	-	-	-	-	8.9	1.6	0.7	-	<0.2
GMW105	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	8.7	-	-	-	-	-	-	-	-	-
GMW105	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.7	-	0.15	-	-	-	-	-	-	-	-	-
GMW105	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	370	180	200	-	350
GMW105	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	5	-	-	-	-	-	-	-	-	-
GMW105	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	880	630	630	-	680
GMW105	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.6	7	6.6	-	7.1
GMW105	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	0.14	-	-	-	-	-	-	-	-	-
GMW105	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.3	6.9	6.72	-	7.59
GMW105	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.5	6.82	6.86	-	7.73
GMW105	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.04	0.58	-1.03	-	-0.91
GMW105	UMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.75	0.68	1.1	-	0.21
GMW106	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	-	-	-	12	-	-	-	-	-	-
GMW106	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	-	-	-	-	34	-	-	-	-	-	-
GMW106	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.9	-	-	-	-	2.4	-	-	-	-	-	-
GMW106	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.9	-	-	-	-	0.5	-	-	-	-	-	-
GMW106	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	<0.03	-	-	-	-	-	-
GMW106	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	<2	-	-	-	-	-	-
GMW106	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	<0.03	-	-	-	-	-	-
GMW106	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW106	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
GMW 107	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	19	20	19	19
GMW 107	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	1.2	1.4	1.4	1.1
GMW 107	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130	130	140	120	120
GMW 107	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.7	6.8	7.2	6.7	6.8
GMW 107	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37	36	-	40	-	41	39	45	48	46	55
GMW 107	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 107	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 107	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	150	140	-	140	-	98	94	89	79	89	98
GMW 107	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 107	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.9	2.1	-	0.8	-	1.7	2.7	<0.2	0.4	0.5	1.6
GMW 107	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 107	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4	0.5	-	<0.2	-	0.4	-	-	-	-	-
GMW 107	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 107	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 107	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 107	UMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	0.06	-	0.04	-	<0.03	-	-	-	-	-
GMW 107	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	220	240	270	270	240
GMW 107	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	4	-	2	-	-	-	-	-
GMW 107	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 107	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 107	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 107	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 107	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	650	670	620	710	650
GMW 107	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.8	7.6	7.5	7.3	7.6
GMW 107	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	0.06	-	0.04	-	<0.03	-	-	-	-	-
GMW 107	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 107	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.89	7.9	8.48	7.4	7.4
GMW 107	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5	7.92	8.41	8.56	8.42
GMW 107	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.53	-0.13	0.41	-7.27	-6.45
GMW 107	UMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	<0.03	<0.03	<0.03	<0.03
GMW 108	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	34	-	-	-	38	47	-	-	-	-	-	-
GMW 108	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	68	-	-	-	66	52	-	-	-	-	-	-
GMW 108	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	-	-	3.4	<0.2	-	-	-	-	-	-
GMW 108	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	-	-	0.8	<0.2	-	-	-	-	-	-
GMW 108	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	-	-	-	<0.03	0.05	-	-	-	-	-	-
GMW 108	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	4	4	-	-	-	-	-	-
GMW 108	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	-	-	-	<0.03	0.05	-	-	-	-	-	-
GMW 108	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 108	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
GMW 109	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	13	21	18	14
GMW 109	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.9	0.3	0.2	<0.1
GMW 109	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99	97	99	87	86
GMW 109	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.2	4.4	3.6	3.4	3.4
GMW 109	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	41	47	-	-	-	41	50	45	47	44	41
GMW 109	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 109	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 109	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	140	-	-	-	60	93	48	65	57	51
GMW 109	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 109	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.9	0.5	-	-	-	0.3	0.4	2.7	0.4	0.2	<0.2
GMW 109	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 109	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	<0.2	-	-	-	<0.2	-	-	-	-	-
GMW 109	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 109	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 109	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 109	UMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	<0.03	-	-	-	0.18	-	-	-	-	-
GMW 109	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130	150	160	170	190
GMW 109	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	2	-	-	-	-	-
GMW 109	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 109	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 109	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 109	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 109	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	560	480	580	530	470
GMW 109	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.4	7.2	6.9	7	7.5
GMW 109	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	<0.03	-	-	-	0.17	-	-	-	-	-
GMW 109	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 109	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.12	5.79	6.16	5.41	5.18
GMW 109	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.95	5.21	5.99	5.83	6.02
GMW 109	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.41	5.27	1.4	-3.74	-7.5
GMW 109	UMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	<0.03	<0.03	<0.03	<0.03
GMW110	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.8	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW110	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
GMW 112	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.3	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.9	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW 112	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33	30	-	-	28	29	32	30	-	-	-	-	-
GMW113	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	30	-	-	25	27	28	24	-	-	-	-	-
GMW113	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	27	-	-	28	28	27	19	-	-	-	-	-
GMW113	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.6	6	-	-	6.4	6.4	6	4.4	-	-	-	-	-
GMW113	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Ammoniacal Nitrogen as NH_4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	-	-	0.03	0.11	0.04	<0.03	-	-	-	-	-
GMW113	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	280	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	<2	-	-	5	<2	<2	27	-	-	-	-	-
GMW113	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	730	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.3	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	<0.03	0.1	0.04	<0.03	-	-	-	-	-
GMW113	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
GMW114	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Chloride	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	9.7	-	8.7	-	5.9	6	6.5	-	-	-	-	-
GMW114	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Sulphate	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29	8.2	-	11	-	12	9.8	12	-	-	-	-	-
GMW114	UMH	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Nitrate as NO_3	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	7.1	-	9.3	-	6.2	8	1.3	-	-	-	-	-
GMW114	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	1.6	-	2.2	-	1.5	1.8	0.3	-	-	-	-	-
GMW114	UMH	Free Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Ammoniacal Nitrogen as NH_4	0.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	0.24	0.04	0.14	-	-	-	-	-
GMW114	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	-	<2	-	51	<2	<2	-	-	-	-	-
GMW114	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	370	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.3	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.07	-	<0.03	-	0.23	0.04	0.13	-	-	-	-	-
GMW114	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	19	14	18	14	12
BHA	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.7	-	2	3.1	3.9	5.1	4
BHA	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63	-	98	110	140	140	130
BHA	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3	-	6	6.5	8.5	9.2	8.3
BHA	UMH	Chloride	250	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	11	-	11	11	13	10	36	44	19	28	21	19
BHA	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA	UMH	Sulphate	250	-	-	-	-	-	-	130	-	-	-	-	-	-	-	-	110	-	130	120	150	91	78	63	140	190	180	160
BHA	UMH	Fluoride	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	<0.3	<0.3	<0.3	<0.3	<0.3
BHA	UMH	Nitrate as NO_3	50	-	-	-	-	-	-	2.5	-	-	-	-	-	-	-	-	2.5	-	0.7	1.9	5.3	4	1.7	<0.2	11	1.7	1.9	4.9
BHA	UMH	Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6	-	<0.2	0.4	1.2	0.9	0.4	-	2.4	0.4	0.4	1.1
BHA	UMH	Free Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA	UMH	Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA	UMH	Complex Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA	UMH	Ammoniacal Nitrogen as NH_3	0.39	-	-	-	-	-	-	0.14	-	-	-	-	-	-	-	-	0.26	-	0.35	0.2	0.21	0.07	0.12	-	-	-	-	-
BHA	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	160	-	180	170	160	210	210
BHA	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	7	4	6	4	6	-	2	3	<2	6
BHA	UMH	Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA	UMH	Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	<1	4	<1	<1	<1
BHA	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	-	21	9	23	7	<7
BHA	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	480	-	560	540	790	710	650
BHA	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.2	-	7.1	6.8	7.6	6.7	7
BHA	UMH	Ammoniacal Nitrogen as NH4	0.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.28	-	0.37	0.21	0.2	-	0.11	-	-	-	-	-
BHA	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.87	-	6.26	6.71	8.57	8.48	7.79
BHA	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.54	-	6.15	7.03	8.07	8.67	8.25
BHA	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-17.75	-	0.89	-2.33	3	-1.11	-2.87
BHA	UMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	0.11	0.09	0.09	0.05

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BHB	LMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	26	27	-	-	-	-	-	-	-	-
BHB	LMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	110	-	-	-	-	-	-	-	46	46	-	-	-	-	-	-	-	-
BHB	LMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	39	-	-	-	-	-	-	-	21	24	-	-	-	-	-	-	-	-
BHB	LMH	Ammoniacal Nitrogen as NH4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	0.04	-	-	-	-	-	-	-	-
BHB	LMH	Ammoniacal Nitrogen as NH_3	**0.39**	-	-	-	-	-	-	-	-	-	0.03	-	-	-	-	-	-	-	0.05	0.04	-	-	-	-	-	-	-	-
BHB	LMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	5.5	-	-	-	-	-	-	-	-
BHB	LMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	3	-	-	-	-	-	-	-	-
BHB	LMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHB	LMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Chloride	**250**	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Sulphate	**250**	-	-	-	-	-	-	96	-	-	-	-	-	-	-	-	80	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	18	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Ammoniacal Nitrogen as NH_3	**0.39**	-	-	-	-	-	-	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-
BHC	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHC	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BHD	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	77	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.8	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Ammoniacal Nitrogen as NH_3	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHD	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHE	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	9.3	9	9.2	-	9.8	-	-	9.4	9.4	9.7	9.2	9.4	9	9.1	9.1	9.8	9.3
BHE	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	1.2	1.3	1.2	-	1	-	-	1	1.1	1.3	1.4	1.3	1.1	0.9	1	1.1	1.1
BHE	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	110	118.1	120	-	140	-	-	130	130	110	120	130	140	120	130	120	110
BHE	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	9.4	10	8.8	-	6.6	-	-	7.4	7.8	8.5	11	8.9	7.1	5.8	6.6	7.8	7.6
BHE	UMH	Chloride	**250**	-	-	-	-	-	-	8.9	-	-	-	12	25.2	12	-	8.6	9.9	-	10	8.5	10	11	11	9.7	8.1	7.6	10	11
BHE	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BHE	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	200	204	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHE	UMH	Sulphate	**250**	-	-	-	-	-	-	120	-	-	-	120	123.68	120	-	120	140	-	150	140	150	140	140	200	120	110	130	120
BHE	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
BHE	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	5.3	-	-	-	5.8	8.7	8.9	-	5.3	3.4	-	5.3	6.6	5.3	8	9.7	8.9	8.4	8.4	9.3	9.3
BHE	UMH	Nitrate as NO2		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHE	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	1.3	2	2	-	1.2	0.8	-	1.2	1.5	1.2	1.7	2.2	2	1.9	1.9	2.1	2.1
BHE	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	-	-
BHE	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	-	-
BHE	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	-	-
BHE	UMH	Ammoniacal Nitrogen as NH4	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.08	<0.03	-	-	-	-	-	-	-	-
BHE	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	200	204	200	-	230	250	-	230	250	230	250	210	220	250	240	210	180
BHE	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	3	<2	4	-	5	4	-	6	-	5	<2	<2	2	3	<2	<2	<2
BHE	UMH	Total Suspended Solids		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHE	UMH	Organic Nitrogen		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHE	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	<1	<1	<1	-	1	<1	-	<1	-	<1	<1	<1	<1	<1	<1	<1	<1
BHE	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	10	8	<7	-	12	<7	-	14	-	<7	<7	<7	7	<7	8	13	<7
BHE	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	590	737	680	-	690	710	-	670	-	560	680	700	650	630	680	690	640
BHE	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	6.4	6.79	6.5	-	6.9	6.8	-	7.1	-	6.7	6.3	6.7	7.2	7.2	7.2	7.4	6.8
BHE	UMH	Ammoniacal Nitrogen as NH_3	**0.39**	-	-	-	-	-	-	0.04	-	-	-	<0.03	<0.03	0.04	-	<0.03	-	-	0.08	<0.03	-	-	-	-	-	-	-	-
BHE	UMH	Total Ammonia as NH3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHE	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.64	7.33	7.66	7.99	6.88	7.45	7.08	6.55
BHE	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.09	8.45	7.68	8.98	7.96	7.44	7.44	6.56
BHE	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-9.84	-7.1	-0.13	-5.83	-7.28	0.07	-2.48	-0.08
BHE	UMH	Ammoniacal Nitrogen as N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	0.11

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BHF	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	84	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.3	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.2	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	15	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	40	-	-	-	-	40	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	27	-	-	-	-	31	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Ammoniacal Nitrogen as NH_3	**0.39**	-	-	-	-	-	-	-	-	-	0.06	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	180	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	490	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHF	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	26	-	-	-	-	-	-	-	-	33	-	-	-	-	-	-	-	-
BHG	LMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	38	-	-	-	-	-	-	-	-	41	-	-	-	-	-	-	-	-
BHG	LMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	31	-	-	-	-	-	-	-	-	49	-	-	-	-	-	-	-	-
BHG	LMH	Ammoniacal Nitrogen as NH_3	**0.39**	-	-	-	-	-	-	-	-	-	0.06	-	-	-	-	-	-	-	-	0.11	-	-	-	-	-	-	-	-
BHG	LMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-
BHG	LMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Ammoniacal Nitrogen as NH4 #	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.12	-	-	-	-	-	-	-	-
BHG	LMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHG	LMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BHH	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Ammoniacal Nitrogen as NH_3	**0.39**	-	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHH	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	-	120	110	-	110	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	27	25	-	22	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	-	0.6	2.1	-	2	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	25	24	-	26	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	280	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Chloride	**250**	-	-	-	-	-	-	10	-	-	-	-	9.1	9.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Sulphate	**250**	-	-	-	-	-	-	140	-	-	-	-	150	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	3.8	-	-	-	-	23	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Ammoniacal Nitrogen as NH_3	**0.39**	-	-	-	-	-	-	0.04	-	-	-	-	0.08	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	5.1	2.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	280	320	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	<2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	<7	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	840	820	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	6.7	6.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHJ	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Indicator

Borehole	Zone	Analysis	DWS / Freshwater	Aug- 13	Sep- 13	Nov- 13	Feb- 14	May- 14	Jun- 14	Oct- 14	Apr- 15	Aug- 15	Oct- 15	Jan- 16	Apr- 16	Jul- 16	Aug- 16	Nov- 16	Feb- 17	May- 17	Aug- 17	Nov- 17	Feb- 18	May- 18	Aug- 18	Nov- 18	Feb- 19	May- 19	Aug-19	Nov-19
BHK	UMH	Calcium	-	-	-	-	-	-	-	-	-	-	-	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Magnesium	-	-	-	-	-	-	-	-	-	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Potassium	-	-	-	-	-	-	-	-	-	-	-	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Sodium	-	-	-	-	-	-	-	-	-	-	-	5.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	180	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Chloride	**250**	-	-	-	-	-	-	-	-	-	18	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Sulphate	**250**	-	-	-	-	-	-	-	-	-	49	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Nitrate as NO_3	**50**	-	-	-	-	-	-	-	-	-	7.1	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Ammoniacal Nitrogen as NH_3	**0.39**	-	-	-	-	-	-	-	-	-	0.04	<0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Free Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Total Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	180	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	340	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHK	UMH	Ammoniacal Nitrogen as N	**0.39**																											
SW11	SW	Sodium	-	21	-	12	9.9	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	19	18	18	19	18	53
SW11	SW	Potassium	-	3.3	-	5.8	2.1	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.1	5.3	7.2	5	5.1	6.1	9.5
SW11	UMH	Calcium	-	33	-	34	39	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	45	63	37	39	40	96
SW11	UMH	Magnesium	-	5.6	-	5.2	6.7	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3	3.8	5.5	3.8	3.8	3.8	8.3
SW11	UMH	Chloride	**250**	11	-	17	11	9	-	-	-	-	24	-	-	-	-	-	-	-	-	-	-	33	29	54	34	25	26	170
SW11	UMH	Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	UMH	Bicarbonate Alkalinity as CaCO3	-	-	-	84	65	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	UMH	Sulphate	**250**	53	-	45	66	28	-	-	-	-	57	-	-	-	-	-	41	-	-	-	-	53	47	45	51	49	43	66
SW11	UMH	Fluoride	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-
SW11	UMH	Nitrate as NO_3	**50**	3.6	-	7.1	12	2.8	-	-	-	-	7.1	-	-	-	-	-	7.5	-	-	-	-	19	17	12	18	19	19	18
SW11	UMH	Nitrite as NO_2	-	0.089	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	UMH	Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	4.2	3.8	-	-	-	-	-
SW11	UMH	Free Cyanide	**0.001**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	UMH	Total Cyanide	**0.05**	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	UMH	Complex Cyanide	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	UMH	Ammoniacal Nitrogen as NH_4	**0.39**	0.11	-	0.51	<0.03	<0.03	-	-	-	-	0.05	-	-	-	-	-	0.03	-	-	-	-	0.03	-	-	-	-	-	-
SW11	UMH	Total Alkalinity as CaCO3	-	-	-	84	65	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	92	100	100	80	96	92
SW11	UMH	Total Organic Carbon	-	<2.0	-	4.6	2.4	5.8	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	5	5	-	-	-	-	-
SW11	UMH	Total Suspended Solids	-	61	-	20	31	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	UMH	Organic Nitrogen	-	0.76	-	580	1.8	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	UMH	Biological Oxygen Demand	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	<1	-	-	-	-	-
SW11	UMH	Chemical Oxygen Demand	-	<7.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-	-	-	12	-	-	-	-	-
SW11	UMH	Electric Conductivity at 25C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	390	360	400	370	380	360	800
SW11	UMH	pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.2	6.3	6.4	6.8	6.9	6.7	7
SW11	UMH	Ammoniacal Nitrogen as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-
SW11	UMH	Total Ammonia as NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-	-
SW11	UMH	Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.65	3.52	4.56	3.07	3.22	3.25	8.02
SW11	UMH	Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.44	3.87	4.65	4.31	3.63	3.93	8.26
SW11	UMH	% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-9.77	-4.74	-0.98	-16.8	-5.99	-9.47	-1.47
SW11	UMH	Ammoniacal Nitrogen as N	**0.39**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	0.03	<0.03	<0.03	<0.03	<0.03

MNA PARAMETERS

Hatfield Road Quarry
Groundwater Quality Data- MNA Parameters

Borehole	Aquifer	Analysis	WQS	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH 101	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 101	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 101	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 101	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 101	LMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 101	LMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 101	LMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 101	LMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 101	CHK	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 101	CHK	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 101	CHK	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 101	CHK	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 102	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 102	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 102	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 102	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 102	LMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 102	LMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 102	LMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 102	LMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 102	CHK	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 102	CHK	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 102	CHK	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 102	CHK	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 103	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 103	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 103	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 103	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 103	LMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01
BH 103	LMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
BH 103	LMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
BH 103	LMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**9.9**
BH 103	CHK	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01
BH 103	CHK	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
BH 103	CHK	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
BH 103	CHK	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.06**
BH 104	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 104	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 104	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 104	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 104	LMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01
BH 104	LMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
BH 104	LMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
BH 104	LMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
BH 104	CHK	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 104	CHK	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 104	CHK	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 104	CHK	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 105	LMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 105	LMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 105	LMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 105	LMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- MNA Parameters

Borehole	Aquifer	Analysis	WQS	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH 105	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 105	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 105	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 105	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 105	CHK	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 105	CHK	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 105	CHK	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 105	CHK	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 106	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 106	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 106	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 106	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 106	LMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 106	LMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 106	LMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 106	LMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 106	CHK	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 106	CHK	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 106	CHK	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 106	CHK	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 108	LMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 108	LMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 108	LMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 108	LMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 108	CHK	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 108	CHK	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 108	CHK	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH 108	CHK	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-A	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-A	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-A	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-A	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-E	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-E	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-E	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-E	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	LMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.05**
BH301	LMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
BH301	LMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
BH301	LMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.03**
BH301	CHK	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01
BH301	CHK	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
BH301	CHK	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
BH301	CHK	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02

Hatfield Road Quarry
Groundwater Quality Data- MNA Parameters

Borehole	Aquifer	Analysis	WQS	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH302	LMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01
BH302	LMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28
BH302	LMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
BH302	LMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.3
BH302	CHK	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01
BH302	CHK	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.5
BH302	CHK	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7
BH302	CHK	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2
BH305	LMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	LMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305	CHK	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH307	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW103	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01
BH307	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW103	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01
GMW103	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.18
GMW103	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
GMW103	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.76
GMW103	LMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01
GMW103	LMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
GMW103	LMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2
GMW103	LMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
GMW104	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW104	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW105	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW107	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01
GMW107	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
GMW107	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02
GMW107	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02
GMW109	UMH	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW109	UMH	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW109	UMH	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW109	UMH	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	SW	Sulphide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	SW	Dissolved Iron II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	SW	Dissolved Iron III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	SW	Manganese II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

VOCs

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH101	UMH	Dichlorodifluoromethane	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-
BH101	UMH	Chloromethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-
BH101	UMH	Bromomethane	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-
BH101	UMH	Chloroethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	Trichlorofluoromethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	Dichloromethane	**0.02**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-
BH101	UMH	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	1,1-Dichloroethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	2,2-Dichloropropane	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-
BH101	UMH	Bromochloromethane	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	Chloroform	**0.3**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	1,1-Dichloropropene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	Carbon tetrachloride	**0.003**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	Benzene	**0.001**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-
BH101	UMH	Trichloroethene	**0.01**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	Dibromomethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	Bromodichloromethane	**0.06**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	cis-1-3-Dichloropropene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	Toluene	**0.7**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-
BH101	UMH	trans-1-3-Dichloropropene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	Tetrachloroethene	**0.01**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	1,3-Dichloropropane	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	Dibromochloromethane	**0.1**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	Chlorobenzene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	Ethylbenzene	**0.3**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-
BH101	UMH	p/m-Xylene	**0.5**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	o-Xylene	**0.5**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-
BH101	UMH	Styrene	**0.02**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	Bromoform	**0.1**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	Isopropylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	-	-	-	-	-	-	-	-	-	<0.004	-	-	-	-	-	-	-
BH101	UMH	Bromobenzene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	1,2,3-Trichloropropane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	Propylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	2-Chlorotoluene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	4-Chlorotoluene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	tert-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	sec-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	4-Isopropyltoluene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	1,3-Dichlorobenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	n-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	Naphthalene	**0.002**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	UMH	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-
BH101	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH101	LMH	Dichlorodifluoromethane	-	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	Methyl Tertiary Butyl Ether	**0.015**	-	<0.0001	-	-	<0.0001	<0.0001	-	-	-	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-
BH101	LMH	Chloromethane	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	Vinyl Chloride	**0.0005**	-	<0.0001	-	-	<0.0001	<0.0001	-	-	-	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-
BH101	LMH	Bromomethane	-	-	<0.001	-	-	<0.001	<0.001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH101	LMH	Chloroethane	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	Trichlorofluoromethane	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	1,1-Dichloroethene	**0.03**	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	Dichloromethane	**0.02**	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
BH101	LMH	trans-1-2-Dichloroethene	**0.05**	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	1,1-Dichloroethane	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	cis-1-2-Dichloroethene	**0.05**	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	2,2-Dichloropropane	-	-	<0.001	-	-	<0.001	<0.001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH101	LMH	Bromochloromethane	-	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	Chloroform	**0.3**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	1,1,1-Trichloroethane	**0.2**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	1,1-Dichloropropene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	Carbon tetrachloride	**0.003**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	1,2-Dichloroethane	**0.003**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	Benzene	**0.001**	-	<0.0005	-	-	<0.0005	<0.0005	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-
BH101	LMH	Trichloroethene	**0.01**	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	1,2-Dichloropropane	**0.04**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	Dibromomethane	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	Bromodichloromethane	**0.06**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	cis-1-3-Dichloropropene	-	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	Toluene	**0.7**	-	<0.0005	-	-	<0.0005	<0.0005	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
BH101	LMH	trans-1-3-Dichloropropene	-	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	1,1,2-Trichloroethane	**0.005**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	Tetrachloroethene	**0.01**	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	1,3-Dichloropropane	-	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	Dibromochloromethane	**0.1**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	1,2-Dibromoethane	**0.0004**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	Chlorobenzene	-	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	1,1,1,2-Tetrachloroethane	**1.848**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	Ethylbenzene	**0.3**	-	<0.0005	-	-	<0.0005	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH101	LMH	p/m-Xylene	**0.5**	-	<0.001	-	-	<0.001	<0.001	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	o-Xylene	**0.5**	-	<0.0005	-	-	<0.0005	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH101	LMH	Styrene	**0.02**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	Bromoform	**0.1**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	Isopropylbenzene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	1,1,2,2-Tetrachloroethane	**1.848**	-	<0.004	-	-	<0.004	<0.004	-	-	-	<0.004	-	-	-	<0.004	-	-	-	-	-	-	-
BH101	LMH	Bromobenzene	-	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	1,2,3-Trichloropropane	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	Propylbenzene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	2-Chlorotoluene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	1,3,5-Trimethylbenzene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	4-Chlorotoluene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	tert-Butylbenzene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	1,2,4-Trimethylbenzene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	sec-Butylbenzene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	4-Isopropyltoluene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	1,3-Dichlorobenzene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	1,4-Dichlorobenzene	**0.3**	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	n-Butylbenzene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	1,2-Dichlorobenzene	**1**	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	1,2-Dibromo-3-chloropropane	**0.001**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	1,2,4-Trichlorobenzene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	Hexachlorobutadiene	**0.0006**	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	Naphthalene	**0.002**	-	<0.002	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	LMH	1,2,3-Trichlorobenzene	-	-	<0.003	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	LMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-
BH101	LMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH101	CHK	Dichlorodifluoromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-
BH101	CHK	Chloromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-
BH101	CHK	Bromomethane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH101	CHK	Chloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	Trichlorofluoromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	Dichloromethane	**0.02**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
BH101	CHK	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	1,1-Dichloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	2,2-Dichloropropane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH101	CHK	Bromochloromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	Chloroform	**0.3**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	1,1-Dichloropropene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	Carbon tetrachloride	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	Benzene	**0.001**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-
BH101	CHK	Trichloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	Dibromomethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	Bromodichloromethane	**0.06**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	cis-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	Toluene	**0.7**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
BH101	CHK	trans-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	trans-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	Tetrachloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	1,3-Dichloropropane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	Dibromochloromethane	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	Chlorobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	Ethylbenzene	**0.3**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH101	CHK	p/m-Xylene	**0.5**	<0.001	-	-	-	<0.001	<0.001	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	o-Xylene	**0.5**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH101	CHK	Styrene	**0.02**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	Bromoform	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	Isopropylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	<0.004	<0.004	-	-	-	<0.004	-	-	-	<0.004	-	-	-	-	-	-	-
BH101	CHK	Bromobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	1,2,3-Trichloropropane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	Propylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	2-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	4-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	tert-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	sec-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	4-Isopropyltoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	1,3-Dichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	n-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	Naphthalene	**0.002**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH101	CHK	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH101	CHK	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-
BH101	CHK	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH102	UMH	Dichlorodifluoromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-
BH102	UMH	Chloromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-
BH102	UMH	Bromomethane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH102	UMH	Chloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	Trichlorofluoromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	Dichloromethane	**0.02**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
BH102	UMH	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	1,1-Dichloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	2,2-Dichloropropane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH102	UMH	Bromochloromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	Chloroform	**0.3**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	1,1-Dichloropropene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	Carbon tetrachloride	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	Benzene	**0.001**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-
BH102	UMH	Trichloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	Dibromomethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	Bromodichloromethane	**0.06**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	cis-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	Toluene	**0.7**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
BH102	UMH	trans-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	Tetrachloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	1,3-Dichloropropane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	Dibromochloromethane	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	Chlorobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	Ethylbenzene	**0.3**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH102	UMH	p/m-Xylene	**0.5**	<0.001	-	-	-	<0.001	<0.001	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	o-Xylene	**0.5**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH102	UMH	Styrene	**0.02**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	Bromoform	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	Isopropylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	<0.004	<0.004	-	-	-	<0.004	-	-	-	<0.004	-	-	-	-	-	-	-
BH102	UMH	Bromobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	1,2,3-Trichloropropane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	Propylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	2-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	4-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	tert-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	sec-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	4-Isopropyltoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	1,3-Dichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	n-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	Naphthalene	**0.002**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH102	UMH	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH102	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-
BH102	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH102	LMH	Dichlorodifluoromethane	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Methyl Tertiary Butyl Ether	**0.015**	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Chloromethane	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Vinyl Chloride	**0.0005**	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Bromomethane	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Chloroethane	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Trichlorofluoromethane	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,1-Dichloroethene	**0.03**	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Dichloromethane	**0.02**	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	trans-1-2-Dichloroethene	**0.05**	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,1-Dichloroethane	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	cis-1-2-Dichloroethene	**0.05**	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	2,2-Dichloropropane	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Bromochloromethane	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Chloroform	**0.3**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,1,1-Trichloroethane	**0.2**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,1-Dichloropropene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Carbon tetrachloride	**0.003**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,2-Dichloroethane	**0.003**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Benzene	**0.001**	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Trichloroethene	**0.01**	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,2-Dichloropropane	**0.04**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Dibromomethane	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Bromodichloromethane	**0.06**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	cis-1-3-Dichloropropene	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Toluene	**0.7**	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	trans-1-3-Dichloropropene	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,1,2-Trichloroethane	**0.005**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Tetrachloroethene	**0.01**	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,3-Dichloropropane	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Dibromochloromethane	**0.1**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,2-Dibromoethane	**0.0004**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Chlorobenzene	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,1,1,2-Tetrachloroethane	**1.848**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Ethylbenzene	**0.3**	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	p/m-Xylene	**0.5**	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	o-Xylene	**0.5**	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Styrene	**0.02**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Bromoform	**0.1**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Isopropylbenzene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,1,2,2-Tetrachloroethane	**1.848**	-	<0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Bromobenzene	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,2,3-Trichloropropane	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Propylbenzene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	2-Chlorotoluene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,3,5-Trimethylbenzene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	4-Chlorotoluene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	tert-Butylbenzene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,2,4-Trimethylbenzene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	sec-Butylbenzene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	4-Isopropyltoluene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,3-Dichlorobenzene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,4-Dichlorobenzene	**0.3**	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	n-Butylbenzene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,2-Dichlorobenzene	**1**	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,2-Dibromo-3-chloropropane	**0.001**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,2,4-Trichlorobenzene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Hexachlorobutadiene	**0.0006**	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Naphthalene	**0.002**	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	1,2,3-Trichlorobenzene	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	LMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH102	CHK	Dichlorodifluoromethane	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Chloromethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Bromomethane	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Chloroethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Trichlorofluoromethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Dichloromethane	**0.02**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,1-Dichloroethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	2,2-Dichloropropane	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Bromochloromethane	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Chloroform	**0.3**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,1-Dichloropropene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Carbon tetrachloride	**0.003**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Benzene	**0.001**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Trichloroethene	**0.01**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Dibromomethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Bromodichloromethane	**0.06**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	cis-1-3-Dichloropropene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Toluene	**0.7**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	trans-1-3-Dichloropropene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Tetrachloroethene	**0.01**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,3-Dichloropropane	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Dibromochloromethane	**0.1**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Chlorobenzene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Ethylbenzene	**0.3**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	p/m-Xylene	**0.5**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	o-Xylene	**0.5**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Styrene	**0.02**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Bromoform	**0.1**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Isopropylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Bromobenzene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,2,3-Trichloropropane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Propylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	2-Chlorotoluene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	4-Chlorotoluene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	tert-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	sec-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	4-Isopropyltoluene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,3-Dichlorobenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	n-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Naphthalene	**0.002**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102	CHK	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH103	UMH	Dichlorodifluoromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Chloromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Bromomethane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Chloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Trichlorofluoromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Dichloromethane	**0.02**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,1-Dichloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	2,2-Dichloropropane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Bromochloromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Chloroform	**0.3**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,1-Dichloropropene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Carbon tetrachloride	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Benzene	**0.001**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Trichloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Dibromomethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Bromodichloromethane	**0.06**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	cis-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Toluene	**0.7**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	trans-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Tetrachloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,3-Dichloropropane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Dibromochloromethane	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Chlorobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Ethylbenzene	**0.3**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	p/m-Xylene	**0.5**	<0.001	-	-	-	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	o-Xylene	**0.5**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Styrene	**0.02**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Bromoform	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Isopropylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	<0.004	<0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Bromobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,2,3-Trichloropropane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Propylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	2-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	4-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	tert-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	sec-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	4-Isopropyltoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,3-Dichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	n-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Naphthalene	**0.002**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH103	LMH	Dichlorodifluoromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Chloromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Bromomethane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Chloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Trichlorofluoromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Dichloromethane	**0.02**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,1-Dichloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	2,2-Dichloropropane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Bromochloromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Chloroform	**0.3**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,1-Dichloropropene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Carbon tetrachloride	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Benzene	**0.001**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Trichloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Dibromomethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Bromodichloromethane	**0.06**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	cis-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Toluene	**0.7**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	trans-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Tetrachloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,3-Dichloropropane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Dibromochloromethane	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Chlorobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Ethylbenzene	**0.3**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	p/m-Xylene	**0.5**	<0.001	-	-	-	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	o-Xylene	**0.5**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Styrene	**0.02**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Bromoform	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Isopropylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	<0.004	<0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Bromobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,2,3-Trichloropropane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Propylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	2-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	4-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	tert-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	sec-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	4-Isopropyltoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,3-Dichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	n-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Naphthalene	**0.002**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	LMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH103	CHK	Dichlorodifluoromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Chloromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Bromomethane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Chloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Trichlorofluoromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Dichloromethane	**0.02**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,1-Dichloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	2,2-Dichloropropane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Bromochloromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Chloroform	**0.3**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,1-Dichloropropene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Carbon tetrachloride	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Benzene	**0.001**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Trichloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Dibromomethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Bromodichloromethane	**0.06**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	cis-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Toluene	**0.7**	<0.0005	-	-	-	<0.0005	0.0013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	trans-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Tetrachloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,3-Dichloropropane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Dibromochloromethane	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Chlorobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Ethylbenzene	**0.3**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	p/m-Xylene	**0.5**	<0.001	-	-	-	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	o-Xylene	**0.5**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Styrene	**0.02**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Bromoform	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Isopropylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	<0.004	<0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Bromobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,2,3-Trichloropropane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Propylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	2-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	4-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	tert-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	sec-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	4-Isopropyltoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,3-Dichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	n-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Naphthalene	**0.002**	<0.002	-	-	-	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103	CHK	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH104	UMH	Dichlorodifluoromethane	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	<0.0001	-	-	-	-	-	-	-
BH104	UMH	Chloromethane	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	<0.0001	-	-	-	-	-	-	-
BH104	UMH	Bromomethane	-	<0.001	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.001	-	-	-	-	-	-	-
BH104	UMH	Chloroethane	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	Trichlorofluoromethane	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	Dichloromethane	**0.02**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.005	-	-	-	-	-	-	-
BH104	UMH	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	1,1-Dichloroethane	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	2,2-Dichloropropane	-	<0.001	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.001	-	-	-	-	-	-	-
BH104	UMH	Bromochloromethane	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	Chloroform	**0.3**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	1,1-Dichloropropene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	Carbon tetrachloride	**0.003**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	Benzene	**0.001**	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	-	-
BH104	UMH	Trichloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	Dibromomethane	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	Bromodichloromethane	**0.06**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	cis-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	Toluene	**0.7**	<0.0005	-	-	-	<0.0005	<0.0005	<0.005	<0.005	<0.005	-	-	-	-	<0.005	-	-	-	-	-	-	-
BH104	UMH	trans-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	Tetrachloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	1,3-Dichloropropane	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	Dibromochloromethane	**0.1**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	Chlorobenzene	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	Ethylbenzene	**0.3**	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	<0.001	-	-	-	-	-	-	-
BH104	UMH	p/m-Xylene	**0.5**	<0.001	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	o-Xylene	**0.5**	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	<0.001	-	-	-	-	-	-	-
BH104	UMH	Styrene	**0.02**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	Bromoform	**0.1**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	Isopropylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	-	-	-	-	<0.004	-	-	-	-	-	-	-
BH104	UMH	Bromobenzene	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	1,2,3-Trichloropropane	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	Propylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	2-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	4-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	tert-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	sec-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	4-Isopropyltoluene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	1,3-Dichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	n-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	Naphthalene	**0.002**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	<0.002	-	-	-	-	-	-	-
BH104	UMH	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-
BH104	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-
BH104	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH104	LMH	Dichlorodifluoromethane	-	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	Methyl Tertiary Butyl Ether	**0.015**	-	<0.0001	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-
BH104	LMH	Chloromethane	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	Vinyl Chloride	**0.0005**	-	<0.0001	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-
BH104	LMH	Bromomethane	-	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-
BH104	LMH	Chloroethane	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	Trichlorofluoromethane	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	1,1-Dichloroethene	**0.03**	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	Dichloromethane	**0.02**	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.005	<0.003	<0.005	<0.005	<0.005	-	-	-	-	-	-	-
BH104	LMH	trans-1-2-Dichloroethene	**0.05**	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	1,1-Dichloroethane	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	cis-1-2-Dichloroethene	**0.05**	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	2,2-Dichloropropane	-	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-
BH104	LMH	Bromochloromethane	-	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	Chloroform	**0.3**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	1,1,1-Trichloroethane	**0.2**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	1,1-Dichloropropene	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	Carbon tetrachloride	**0.003**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	1,2-Dichloroethane	**0.003**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	Benzene	**0.001**	-	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-	-	-
BH104	LMH	Trichloroethene	**0.01**	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	1,2-Dichloropropane	**0.04**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	Dibromomethane	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	Bromodichloromethane	**0.06**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	cis-1-3-Dichloropropene	-	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	Toluene	**0.7**	-	<0.0005	-	-	<0.0005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-
BH104	LMH	trans-1-3-Dichloropropene	-	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	1,1,2-Trichloroethane	**0.005**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	Tetrachloroethene	**0.01**	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	1,3-Dichloropropane	-	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	Dibromochloromethane	**0.1**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	1,2-Dibromoethane	**0.0004**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	Chlorobenzene	-	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	1,1,1,2-Tetrachloroethane	**1.848**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	Ethylbenzene	**0.3**	-	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.001	<0.001	<0.001	-	-	-	-	-	-	-
BH104	LMH	p/m-Xylene	**0.5**	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	o-Xylene	**0.5**	-	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.001	<0.001	<0.001	-	-	-	-	-	-	-
BH104	LMH	Styrene	**0.02**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	Bromoform	**0.1**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	Isopropylbenzene	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	1,1,2,2-Tetrachloroethane	**1.848**	-	<0.004	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	-	-	-	-	-	-
BH104	LMH	Bromobenzene	-	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	1,2,3-Trichloropropane	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	Propylbenzene	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	2-Chlorotoluene	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	1,3,5-Trimethylbenzene	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	4-Chlorotoluene	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	tert-Butylbenzene	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	1,2,4-Trimethylbenzene	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	sec-Butylbenzene	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	4-Isopropyltoluene	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	1,3-Dichlorobenzene	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	1,4-Dichlorobenzene	**0.3**	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	n-Butylbenzene	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	1,2-Dichlorobenzene	**1**	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	1,2-Dibromo-3-chloropropane	**0.001**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	1,2,4-Trichlorobenzene	-	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	Hexachlorobutadiene	**0.0006**	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	Naphthalene	**0.002**	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	LMH	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	LMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-
BH104	LMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH104	CHK	Dichlorodifluoromethane	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-
BH104	CHK	Chloromethane	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-
BH104	CHK	Bromomethane	-	<0.001	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-
BH104	CHK	Chloroethane	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	Trichlorofluoromethane	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	Dichloromethane	**0.02**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	-	-	-	-	-	-	-
BH104	CHK	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	1,1-Dichloroethane	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	2,2-Dichloropropane	-	<0.001	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-
BH104	CHK	Bromochloromethane	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	Chloroform	**0.3**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	1,1-Dichloropropene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	Carbon tetrachloride	**0.003**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	Benzene	**0.001**	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-	-	-
BH104	CHK	Trichloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	Dibromomethane	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	Bromodichloromethane	**0.06**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	cis-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	Toluene	**0.7**	<0.0005	-	-	-	<0.0005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-
BH104	CHK	trans-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	Tetrachloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	1,3-Dichloropropane	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	Dibromochloromethane	**0.1**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	Chlorobenzene	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	Ethylbenzene	**0.3**	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	-	-	-	-	-	-	-
BH104	CHK	p/m-Xylene	**0.5**	<0.001	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	o-Xylene	**0.5**	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	-	-	-	-	-	-	-
BH104	CHK	Styrene	**0.02**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	Bromoform	**0.1**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	Isopropylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	-	-	-	-	-	-
BH104	CHK	Bromobenzene	-	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	1,2,3-Trichloropropane	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	Propylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	2-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	4-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	tert-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	sec-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	4-Isopropyltoluene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	1,3-Dichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	n-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	Naphthalene	**0.002**	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-
BH104	CHK	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-
BH104	CHK	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-
BH104	CHK	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH105	UMHX	Dichlorodifluoromethane	-	-	-	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	Methyl Tertiary Butyl Ether	**0.015**	-	-	<0.0001	-	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH105	UMHX	Chloromethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	Vinyl Chloride	**0.0005**	-	-	<0.0001	-	<0.0001	0.0065	<0.0001	0.0058	0.013	0.0074	<0.0001	0.014	0.0003	<0.0001	0.0002	0.0003	0.0003	0.0001	0.0001	0.0005	0.0019
BH105	UMHX	Bromomethane	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH105	UMHX	Chloroethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	Trichlorofluoromethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	1,1-Dichloroethene	**0.03**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	Dichloromethane	**0.02**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.005	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH105	UMHX	trans-1-2-Dichloroethene	**0.05**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	1,1-Dichloroethane	-	-	-	0.003	-	0.008	0.004	<0.003	0.004	0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	cis-1-2-Dichloroethene	**0.05**	-	-	0.022	-	0.083	0.13	0.054	0.074	0.25	0.59	0.42	0.43	0.44	0.068	0.26	0.22	0.2	0.16	0.27	0.2	0.18
BH105	UMHX	2,2-Dichloropropane	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH105	UMHX	Bromochloromethane	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	Chloroform	**0.3**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	1,1,1-Trichloroethane	**0.2**	-	-	<0.002	-	<0.002	0.005	<0.002	<0.002	0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	1,1-Dichloropropene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	Carbon tetrachloride	**0.003**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	1,2-Dichloroethane	**0.003**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	Benzene	**0.001**	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH105	UMHX	Trichloroethene	**0.01**	-	-	0.038	-	0.12	0.086	0.063	0.059	0.2	0.36	0.23	0.16	0.22	0.031	0.098	0.092	0.082	0.14	0.29	0.21	0.17
BH105	UMHX	1,2-Dichloropropane	**0.04**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	Dibromomethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	Bromodichloromethane	**0.06**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	cis-1-3-Dichloropropene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	Toluene	**0.7**	-	-	<0.0005	-	<0.0005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH105	UMHX	trans-1-3-Dichloropropene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	1,1,2-Trichloroethane	**0.005**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	Tetrachloroethene	**0.01**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	1,3-Dichloropropane	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	Dibromochloromethane	**0.1**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	1,2-Dibromoethane	**0.0004**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	Chlorobenzene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	1,1,1,2-Tetrachloroethane	**1.848**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	Ethylbenzene	**0.3**	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH105	UMHX	p/m-Xylene	**0.5**	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	o-Xylene	**0.5**	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH105	UMHX	Styrene	**0.02**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	Bromoform	**0.1**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	Isopropylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	1,1,2,2-Tetrachloroethane	**1.848**	-	-	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
BH105	UMHX	Bromobenzene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	1,2,3-Trichloropropane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	Propylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	2-Chlorotoluene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	1,3,5-Trimethylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	4-Chlorotoluene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	tert-Butylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	1,2,4-Trimethylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	sec-Butylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	4-Isopropyltoluene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	1,3-Dichlorobenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	1,4-Dichlorobenzene	**0.3**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	n-Butylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	1,2-Dichlorobenzene	**1**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	1,2-Dibromo-3-chloropropane	**0.001**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	1,2,4-Trichlorobenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	Hexachlorobutadiene	**0.0006**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	Naphthalene	**0.002**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	UMHX	1,2,3-Trichlorobenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	UMHX	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99	110	110	99	100	99	100	98
BH105	UMHX	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	100	120	110	110	100	110	91

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH105	LMH	Dichlorodifluoromethane	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH105	LMH	Chloromethane	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	Vinyl Chloride	**0.0005**	<0.0001	-	-	0.0011	<0.0001	0.0026	0.0005	0.0005	0.0003	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.0007	0.0006
BH105	LMH	Bromomethane	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH105	LMH	Chloroethane	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	Trichlorofluoromethane	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	1,1-Dichloroethene	**0.03**	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	Dichloromethane	**0.02**	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH105	LMH	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	1,1-Dichloroethane	-	<0.003	-	-	0.011	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	0.11	0.01	0.13	0.025	0.021	0.036	0.12	0.028	0.11	0.094	0.067	0.078	0.059	0.055	0.086	0.046	0.39	0.2
BH105	LMH	2,2-Dichloropropane	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH105	LMH	Bromochloromethane	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	Chloroform	**0.3**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	0.014	<0.002	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	1,1-Dichloropropene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	Carbon tetrachloride	**0.003**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	1,2-Dichloroethane	**0.003**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	Benzene	**0.001**	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH105	LMH	Trichloroethene	**0.01**	<0.003	-	-	0.15	0.012	0.069	0.018	0.016	0.022	0.061	0.024	0.041	0.047	0.031	0.028	0.019	0.021	0.037	0.029	0.26	0.15
BH105	LMH	1,2-Dichloropropane	**0.04**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	Dibromomethane	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	Bromodichloromethane	**0.06**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	cis-1-3-Dichloropropene	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	Toluene	**0.7**	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH105	LMH	trans-1-3-Dichloropropene	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	Tetrachloroethene	**0.01**	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	1,3-Dichloropropane	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	Dibromochloromethane	**0.1**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	1,2-Dibromoethane	**0.0004**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	Chlorobenzene	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	Ethylbenzene	**0.3**	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH105	LMH	p/m-Xylene	**0.5**	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	o-Xylene	**0.5**	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH105	LMH	Styrene	**0.02**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	Bromoform	**0.1**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	Isopropylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
BH105	LMH	Bromobenzene	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	1,2,3-Trichloropropane	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	Propylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	2-Chlorotoluene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	1,3,5-Trimethylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	4-Chlorotoluene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	tert-Butylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	1,2,4-Trimethylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	sec-Butylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	4-Isopropyltoluene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	1,3-Dichlorobenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	n-Butylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	1,2-Dichlorobenzene	**1**	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	1,2,4-Trichlorobenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	Hexachlorobutadiene	**0.0006**	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	Naphthalene	**0.002**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	LMH	1,2,3-Trichlorobenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	LMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	110	110	100	110	100	100	76
BH105	LMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	110	120	110	110	100	100	72

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH105	CHK	Dichlorodifluoromethane	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH105	CHK	Chloromethane	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	Vinyl Chloride	**0.0005**	0.0048	-	-	0.0009	<0.0001	0.03	0.0026	<0.0001	0.0008	<0.0001	<0.0001	0.011	<0.0001	<0.0001	<0.0001	0.0051	0.0001	<0.0001	<0.0001	0.0012	<0.0001
BH105	CHK	Bromomethane	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH105	CHK	Chloroethane	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	Trichlorofluoromethane	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	1,1-Dichloroethene	**0.03**	<0.003	-	-	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	Dichloromethane	**0.02**	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH105	CHK	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.005	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	1,1-Dichloroethane	-	0.0062	-	-	0.012	0.009	0.014	0.006	0.003	<0.003	<0.003	<0.003	0.004	<0.003	<0.003	<0.003	0.006	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	cis-1-2-Dichloroethene	**0.05**	0.22	-	-	0.13	0.096	0.64	0.22	0.12	0.11	0.12	0.1	0.71	0.11	0.17	0.1	1.1	0.12	0.13	0.067	0.36	0.026
BH105	CHK	2,2-Dichloropropane	-	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH105	CHK	Bromochloromethane	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	Chloroform	**0.3**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	1,1,1-Trichloroethane	**0.2**	0.0056	-	-	0.016	<0.002	0.017	0.006	<0.002	<0.002	<0.002	<0.002	0.004	<0.002	<0.002	<0.002	0.006	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	1,1-Dichloropropene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	Carbon tetrachloride	**0.003**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	1,2-Dichloroethane	**0.003**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	Benzene	**0.001**	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH105	CHK	Trichloroethene	**0.01**	0.11	-	-	0.17	0.11	0.33	0.12	0.069	0.063	0.11	0.064	0.2	0.083	0.085	0.035	0.34	0.051	0.059	0.055	0.28	0.028
BH105	CHK	1,2-Dichloropropane	**0.04**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	Dibromomethane	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	Bromodichloromethane	**0.06**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	cis-1-3-Dichloropropene	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	Toluene	**0.7**	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH105	CHK	trans-1-3-Dichloropropene	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	Tetrachloroethene	**0.01**	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	1,3-Dichloropropane	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	Dibromochloromethane	**0.1**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	1,2-Dibromoethane	**0.0004**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	Chlorobenzene	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	Ethylbenzene	**0.3**	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH105	CHK	p/m-Xylene	**0.5**	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	o-Xylene	**0.5**	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH105	CHK	Styrene	**0.02**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	Bromoform	**0.1**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	Isopropylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
BH105	CHK	Bromobenzene	-	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	1,2,3-Trichloropropane	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	Propylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	2-Chlorotoluene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	1,3,5-Trimethylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	4-Chlorotoluene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	tert-Butylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	1,2,4-Trimethylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	sec-Butylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	4-Isopropyltoluene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	1,3-Dichlorobenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	n-Butylbenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	1,2-Dichlorobenzene	**1**	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	1,2,4-Trichlorobenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	Hexachlorobutadiene	**0.0006**	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	Naphthalene	**0.002**	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH105	CHK	1,2,3-Trichlorobenzene	-	<0.003	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH105	CHK	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	110	110	98	100	99	97	88
BH105	CHK	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	110	120	110	110	100	92	83

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH106	UMH	Dichlorodifluoromethane	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Chloromethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Bromomethane	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Chloroethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Trichlorofluoromethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Dichloromethane	**0.02**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,1-Dichloroethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	2,2-Dichloropropane	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Bromochloromethane	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Chloroform	**0.3**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,1-Dichloropropene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Carbon tetrachloride	**0.003**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Benzene	**0.001**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Trichloroethene	**0.01**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Dibromomethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Bromodichloromethane	**0.06**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	cis-1-3-Dichloropropene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Toluene	**0.7**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	trans-1-3-Dichloropropene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Tetrachloroethene	**0.01**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,3-Dichloropropane	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Dibromochloromethane	**0.1**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Chlorobenzene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Ethylbenzene	**0.3**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	p/m-Xylene	**0.5**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	o-Xylene	**0.5**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Styrene	**0.02**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Bromoform	**0.1**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Isopropylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Bromobenzene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,2,3-Trichloropropane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Propylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	2-Chlorotoluene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	4-Chlorotoluene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	tert-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	sec-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	4-Isopropyltoluene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,3-Dichlorobenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	n-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Naphthalene	**0.002**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH106	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH106	LMH	Dichlorodifluoromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-
BH106	LMH	Chloromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-
BH106	LMH	Bromomethane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH106	LMH	Chloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	Trichlorofluoromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	Dichloromethane	**0.02**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
BH106	LMH	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	1,1-Dichloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	2,2-Dichloropropane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH106	LMH	Bromochloromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	Chloroform	**0.3**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	1,1-Dichloropropene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	Carbon tetrachloride	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	Benzene	**0.001**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-
BH106	LMH	Trichloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	Dibromomethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	Bromodichloromethane	**0.06**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	cis-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	Toluene	**0.7**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
BH106	LMH	trans-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	Tetrachloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	1,3-Dichloropropane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	Dibromochloromethane	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	Chlorobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	Ethylbenzene	**0.3**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH106	LMH	p/m-Xylene	**0.5**	<0.001	-	-	-	<0.001	<0.001	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	o-Xylene	**0.5**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH106	LMH	Styrene	**0.02**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	Bromoform	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	Isopropylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	<0.004	<0.004	-	-	-	<0.004	-	-	-	<0.004	-	-	-	-	-	-	-
BH106	LMH	Bromobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	1,2,3-Trichloropropane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	Propylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	2-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	4-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	tert-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	sec-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	4-Isopropyltoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	1,3-Dichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	n-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	Naphthalene	**0.002**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	LMH	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	LMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-
BH106	LMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH106	CHK	Dichlorodifluoromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-
BH106	CHK	Chloromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-
BH106	CHK	Bromomethane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH106	CHK	Chloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	Trichlorofluoromethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	Dichloromethane	**0.02**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
BH106	CHK	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	1,1-Dichloroethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	2,2-Dichloropropane	-	<0.001	-	-	-	<0.001	<0.001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH106	CHK	Bromochloromethane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	Chloroform	**0.3**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	1,1-Dichloropropene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	Carbon tetrachloride	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	Benzene	**0.001**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-
BH106	CHK	Trichloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	Dibromomethane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	Bromodichloromethane	**0.06**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	cis-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	Toluene	**0.7**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
BH106	CHK	trans-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	Tetrachloroethene	**0.01**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	1,3-Dichloropropane	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	Dibromochloromethane	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	Chlorobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	Ethylbenzene	**0.3**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH106	CHK	p/m-Xylene	**0.5**	<0.001	-	-	-	<0.001	<0.001	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	o-Xylene	**0.5**	<0.0005	-	-	-	<0.0005	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH106	CHK	Styrene	**0.02**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	Bromoform	**0.1**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	Isopropylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	<0.004	<0.004	-	-	-	<0.004	-	-	-	<0.004	-	-	-	-	-	-	-
BH106	CHK	Bromobenzene	-	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	1,2,3-Trichloropropane	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	Propylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	2-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	4-Chlorotoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	tert-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	sec-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	4-Isopropyltoluene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	1,3-Dichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	n-Butylbenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	Naphthalene	**0.002**	<0.002	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH106	CHK	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH106	CHK	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-
BH106	CHK	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH108	UMH	Dichlorodifluoromethane	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001
BH108	UMH	Chloromethane	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	Vinyl Chloride	**0.0005**	-	-	-	-	<0.0001	<0.0001	0.0002	0.0002	<0.0001	<0.0001	<0.0001	0.0004	<0.0001	0.0005	<0.0001	<0.0001	0.0007	-	0.0009	0.0008	0.0013
BH108	UMH	Bromomethane	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001
BH108	UMH	Chloroethane	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	Trichlorofluoromethane	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	1,1-Dichloroethene	**0.03**	-	-	-	-	<0.003	0.004	0.005	0.003	0.003	<0.003	0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	Dichloromethane	**0.02**	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005
BH108	UMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	1,1-Dichloroethane	-	-	-	-	-	0.006	0.011	0.013	0.01	0.01	0.01	0.01	0.009	<0.003	0.005	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	<0.003	0.004	0.004	0.005	<0.003	<0.003	<0.003	0.008	0.013	0.024	0.015	0.034	0.19	-	0.15	0.043	0.042
BH108	UMH	2,2-Dichloropropane	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001
BH108	UMH	Bromochloromethane	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	Chloroform	**0.3**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	<0.002	0.017	0.019	<0.002	0.013	0.01	0.013	0.014	0.004	0.007	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	1,1-Dichloropropene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	Carbon tetrachloride	**0.003**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	1,2-Dichloroethane	**0.003**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	Benzene	**0.001**	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005
BH108	UMH	Trichloroethene	**0.01**	-	-	-	-	0.005	0.006	0.009	0.01	0.005	0.01	0.005	0.021	0.056	0.1	0.063	0.088	0.3	-	0.44	0.21	0.15
BH108	UMH	1,2-Dichloropropane	**0.04**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	Dibromomethane	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	Bromodichloromethane	**0.06**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	cis-1-3-Dichloropropene	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	Toluene	**0.7**	-	-	-	-	<0.0005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005
BH108	UMH	trans-1-3-Dichloropropene	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	Tetrachloroethene	**0.01**	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	1,3-Dichloropropane	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	Dibromochloromethane	**0.1**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	Chlorobenzene	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	Ethylbenzene	**0.3**	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001
BH108	UMH	p/m-Xylene	**0.5**	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	o-Xylene	**0.5**	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001
BH108	UMH	Styrene	**0.02**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	Bromoform	**0.1**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	Isopropylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	<0.004	<0.004	<0.004
BH108	UMH	Bromobenzene	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	1,2,3-Trichloropropane	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	Propylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	2-Chlorotoluene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	1,3,5-Trimethylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	4-Chlorotoluene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	tert-Butylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	1,2,4-Trimethylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	sec-Butylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	4-Isopropyltoluene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	1,3-Dichlorobenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	n-Butylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	1,2-Dichlorobenzene	**1**	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	1,2,4-Trichlorobenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	Naphthalene	**0.002**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002
BH108	UMH	1,2,3-Trichlorobenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003
BH108	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	97	110	100	100	-	98	100	75
BH108	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	100	110	110	-	100	95	81

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH108	LMH	Dichlorodifluoromethane	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH108	LMH	Chloromethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	Vinyl Chloride	**0.0005**	-	-	0.0042	-	0.0016	<0.0001	0.0014	0.0015	0.0013	0.0007	0.0013	0.0016	0.0008	0.0029	0.0026	<0.0001	0.0028	0.0021	0.0028	0.0028	0.0048
BH108	LMH	Bromomethane	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH108	LMH	Chloroethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	Trichlorofluoromethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	1,1-Dichloroethene	**0.03**	-	-	0.01	-	0.007	<0.003	0.005	0.005	0.004	<0.003	0.004	0.005	<0.003	0.004	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	Dichloromethane	**0.02**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH108	LMH	trans-1-2-Dichloroethene	**0.05**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	1,1-Dichloroethane	-	-	-	0.025	-	0.012	0.005	0.009	0.01	0.008	0.004	0.009	0.013	0.011	0.013	0.011	<0.003	0.005	0.004	0.003	<0.003	<0.003
BH108	LMH	cis-1-2-Dichloroethene	**0.05**	-	-	0.047	-	0.03	0.011	0.029	0.027	0.024	0.011	0.026	0.035	0.042	0.06	0.058	0.004	0.13	0.16	0.053	0.075	0.084
BH108	LMH	2,2-Dichloropropane	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH108	LMH	Bromochloromethane	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	Chloroform	**0.3**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	1,1,1-Trichloroethane	**0.2**	-	-	<0.002	-	<0.002	0.012	0.02	<0.002	0.017	0.01	<0.002	0.019	0.015	0.019	0.017	<0.002	0.009	0.006	0.006	0.004	0.003
BH108	LMH	1,1-Dichloropropene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	Carbon tetrachloride	**0.003**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	1,2-Dichloroethane	**0.003**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	Benzene	**0.001**	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH108	LMH	Trichloroethene	**0.01**	-	-	0.077	-	0.065	0.012	0.064	0.071	0.061	0.044	0.067	0.072	0.098	0.14	0.14	0.01	0.34	0.47	0.27	0.28	0.26
BH108	LMH	1,2-Dichloropropane	**0.04**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	Dibromomethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	Bromodichloromethane	**0.06**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	cis-1-3-Dichloropropene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	Toluene	**0.7**	-	-	<0.0005	-	<0.0005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH108	LMH	trans-1-3-Dichloropropene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	1,1,2-Trichloroethane	**0.005**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	Tetrachloroethene	**0.01**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	1,3-Dichloropropane	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	Dibromochloromethane	**0.1**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	1,2-Dibromoethane	**0.0004**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	Chlorobenzene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	Ethylbenzene	**0.3**	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH108	LMH	p/m-Xylene	**0.5**	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	o-Xylene	**0.5**	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH108	LMH	Styrene	**0.02**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	Bromoform	**0.1**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	Isopropylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
BH108	LMH	Bromobenzene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	1,2,3-Trichloropropane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	Propylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	2-Chlorotoluene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	1,3,5-Trimethylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	4-Chlorotoluene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	tert-Butylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	1,2,4-Trimethylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	sec-Butylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	4-Isopropyltoluene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	1,3-Dichlorobenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	1,4-Dichlorobenzene	**0.3**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	n-Butylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	1,2-Dichlorobenzene	**1**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	1,2,4-Trichlorobenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	Hexachlorobutadiene	**0.0006**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	Naphthalene	**0.002**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	LMH	1,2,3-Trichlorobenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	LMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	97	110	100	100	100	100	99	91
BH108	LMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	98	110	110	110	100	94	87

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH108	CHK	Dichlorodifluoromethane	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	Methyl Tertiary Butyl Ether	**0.015**	-	-	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH108	CHK	Chloromethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	Vinyl Chloride	**0.0005**	-	-	<0.0001	-	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH108	CHK	Bromomethane	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH108	CHK	Chloroethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	Trichlorofluoromethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	1,1-Dichloroethene	**0.03**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	Dichloromethane	**0.02**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH108	CHK	trans-1-2-Dichloroethene	**0.05**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	1,1-Dichloroethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.008	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	cis-1-2-Dichloroethene	**0.05**	-	-	<0.003	-	<0.003	0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.059	<0.003	<0.003	0.005	0.006	<0.003
BH108	CHK	2,2-Dichloropropane	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH108	CHK	Bromochloromethane	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	Chloroform	**0.3**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	1,1,1-Trichloroethane	**0.2**	-	-	<0.002	-	<0.002	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.012	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	1,1-Dichloropropene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	Carbon tetrachloride	**0.003**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	1,2-Dichloroethane	**0.003**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	Benzene	**0.001**	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH108	CHK	Trichloroethene	**0.01**	-	-	<0.003	-	<0.003	<0.003	0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.17	<0.003	<0.003	0.007	0.01	0.006
BH108	CHK	1,2-Dichloropropane	**0.04**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	Dibromomethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	Bromodichloromethane	**0.06**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	cis-1-3-Dichloropropene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	Toluene	**0.7**	-	-	<0.0005	-	<0.0005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH108	CHK	trans-1-3-Dichloropropene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	1,1,2-Trichloroethane	**0.005**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	Tetrachloroethene	**0.01**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	1,3-Dichloropropane	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	Dibromochloromethane	**0.1**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	1,2-Dibromoethane	**0.0004**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	Chlorobenzene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	1,1,1,2-Tetrachloroethane	**1.848**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	Ethylbenzene	**0.3**	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH108	CHK	p/m-Xylene	**0.5**	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	o-Xylene	**0.5**	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH108	CHK	Styrene	**0.02**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	Bromoform	**0.1**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	Isopropylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	1,1,2,2-Tetrachloroethane	**1.848**	-	-	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
BH108	CHK	Bromobenzene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	1,2,3-Trichloropropane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	Propylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	2-Chlorotoluene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	1,3,5-Trimethylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	4-Chlorotoluene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	tert-Butylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	1,2,4-Trimethylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	sec-Butylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	4-Isopropyltoluene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	1,3-Dichlorobenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	1,4-Dichlorobenzene	**0.3**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	n-Butylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	1,2-Dichlorobenzene	**1**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	1,2-Dibromo-3-chloropropane	**0.001**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	1,2,4-Trichlorobenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	Hexachlorobutadiene	**0.0006**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	Naphthalene	**0.002**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH108	CHK	1,2,3-Trichlorobenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH108	CHK	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	97	110	95	100	100	98	100	91
BH108	CHK	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	100	110	110	110	100	95	86

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH201S	LMH	Dichlorodifluoromethane	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH201S	LMH	Chloromethane	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	Vinyl Chloride	**0.0005**	-	-	-	-	<0.0001	<0.0001	<0.0001	0.0003	0.0002	0.0002	<0.0001	<0.0001	0.0002	0.0002	0.0001	0.0003	0.0003	0.0002	0.0003	0.0002	0.0003
BH201S	LMH	Bromomethane	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH201S	LMH	Chloroethane	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	Trichlorofluoromethane	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	1,1-Dichloroethene	**0.03**	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	Dichloromethane	**0.02**	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH201S	LMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	1,1-Dichloroethane	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	0.021	0.028	0.037	0.03	0.03	0.03	<0.003	<0.003	0.035	0.029	0.032	0.035	0.036	0.036	0.03	0.022	0.031
BH201S	LMH	2,2-Dichloropropane	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH201S	LMH	Bromochloromethane	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	Chloroform	**0.3**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.005	0.006	0.004	0.005	<0.002
BH201S	LMH	1,1-Dichloropropene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	Carbon tetrachloride	**0.003**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	1,2-Dichloroethane	**0.003**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	Benzene	**0.001**	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH201S	LMH	Trichloroethene	**0.01**	-	-	-	-	0.057	0.067	0.075	0.062	0.064	0.077	<0.003	<0.003	0.078	0.068	0.07	0.074	0.088	0.12	0.12	0.096	0.11
BH201S	LMH	1,2-Dichloropropane	**0.04**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	Dibromomethane	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	Bromodichloromethane	**0.06**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	cis-1-3-Dichloropropene	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	Toluene	**0.7**	-	-	-	-	<0.0005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH201S	LMH	trans-1-3-Dichloropropene	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	Tetrachloroethene	**0.01**	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	1,3-Dichloropropane	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	Dibromochloromethane	**0.1**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	Chlorobenzene	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	Ethylbenzene	**0.3**	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH201S	LMH	p/m-Xylene	**0.5**	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	o-Xylene	**0.5**	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH201S	LMH	Styrene	**0.02**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	Bromoform	**0.1**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	Isopropylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
BH201S	LMH	Bromobenzene	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	1,2,3-Trichloropropane	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	Propylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	2-Chlorotoluene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	1,3,5-Trimethylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	4-Chlorotoluene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	tert-Butylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	1,2,4-Trimethylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	sec-Butylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	4-Isopropyltoluene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	1,3-Dichlorobenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	n-Butylbenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	1,2-Dichlorobenzene	**1**	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	1,2,4-Trichlorobenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	Naphthalene	**0.002**	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH201S	LMH	1,2,3-Trichlorobenzene	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH201S	LMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99	110	100	100	100	100	97	93
BH201S	LMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	100	110	110	110	100	93	86

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH201D	LMH	Dichlorodifluoromethane	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	<0.0001	-	-	-	-	-	-
BH201D	LMH	Chloromethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	Vinyl Chloride	**0.0005**	-	-	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	<0.0001	-	-	-	-	-	-
BH201D	LMH	Bromomethane	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-
BH201D	LMH	Chloroethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	Trichlorofluoromethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	1,1-Dichloroethene	**0.03**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	Dichloromethane	**0.02**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.005	-	-	-	-	-	-
BH201D	LMH	trans-1-2-Dichloroethene	**0.05**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	1,1-Dichloroethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	cis-1-2-Dichloroethene	**0.05**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	2,2-Dichloropropane	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-
BH201D	LMH	Bromochloromethane	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	Chloroform	**0.3**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	1,1,1-Trichloroethane	**0.2**	-	-	<0.002	-	<0.002	0.004	0.005	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	1,1-Dichloropropene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	Carbon tetrachloride	**0.003**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	1,2-Dichloroethane	**0.003**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	Benzene	**0.001**	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-	<0.0005	-	-	-	-	-	-
BH201D	LMH	Trichloroethene	**0.01**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	1,2-Dichloropropane	**0.04**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	Dibromomethane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	Bromodichloromethane	**0.06**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	cis-1-3-Dichloropropene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	Toluene	**0.7**	-	-	<0.0005	-	<0.0005	<0.0005	<0.005	<0.005	<0.005	-	-	-	-	-	<0.005	-	-	-	-	-	-
BH201D	LMH	trans-1-3-Dichloropropene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	1,1,2-Trichloroethane	**0.005**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	Tetrachloroethene	**0.01**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	1,3-Dichloropropane	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	Dibromochloromethane	**0.1**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	1,2-Dibromoethane	**0.0004**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	Chlorobenzene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	Ethylbenzene	**0.3**	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-	<0.001	-	-	-	-	-	-
BH201D	LMH	p/m-Xylene	**0.5**	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	o-Xylene	**0.5**	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-	<0.001	-	-	-	-	-	-
BH201D	LMH	Styrene	**0.02**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	Bromoform	**0.1**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	Isopropylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	-	-	-	-	-	<0.004	-	-	-	-	-	-
BH201D	LMH	Bromobenzene	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	1,2,3-Trichloropropane	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	Propylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	2-Chlorotoluene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	1,3,5-Trimethylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	4-Chlorotoluene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	tert-Butylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	1,2,4-Trimethylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	sec-Butylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	4-Isopropyltoluene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	1,3-Dichlorobenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	1,4-Dichlorobenzene	**0.3**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	n-Butylbenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	1,2-Dichlorobenzene	**1**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	1,2,4-Trichlorobenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	Hexachlorobutadiene	**0.0006**	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	Naphthalene	**0.002**	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-
BH201D	LMH	1,2,3-Trichlorobenzene	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	<0.003	-	-	-	-	-	-
BH201D	LMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	-	-	-	-	-	-
BH201D	LMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
FT101	UMH	Dichlorodifluoromethane	-	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Chloromethane	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Bromomethane	-	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Chloroethane	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Trichlorofluoromethane	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Dichloromethane	**0.02**	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,1-Dichloroethane	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	2,2-Dichloropropane	-	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Bromochloromethane	-	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Chloroform	**0.3**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,1-Dichloropropene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Carbon tetrachloride	**0.003**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Benzene	**0.001**	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Trichloroethene	**0.01**	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Dibromomethane	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Bromodichloromethane	**0.06**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	cis-1-3-Dichloropropene	-	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Toluene	**0.7**	<0.0005	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	trans-1-3-Dichloropropene	-	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Tetrachloroethene	**0.01**	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,3-Dichloropropane	-	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Dibromochloromethane	**0.1**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Chlorobenzene	-	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Ethylbenzene	**0.3**	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	p/m-Xylene	**0.5**	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	o-Xylene	**0.5**	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Styrene	**0.02**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Bromoform	**0.1**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Isopropylbenzene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	-	-	-	-	<0.004	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Bromobenzene	-	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,2,3-Trichloropropane	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Propylbenzene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	2-Chlorotoluene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	4-Chlorotoluene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	tert-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	sec-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	4-Isopropyltoluene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,3-Dichlorobenzene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	n-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Naphthalene	**0.002**	<0.002	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT101	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
FT102	UMH	Dichlorodifluoromethane	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Chloromethane	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Bromomethane	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Chloroethane	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Trichlorofluoromethane	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Dichloromethane	**0.02**	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,1-Dichloroethane	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	2,2-Dichloropropane	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Bromochloromethane	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Chloroform	**0.3**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,1-Dichloropropene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Carbon tetrachloride	**0.003**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Benzene	**0.001**	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Trichloroethene	**0.01**	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Dibromomethane	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Bromodichloromethane	**0.06**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	cis-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Toluene	**0.7**	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	trans-1-3-Dichloropropene	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Tetrachloroethene	**0.01**	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,3-Dichloropropane	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Dibromochloromethane	**0.1**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Chlorobenzene	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Ethylbenzene	**0.3**	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	p/m-Xylene	**0.5**	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	o-Xylene	**0.5**	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Styrene	**0.02**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Bromoform	**0.1**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Isopropylbenzene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	<0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Bromobenzene	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,2,3-Trichloropropane	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Propylbenzene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	2-Chlorotoluene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	4-Chlorotoluene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	tert-Butylbenzene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	sec-Butylbenzene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	4-Isopropyltoluene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,3-Dichlorobenzene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	n-Butylbenzene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Naphthalene	**0.002**	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT102	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
FT103	UMH	Dichlorodifluoromethane	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Methyl Tertiary Butyl Ether	**0.015**	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Chloromethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Vinyl Chloride	**0.0005**	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Bromomethane	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Chloroethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Trichlorofluoromethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,1-Dichloroethene	**0.03**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Dichloromethane	**0.02**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	trans-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,1-Dichloroethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	cis-1-2-Dichloroethene	**0.05**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	2,2-Dichloropropane	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Bromochloromethane	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Chloroform	**0.3**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,1,1-Trichloroethane	**0.2**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,1-Dichloropropene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Carbon tetrachloride	**0.003**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,2-Dichloroethane	**0.003**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Benzene	**0.001**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Trichloroethene	**0.01**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,2-Dichloropropane	**0.04**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Dibromomethane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Bromodichloromethane	**0.06**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	cis-1-3-Dichloropropene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Toluene	**0.7**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	trans-1-3-Dichloropropene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,1,2-Trichloroethane	**0.005**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Tetrachloroethene	**0.01**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,3-Dichloropropane	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Dibromochloromethane	**0.1**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,2-Dibromoethane	**0.0004**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Chlorobenzene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,1,1,2-Tetrachloroethane	**1.848**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Ethylbenzene	**0.3**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	p/m-Xylene	**0.5**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	o-Xylene	**0.5**	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Styrene	**0.02**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Bromoform	**0.1**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Isopropylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,1,2,2-Tetrachloroethane	**1.848**	<0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Bromobenzene	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,2,3-Trichloropropane	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Propylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	2-Chlorotoluene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,3,5-Trimethylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	4-Chlorotoluene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	tert-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,2,4-Trimethylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	sec-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	4-Isopropyltoluene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,3-Dichlorobenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,4-Dichlorobenzene	**0.3**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	n-Butylbenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,2-Dichlorobenzene	**1**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,2-Dibromo-3-chloropropane	**0.001**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,2,4-Trichlorobenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Hexachlorobutadiene	**0.0006**	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Naphthalene	**0.002**	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	1,2,3-Trichlorobenzene	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT103	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH-A	UMH	Dichlorodifluoromethane	-	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	-	<0.0001
BH-A	UMH	Chloromethane	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	Vinyl Chloride	**0.0005**	-	-	-	-	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	-	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	0.0001	-	<0.0001
BH-A	UMH	Bromomethane	-	-	-	-	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	-	<0.001
BH-A	UMH	Chloroethane	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	Trichlorofluoromethane	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	1,1-Dichloroethene	**0.03**	-	-	-	-	0.006	<0.003	-	<0.003	<0.003	<0.003	-	0.005	0.005	0.004	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	Dichloromethane	**0.02**	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	-	<0.005
BH-A	UMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	1,1-Dichloroethane	-	-	-	-	-	0.015	0.004	-	<0.003	0.009	0.006	-	0.014	0.013	0.009	0.005	<0.003	<0.003	-	0.008	-	0.008
BH-A	UMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	2,2-Dichloropropane	-	-	-	-	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	-	<0.001
BH-A	UMH	Bromochloromethane	-	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	Chloroform	**0.3**	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	0.033	0.008	-	0.006	0.014	0.022	-	0.022	0.024	0.02	<0.002	<0.002	<0.002	-	0.01	-	0.012
BH-A	UMH	1,1-Dichloropropene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	Carbon tetrachloride	**0.003**	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	1,2-Dichloroethane	**0.003**	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	Benzene	**0.001**	-	-	-	-	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	-	<0.0005
BH-A	UMH	Trichloroethene	**0.01**	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	1,2-Dichloropropane	**0.04**	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	Dibromomethane	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	Bromodichloromethane	**0.06**	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	cis-1-3-Dichloropropene	-	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	Toluene	**0.7**	-	-	-	-	<0.0005	<0.0005	-	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	-	<0.005
BH-A	UMH	trans-1-3-Dichloropropene	-	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	Tetrachloroethene	**0.01**	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	1,3-Dichloropropane	-	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	Dibromochloromethane	**0.1**	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	Chlorobenzene	-	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	Ethylbenzene	**0.3**	-	-	-	-	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	-	<0.001
BH-A	UMH	p/m-Xylene	**0.5**	-	-	-	-	<0.001	<0.001	-	<0.001	<0.001	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	o-Xylene	**0.5**	-	-	-	-	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	-	<0.001
BH-A	UMH	Styrene	**0.02**	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	Bromoform	**0.1**	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	Isopropylbenzene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	<0.004	<0.004	-	<0.004	<0.004	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	<0.004	-	<0.004
BH-A	UMH	Bromobenzene	-	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	1,2,3-Trichloropropane	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	Propylbenzene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	2-Chlorotoluene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	1,3,5-Trimethylbenzene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	4-Chlorotoluene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	tert-Butylbenzene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	1,2,4-Trimethylbenzene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	sec-Butylbenzene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	4-Isopropyltoluene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	1,3-Dichlorobenzene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	n-Butylbenzene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	1,2-Dichlorobenzene	**1**	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	1,2,4-Trichlorobenzene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	Naphthalene	**0.002**	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002
BH-A	UMH	1,2,3-Trichlorobenzene	-	-	-	-	-	<0.003	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	<0.003
BH-A	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	110	100	110	-	100	-	95
BH-A	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	100	110	98	-	110	-	90

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH-B	LMH	Dichlorodifluoromethane	-	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	<0.0001	-	-	-	-	-	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-
BH-B	LMH	Chloromethane	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	Vinyl Chloride	**0.0005**	-	-	-	-	<0.0001	-	-	-	-	-	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-
BH-B	LMH	Bromomethane	-	-	-	-	-	<0.001	-	-	-	-	-	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-
BH-B	LMH	Chloroethane	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	Trichlorofluoromethane	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	1,1-Dichloroethene	**0.03**	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	Dichloromethane	**0.02**	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.005	<0.005	-	-	-	-	-	-	-	-
BH-B	LMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	1,1-Dichloroethane	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	2,2-Dichloropropane	-	-	-	-	-	<0.001	-	-	-	-	-	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-
BH-B	LMH	Bromochloromethane	-	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	Chloroform	**0.3**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	1,1-Dichloropropene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	Carbon tetrachloride	**0.003**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	1,2-Dichloroethane	**0.003**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	Benzene	**0.001**	-	-	-	-	<0.0005	-	-	-	-	-	<0.0005	<0.0005	<0.0005	-	-	-	-	-	-	-	-
BH-B	LMH	Trichloroethene	**0.01**	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	1,2-Dichloropropane	**0.04**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	Dibromomethane	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	Bromodichloromethane	**0.06**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	cis-1-3-Dichloropropene	-	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	Toluene	**0.7**	-	-	-	-	<0.0005	-	-	-	-	-	<0.0005	<0.005	<0.005	-	-	-	-	-	-	-	-
BH-B	LMH	trans-1-3-Dichloropropene	-	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	Tetrachloroethene	**0.01**	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	1,3-Dichloropropane	-	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	Dibromochloromethane	**0.1**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	Chlorobenzene	-	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	Ethylbenzene	**0.3**	-	-	-	-	<0.0005	-	-	-	-	-	<0.0005	<0.001	<0.001	-	-	-	-	-	-	-	-
BH-B	LMH	p/m-Xylene	**0.5**	-	-	-	-	<0.001	-	-	-	-	-	<0.001	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	o-Xylene	**0.5**	-	-	-	-	<0.0005	-	-	-	-	-	<0.0005	<0.001	<0.001	-	-	-	-	-	-	-	-
BH-B	LMH	Styrene	**0.02**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	Bromoform	**0.1**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	Isopropylbenzene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	<0.004	-	-	-	-	-	<0.004	<0.004	<0.004	-	-	-	-	-	-	-	-
BH-B	LMH	Bromobenzene	-	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	1,2,3-Trichloropropane	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	Propylbenzene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	2-Chlorotoluene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	1,3,5-Trimethylbenzene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	4-Chlorotoluene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	tert-Butylbenzene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	1,2,4-Trimethylbenzene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	sec-Butylbenzene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	4-Isopropyltoluene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	1,3-Dichlorobenzene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	n-Butylbenzene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	1,2-Dichlorobenzene	**1**	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	1,2,4-Trichlorobenzene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	Naphthalene	**0.002**	-	-	-	-	<0.002	-	-	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-
BH-B	LMH	1,2,3-Trichlorobenzene	-	-	-	-	-	<0.003	-	-	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-
BH-B	LMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-B	LMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH-C	UMH	Dichlorodifluoromethane	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Chloromethane	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Vinyl Chloride	**0.0005**	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Bromomethane	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Chloroethane	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Trichlorofluoromethane	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,1-Dichloroethene	**0.03**	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Dichloromethane	**0.02**	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,1-Dichloroethane	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	2,2-Dichloropropane	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Bromochloromethane	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Chloroform	**0.3**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,1-Dichloropropene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Carbon tetrachloride	**0.003**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,2-Dichloroethane	**0.003**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Benzene	**0.001**	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Trichloroethene	**0.01**	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,2-Dichloropropane	**0.04**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Dibromomethane	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Bromodichloromethane	**0.06**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	cis-1-3-Dichloropropene	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Toluene	**0.7**	-	-	-	-	-	<0.0005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	trans-1-3-Dichloropropene	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Tetrachloroethene	**0.01**	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,3-Dichloropropane	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Dibromochloromethane	**0.1**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Chlorobenzene	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Ethylbenzene	**0.3**	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	p/m-Xylene	**0.5**	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	o-Xylene	**0.5**	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Styrene	**0.02**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Bromoform	**0.1**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Isopropylbenzene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	<0.004	<0.004	<0.004	<0.004	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Bromobenzene	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,2,3-Trichloropropane	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Propylbenzene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	2-Chlorotoluene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,3,5-Trimethylbenzene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	4-Chlorotoluene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	tert-Butylbenzene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,2,4-Trimethylbenzene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	sec-Butylbenzene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	4-Isopropyltoluene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,3-Dichlorobenzene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	n-Butylbenzene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,2-Dichlorobenzene	**1**	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,2,4-Trichlorobenzene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Naphthalene	**0.002**	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	1,2,3-Trichlorobenzene	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-C	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH-D	UMH	Dichlorodifluoromethane	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Chloromethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Vinyl Chloride	**0.0005**	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Bromomethane	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Chloroethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,1-Dichloroethene	**0.03**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Dichloromethane	**0.02**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	2,2-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Bromochloromethane	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Chloroform	**0.3**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,1-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Carbon tetrachloride	**0.003**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,2-Dichloroethane	**0.003**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Benzene	**0.001**	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Trichloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,2-Dichloropropane	**0.04**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Dibromomethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Bromodichloromethane	**0.06**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	cis-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Toluene	**0.7**	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	trans-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Tetrachloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,3-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Dibromochloromethane	**0.1**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Chlorobenzene	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Ethylbenzene	**0.3**	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	p/m-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	o-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Styrene	**0.02**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Bromoform	**0.1**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Isopropylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.004	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Bromobenzene	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,2,3-Trichloropropane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Propylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	2-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,3,5-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	4-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	tert-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	sec-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	4-Isopropyltoluene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	n-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,2-Dichlorobenzene	**1**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Naphthalene	**0.002**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-D	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH-E	UMH	Dichlorodifluoromethane	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-
BH-E	UMH	Chloromethane	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	Vinyl Chloride	**0.0005**	-	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	-	-	-	<0.0001	-	-	-	-	-	-	-
BH-E	UMH	Bromomethane	-	-	-	-	-	<0.001	<0.001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH-E	UMH	Chloroethane	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	Trichlorofluoromethane	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	1,1-Dichloroethene	**0.03**	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	Dichloromethane	**0.02**	-	-	-	-	<0.003	<0.003	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
BH-E	UMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	1,1-Dichloroethane	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	2,2-Dichloropropane	-	-	-	-	-	<0.001	<0.001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH-E	UMH	Bromochloromethane	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	Chloroform	**0.3**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	1,1-Dichloropropene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	Carbon tetrachloride	**0.003**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	1,2-Dichloroethane	**0.003**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	Benzene	**0.001**	-	-	-	-	<0.0005	<0.0005	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-
BH-E	UMH	Trichloroethene	**0.01**	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	1,2-Dichloropropane	**0.04**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	Dibromomethane	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	Bromodichloromethane	**0.06**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	cis-1-3-Dichloropropene	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	Toluene	**0.7**	-	-	-	-	<0.0005	<0.0005	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
BH-E	UMH	trans-1-3-Dichloropropene	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	Tetrachloroethene	**0.01**	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	1,3-Dichloropropane	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	Dibromochloromethane	**0.1**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	Chlorobenzene	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	Ethylbenzene	**0.3**	-	-	-	-	<0.0005	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH-E	UMH	p/m-Xylene	**0.5**	-	-	-	-	<0.001	<0.001	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	o-Xylene	**0.5**	-	-	-	-	<0.0005	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-
BH-E	UMH	Styrene	**0.02**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	Bromoform	**0.1**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	Isopropylbenzene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	<0.004	<0.004	-	-	-	<0.004	-	-	-	<0.004	-	-	-	-	-	-	-
BH-E	UMH	Bromobenzene	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	1,2,3-Trichloropropane	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	Propylbenzene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	2-Chlorotoluene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	1,3,5-Trimethylbenzene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	4-Chlorotoluene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	tert-Butylbenzene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	1,2,4-Trimethylbenzene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	sec-Butylbenzene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	4-Isopropyltoluene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	1,3-Dichlorobenzene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	n-Butylbenzene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	1,2-Dichlorobenzene	**1**	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	1,2,4-Trichlorobenzene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	Naphthalene	**0.002**	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-
BH-E	UMH	1,2,3-Trichlorobenzene	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	-	-	-	<0.003	-	-	-	-	-	-	-
BH-E	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-E	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH-J	UMH	Dichlorodifluoromethane	-	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Chloromethane	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Vinyl Chloride	**0.0005**	-	-	-	-	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Bromomethane	-	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Chloroethane	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Trichlorofluoromethane	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,1-Dichloroethene	**0.03**	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Dichloromethane	**0.02**	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.005	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,1-Dichloroethane	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	2,2-Dichloropropane	-	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Bromochloromethane	-	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Chloroform	**0.3**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,1-Dichloropropene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Carbon tetrachloride	**0.003**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,2-Dichloroethane	**0.003**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Benzene	**0.001**	-	-	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Trichloroethene	**0.01**	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,2-Dichloropropane	**0.04**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Dibromomethane	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Bromodichloromethane	**0.06**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	cis-1-3-Dichloropropene	-	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Toluene	**0.7**	-	-	-	-	<0.0005	-	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	trans-1-3-Dichloropropene	-	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Tetrachloroethene	**0.01**	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,3-Dichloropropane	-	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Dibromochloromethane	**0.1**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Chlorobenzene	-	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Ethylbenzene	**0.3**	-	-	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.001	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	p/m-Xylene	**0.5**	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	o-Xylene	**0.5**	-	-	-	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.001	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Styrene	**0.02**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Bromoform	**0.1**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Isopropylbenzene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	<0.004	-	<0.004	<0.004	<0.004	<0.004	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Bromobenzene	-	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,2,3-Trichloropropane	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Propylbenzene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	2-Chlorotoluene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,3,5-Trimethylbenzene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	4-Chlorotoluene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	tert-Butylbenzene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,2,4-Trimethylbenzene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	sec-Butylbenzene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	4-Isopropyltoluene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,3-Dichlorobenzene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	n-Butylbenzene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,2-Dichlorobenzene	**1**	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,2,4-Trichlorobenzene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Naphthalene	**0.002**	-	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	1,2,3-Trichlorobenzene	-	-	-	-	-	<0.003	-	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-J	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH-K	UMH	Dichlorodifluoromethane	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Chloromethane	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Vinyl Chloride	**0.0005**	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Bromomethane	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Chloroethane	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Trichlorofluoromethane	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,1-Dichloroethene	**0.03**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Dichloromethane	**0.02**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,1-Dichloroethane	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	2,2-Dichloropropane	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Bromochloromethane	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Chloroform	**0.3**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,1-Dichloropropene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Carbon tetrachloride	**0.003**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,2-Dichloroethane	**0.003**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Benzene	**0.001**	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Trichloroethene	**0.01**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,2-Dichloropropane	**0.04**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Dibromomethane	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Bromodichloromethane	**0.06**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	cis-1-3-Dichloropropene	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Toluene	**0.7**	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	trans-1-3-Dichloropropene	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Tetrachloroethene	**0.01**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,3-Dichloropropane	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Dibromochloromethane	**0.1**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Chlorobenzene	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Ethylbenzene	**0.3**	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	p/m-Xylene	**0.5**	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	o-Xylene	**0.5**	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Styrene	**0.02**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Bromoform	**0.1**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Isopropylbenzene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	<0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Bromobenzene	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,2,3-Trichloropropane	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Propylbenzene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	2-Chlorotoluene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,3,5-Trimethylbenzene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	4-Chlorotoluene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	tert-Butylbenzene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,2,4-Trimethylbenzene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	sec-Butylbenzene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	4-Isopropyltoluene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,3-Dichlorobenzene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	n-Butylbenzene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,2-Dichlorobenzene	**1**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,2,4-Trichlorobenzene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Naphthalene	**0.002**	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	1,2,3-Trichlorobenzene	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH-K	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH301	LMH	Dichlorodifluoromethane	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	<0.0001
BH301	LMH	Chloromethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	Vinyl Chloride	**0.0005**	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	<0.0001
BH301	LMH	Bromomethane	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	<0.001
BH301	LMH	Chloroethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	1,1-Dichloroethene	**0.03**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	Dichloromethane	**0.02**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.005
BH301	LMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	2,2-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	<0.001
BH301	LMH	Bromochloromethane	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	Chloroform	**0.3**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	1,1-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	Carbon tetrachloride	**0.003**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	1,2-Dichloroethane	**0.003**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	Benzene	**0.001**	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	<0.0005
BH301	LMH	Trichloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	1,2-Dichloropropane	**0.04**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	Dibromomethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	Bromodichloromethane	**0.06**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	cis-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	Toluene	**0.7**	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	<0.005
BH301	LMH	trans-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	Tetrachloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	1,3-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	Dibromochloromethane	**0.1**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	Chlorobenzene	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	Ethylbenzene	**0.3**	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	<0.001
BH301	LMH	p/m-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	o-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	<0.001
BH301	LMH	Styrene	**0.02**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	Bromoform	**0.1**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	Isopropylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.004	-	-	-	-	-	-	-	-	-	-	-	<0.004
BH301	LMH	Bromobenzene	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	1,2,3-Trichloropropane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	Propylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	2-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	1,3,5-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	4-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	tert-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	sec-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	4-Isopropyltoluene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	n-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	1,2-Dichlorobenzene	**1**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	Naphthalene	**0.002**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	LMH	1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	LMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100
BH301	LMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	92

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH301	CHK	Dichlorodifluoromethane	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	<0.0001
BH301	CHK	Chloromethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	Vinyl Chloride	**0.0005**	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	<0.0001
BH301	CHK	Bromomethane	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	<0.001
BH301	CHK	Chloroethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	1,1-Dichloroethene	**0.03**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	Dichloromethane	**0.02**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.005
BH301	CHK	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	2,2-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	<0.001
BH301	CHK	Bromochloromethane	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	Chloroform	**0.3**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	1,1-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	Carbon tetrachloride	**0.003**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	1,2-Dichloroethane	**0.003**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	Benzene	**0.001**	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	<0.0005
BH301	CHK	Trichloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	1,2-Dichloropropane	**0.04**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	Dibromomethane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	Bromodichloromethane	**0.06**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	cis-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	Toluene	**0.7**	-	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	<0.005
BH301	CHK	trans-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	Tetrachloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	1,3-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	Dibromochloromethane	**0.1**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	Chlorobenzene	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	Ethylbenzene	**0.3**	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	<0.001
BH301	CHK	p/m-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	o-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	<0.001
BH301	CHK	Styrene	**0.02**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	Bromoform	**0.1**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	Isopropylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.004	-	-	-	-	-	-	-	-	-	-	-	<0.004
BH301	CHK	Bromobenzene	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	1,2,3-Trichloropropane	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	Propylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	2-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	1,3,5-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	4-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	tert-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	sec-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	4-Isopropyltoluene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	n-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	1,2-Dichlorobenzene	**1**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	Naphthalene	**0.002**	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-	<0.002
BH301	CHK	1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-	-	-	-	-	-	<0.003
BH301	CHK	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110
BH301	CHK	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH302	LMH	Dichlorodifluoromethane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	<0.0001	<0.0001	-	-	-	-	-
BH302	LMH	Chloromethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	Vinyl Chloride	**0.0005**	-	-	-	-	-	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	<0.0001	<0.0001	-	-	-	-	-
BH302	LMH	Bromomethane	-	-	-	-	-	-	-	-	-	<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	-	-	-
BH302	LMH	Chloroethane	-	-	-	-	-	-	-	-	-	0.007	0.005	-	-	-	<0.003	0.006	<0.003	-	-	-	-	-
BH302	LMH	Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	1,1-Dichloroethene	**0.03**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	Dichloromethane	**0.02**	-	-	-	-	-	-	-	-	<0.003	<0.005	-	-	-	<0.005	<0.005	<0.005	-	-	-	-	-
BH302	LMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	2,2-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	-	-	-
BH302	LMH	Bromochloromethane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	Chloroform	**0.3**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	1,1-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	Carbon tetrachloride	**0.003**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	1,2-Dichloroethane	**0.003**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	Benzene	**0.001**	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	-	-	-	-	-
BH302	LMH	Trichloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	1,2-Dichloropropane	**0.04**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	Dibromomethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	Bromodichloromethane	**0.06**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	cis-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	Toluene	**0.7**	-	-	-	-	-	-	-	-	<0.005	<0.005	-	-	-	<0.005	<0.005	<0.005	-	-	-	-	-
BH302	LMH	trans-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	Tetrachloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	1,3-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	Dibromochloromethane	**0.1**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	Chlorobenzene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	Ethylbenzene	**0.3**	-	-	-	-	-	-	-	-	<0.0005	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	-	-	-
BH302	LMH	p/m-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.001	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	o-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.0005	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	-	-	-
BH302	LMH	Styrene	**0.02**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	Bromoform	**0.1**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	Isopropylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.004	<0.004	-	-	-	<0.004	<0.004	<0.004	-	-	-	-	-
BH302	LMH	Bromobenzene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	1,2,3-Trichloropropane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	Propylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	2-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	1,3,5-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	4-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	tert-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	sec-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	4-Isopropyltoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	n-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	1,2-Dichlorobenzene	**1**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	Naphthalene	**0.002**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	LMH	1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	LMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	120	97	-	-	-	-	-
BH302	LMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	110	100	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH302	CHK	Dichlorodifluoromethane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	<0.0001	<0.0001	-	-	-	-	-
BH302	CHK	Chloromethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	Vinyl Chloride	**0.0005**	-	-	-	-	-	-	-	-	<0.0001	<0.0001	-	-	-	<0.0001	<0.0001	<0.0001	-	-	-	-	-
BH302	CHK	Bromomethane	-	-	-	-	-	-	-	-	-	<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	-	-	-
BH302	CHK	Chloroethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	1,1-Dichloroethene	**0.03**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	Dichloromethane	**0.02**	-	-	-	-	-	-	-	-	<0.003	<0.005	-	-	-	<0.005	<0.005	<0.005	-	-	-	-	-
BH302	CHK	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	2,2-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	-	-	-
BH302	CHK	Bromochloromethane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	Chloroform	**0.3**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	1,1-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	Carbon tetrachloride	**0.003**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	1,2-Dichloroethane	**0.003**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	Benzene	**0.001**	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	-	-	-	-	-
BH302	CHK	Trichloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	1,2-Dichloropropane	**0.04**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	Dibromomethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	Bromodichloromethane	**0.06**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	cis-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	Toluene	**0.7**	-	-	-	-	-	-	-	-	<0.005	<0.005	-	-	-	<0.005	<0.005	<0.005	-	-	-	-	-
BH302	CHK	trans-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	Tetrachloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	1,3-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	Dibromochloromethane	**0.1**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	Chlorobenzene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	Ethylbenzene	**0.3**	-	-	-	-	-	-	-	-	<0.0005	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	-	-	-
BH302	CHK	p/m-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.001	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	o-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.0005	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	-	-	-
BH302	CHK	Styrene	**0.02**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	Bromoform	**0.1**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	Isopropylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.004	<0.004	-	-	-	<0.004	<0.004	<0.004	-	-	-	-	-
BH302	CHK	Bromobenzene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	1,2,3-Trichloropropane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	Propylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	2-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	1,3,5-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	4-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	tert-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	sec-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	4-Isopropyltoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	n-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	1,2-Dichlorobenzene	**1**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	Naphthalene	**0.002**	-	-	-	-	-	-	-	-	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	-	-	-
BH302	CHK	1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	-	-	-	<0.003	<0.003	<0.003	-	-	-	-	-
BH302	CHK	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	110	97	-	-	-	-	-
BH302	CHK	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	100	110	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH305	LMH	Dichlorodifluoromethane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	-	-	-
BH305	LMH	Chloromethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	Vinyl Chloride	**0.0005**	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	-	-	-
BH305	LMH	Bromomethane	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	-	-	-
BH305	LMH	Chloroethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	1,1-Dichloroethene	**0.03**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	Dichloromethane	**0.02**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	-	-	-
BH305	LMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	2,2-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	-	-	-
BH305	LMH	Bromochloromethane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	Chloroform	**0.3**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	1,1-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	Carbon tetrachloride	**0.003**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	1,2-Dichloroethane	**0.003**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	Benzene	**0.001**	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	-	-	-
BH305	LMH	Trichloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	1,2-Dichloropropane	**0.04**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	Dibromomethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	Bromodichloromethane	**0.06**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	cis-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	Toluene	**0.7**	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	-	-	-
BH305	LMH	trans-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	Tetrachloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	1,3-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	Dibromochloromethane	**0.1**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	Chlorobenzene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	Ethylbenzene	**0.3**	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	-	-	-
BH305	LMH	p/m-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	o-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	-	-	-
BH305	LMH	Styrene	**0.02**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	Bromoform	**0.1**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	Isopropylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	<0.004	-	-	-
BH305	LMH	Bromobenzene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	1,2,3-Trichloropropane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	Propylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	2-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	1,3,5-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	4-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	tert-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	sec-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	4-Isopropyltoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	n-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	1,2-Dichlorobenzene	**1**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	Naphthalene	**0.002**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-	-
BH305	LMH	1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	<0.003	-	-	-
BH305	LMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	110	97	-	100	-	-	-
BH305	LMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	100	100	-	100	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH305	CHK	Dichlorodifluoromethane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-
BH305	CHK	Chloromethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	Vinyl Chloride	**0.0005**	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-
BH305	CHK	Bromomethane	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
BH305	CHK	Chloroethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	1,1-Dichloroethene	**0.03**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	Dichloromethane	**0.02**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
BH305	CHK	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	2,2-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
BH305	CHK	Bromochloromethane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	Chloroform	**0.3**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	1,1-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	Carbon tetrachloride	**0.003**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	1,2-Dichloroethane	**0.003**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	Benzene	**0.001**	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-
BH305	CHK	Trichloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	1,2-Dichloropropane	**0.04**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	Dibromomethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	Bromodichloromethane	**0.06**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	cis-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	Toluene	**0.7**	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-
BH305	CHK	trans-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	Tetrachloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	1,3-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	Dibromochloromethane	**0.1**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	Chlorobenzene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	Ethylbenzene	**0.3**	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
BH305	CHK	p/m-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	o-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
BH305	CHK	Styrene	**0.02**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	Bromoform	**0.1**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	Isopropylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	-	-	-	-
BH305	CHK	Bromobenzene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	1,2,3-Trichloropropane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	Propylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	2-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	1,3,5-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	4-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	tert-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	sec-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	4-Isopropyltoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	n-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	1,2-Dichlorobenzene	**1**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	Naphthalene	**0.002**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-
BH305	CHK	1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-
BH305	CHK	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	110	99	-	-	-	-	-
BH305	CHK	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	100	110	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH306	UMH	Dichlorodifluoromethane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH306	UMH	Chloromethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	Vinyl Chloride	**0.0005**	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH306	UMH	Bromomethane	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH306	UMH	Chloroethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	1,1-Dichloroethene	**0.03**	-	-	-	-	-	-	-	-	0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	0.004	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	Dichloromethane	**0.02**	-	-	-	-	-	-	-	-	<0.003	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH306	UMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	0.01	<0.003	<0.003	<0.003	0.005	0.006	0.005	0.009	0.009	0.008	0.007	0.008	0.008
BH306	UMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	2,2-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH306	UMH	Bromochloromethane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	Chloroform	**0.3**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	-	-	-	0.013	<0.002	<0.002	<0.002	0.009	0.008	0.007	0.017	0.011	0.012	0.006	0.01	0.008
BH306	UMH	1,1-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	Carbon tetrachloride	**0.003**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	1,2-Dichloroethane	**0.003**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	Benzene	**0.001**	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH306	UMH	Trichloroethene	**0.01**	-	-	-	-	-	-	-	-	0.005	<0.003	<0.003	<0.003	<0.003	0.003	0.004	0.011	<0.003	0.019	0.006	0.012	<0.003
BH306	UMH	1,2-Dichloropropane	**0.04**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	Dibromomethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	Bromodichloromethane	**0.06**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	cis-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	Toluene	**0.7**	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BH306	UMH	trans-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	Tetrachloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	1,3-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	Dibromochloromethane	**0.1**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	Chlorobenzene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	Ethylbenzene	**0.3**	-	-	-	-	-	-	-	-	<0.0005	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH306	UMH	p/m-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.001	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	o-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.0005	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BH306	UMH	Styrene	**0.02**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	Bromoform	**0.1**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	Isopropylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
BH306	UMH	Bromobenzene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	1,2,3-Trichloropropane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	Propylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	2-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	1,3,5-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	4-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	tert-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	sec-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	4-Isopropyltoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	n-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	1,2-Dichlorobenzene	**1**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	Naphthalene	**0.002**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BH306	UMH	1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
BH306	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	110	98	99	110	100	95	89
BH306	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	100	110	110	110	100	91	81

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH307	UMH	Dichlorodifluoromethane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-
BH307	UMH	Chloromethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	Vinyl Chloride	**0.0005**	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-
BH307	UMH	Bromomethane	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-
BH307	UMH	Chloroethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	1,1-Dichloroethene	**0.03**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	Dichloromethane	**0.02**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-
BH307	UMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	2,2-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-
BH307	UMH	Bromochloromethane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	Chloroform	**0.3**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.005	-	-	-	-	-	-
BH307	UMH	1,1-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	Carbon tetrachloride	**0.003**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	1,2-Dichloroethane	**0.003**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	Benzene	**0.001**	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-	-
BH307	UMH	Trichloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	0.007	0.006	0.01	-	-	-	-	-	-
BH307	UMH	1,2-Dichloropropane	**0.04**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	Dibromomethane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	Bromodichloromethane	**0.06**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	cis-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	Toluene	**0.7**	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-
BH307	UMH	trans-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	Tetrachloroethene	**0.01**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	1,3-Dichloropropane	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	Dibromochloromethane	**0.1**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	Chlorobenzene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	Ethylbenzene	**0.3**	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-
BH307	UMH	p/m-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	o-Xylene	**0.5**	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-
BH307	UMH	Styrene	**0.02**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	Bromoform	**0.1**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	Isopropylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	-	-	-	-	-
BH307	UMH	Bromobenzene	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	1,2,3-Trichloropropane	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	Propylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	2-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	1,3,5-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	4-Chlorotoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	tert-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	sec-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	4-Isopropyltoluene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	n-Butylbenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	1,2-Dichlorobenzene	**1**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	Naphthalene	**0.002**	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-
BH307	UMH	1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-
BH307	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	110	-	-	-	-	-	-
BH307	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	100	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
GMW103L	UMH	Dichlorodifluoromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001
GMW103L	UMH	Chloromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	Vinyl Chloride	**0.0005**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001
GMW103L	UMH	Bromomethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
GMW103L	UMH	Chloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	1,1-Dichloroethene	**0.03**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	Dichloromethane	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.005
GMW103L	UMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	2,2-Dichloropropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
GMW103L	UMH	Bromochloromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	Chloroform	**0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	1,1-Dichloropropene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	Carbon tetrachloride	**0.003**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	1,2-Dichloroethane	**0.003**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	Benzene	**0.001**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005
GMW103L	UMH	Trichloroethene	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	1,2-Dichloropropane	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	Dibromomethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	Bromodichloromethane	**0.06**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	cis-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	Toluene	**0.7**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.005
GMW103L	UMH	trans-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	Tetrachloroethene	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	1,3-Dichloropropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	Dibromochloromethane	**0.1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	Chlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	Ethylbenzene	**0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
GMW103L	UMH	p/m-Xylene	**0.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	o-Xylene	**0.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
GMW103L	UMH	Styrene	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	Bromoform	**0.1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	Isopropylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.004
GMW103L	UMH	Bromobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	1,2,3-Trichloropropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	Propylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	2-Chlorotoluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	1,3,5-Trimethylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	4-Chlorotoluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	tert-Butylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	sec-Butylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	4-Isopropyltoluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	n-Butylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	1,2-Dichlorobenzene	**1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	Naphthalene	**0.002**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW103L	UMH	1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW103L	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	97
GMW103L	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	91

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
GMW107	UMH	Dichlorodifluoromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001
GMW107	UMH	Chloromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	Vinyl Chloride	**0.0005**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001
GMW107	UMH	Bromomethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
GMW107	UMH	Chloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	1,1-Dichloroethene	**0.03**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	Dichloromethane	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.005
GMW107	UMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	2,2-Dichloropropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
GMW107	UMH	Bromochloromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	Chloroform	**0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	1,1-Dichloropropene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	Carbon tetrachloride	**0.003**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	1,2-Dichloroethane	**0.003**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	Benzene	**0.001**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005
GMW107	UMH	Trichloroethene	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	1,2-Dichloropropane	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	Dibromomethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	Bromodichloromethane	**0.06**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	cis-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	Toluene	**0.7**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.005
GMW107	UMH	trans-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	Tetrachloroethene	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	1,3-Dichloropropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	Dibromochloromethane	**0.1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	Chlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	Ethylbenzene	**0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
GMW107	UMH	p/m-Xylene	**0.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	o-Xylene	**0.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
GMW107	UMH	Styrene	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	Bromoform	**0.1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	Isopropylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.004
GMW107	UMH	Bromobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	1,2,3-Trichloropropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	Propylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	2-Chlorotoluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	1,3,5-Trimethylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	4-Chlorotoluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	tert-Butylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	sec-Butylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	4-Isopropyltoluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	n-Butylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	1,2-Dichlorobenzene	**1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	Naphthalene	**0.002**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW107	UMH	1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW107	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100
GMW107	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98

Hatfield Road Quarry
Groundwater Quality Data- VOCs

Borehole	Aquifer	Analysis	WQS / Freshwater	Aug-13	Sep-13	Oct-14	Nov-14	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
GMW109	UMH	Dichlorodifluoromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	Methyl Tertiary Butyl Ether	**0.015**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001
GMW109	UMH	Chloromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	Vinyl Chloride	**0.0005**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001
GMW109	UMH	Bromomethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
GMW109	UMH	Chloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	1,1-Dichloroethene	**0.03**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	Dichloromethane	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.005
GMW109	UMH	trans-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	cis-1-2-Dichloroethene	**0.05**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	2,2-Dichloropropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
GMW109	UMH	Bromochloromethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	Chloroform	**0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	1,1,1-Trichloroethane	**0.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	1,1-Dichloropropene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	Carbon tetrachloride	**0.003**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	1,2-Dichloroethane	**0.003**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	Benzene	**0.001**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005
GMW109	UMH	Trichloroethene	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GMW109	UMH	1,2-Dichloropropane	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	Dibromomethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	Bromodichloromethane	**0.06**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	cis-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	Toluene	**0.7**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.005
GMW109	UMH	trans-1-3-Dichloropropene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	1,1,2-Trichloroethane	**0.005**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	Tetrachloroethene	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	1,3-Dichloropropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	Dibromochloromethane	**0.1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	1,2-Dibromoethane	**0.0004**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	Chlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	1,1,1,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	Ethylbenzene	**0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
GMW109	UMH	p/m-Xylene	**0.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	o-Xylene	**0.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001
GMW109	UMH	Styrene	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	Bromoform	**0.1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	Isopropylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	1,1,2,2-Tetrachloroethane	**1.848**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.004
GMW109	UMH	Bromobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	1,2,3-Trichloropropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	Propylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	2-Chlorotoluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	1,3,5-Trimethylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	4-Chlorotoluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	tert-Butylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	sec-Butylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	4-Isopropyltoluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	1,4-Dichlorobenzene	**0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	n-Butylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	1,2-Dichlorobenzene	**1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	1,2-Dibromo-3-chloropropane	**0.001**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	Hexachlorobutadiene	**0.0006**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	Naphthalene	**0.002**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002
GMW109	UMH	1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003
GMW109	UMH	Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100
GMW109	UMH	Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98

SVOCs

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH 101	UMH	Phenol	2-Chlorophenol	-	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Phenol	2-Methylphenol	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-
BH 101	UMH	Phenol	2-Nitrophenol	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-
BH 101	UMH	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-
BH 101	UMH	Phenol	2,4-Dimethylphenol	-	<0.01	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-
BH 101	UMH	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-
BH 101	UMH	Phenol	4-Methylphenol	-	<0.01	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Phenol	4-Nitrophenol	-	<0.01	-	-	-	-	-	-	-	<0.01	-	-	-	-	-
BH 101	UMH	Phenol	Pentachlorophenol	0.009	<0.01	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Phenol	Phenol	0.0077	<0.01	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	PAH	2-Chloronaphthalene	-	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	PAH	2-Methylnaphthalene	-	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	PAH	Naphthalene	0.002	<0.001	-	-	-	-	-	-	-	<0.001	-	<0.0001	-	-	-
BH 101	UMH	PAH	Acenaphthylene	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	<0.000013	-	-	-
BH 101	UMH	PAH	Acenaphthene	-	<0.001	-	-	-	-	-	-	-	<0.001	-	<0.000013	-	-	-
BH 101	UMH	PAH	Fluorene	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	<0.000014	-	-	-
BH 101	UMH	PAH	Phenanthrene	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	<0.000011	-	-	-
BH 101	UMH	PAH	Anthracene	0.0001	<0.0005	-	-	-	-	-	-	-	<0.0005	-	<0.000013	-	-	-
BH 101	UMH	PAH	Fluoranthene	0.0000063	<0.0005	-	-	-	-	-	-	-	<0.0005	-	<0.000012	-	-	-
BH 101	UMH	PAH	Pyrene	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	<0.000013	-	-	-
BH 101	UMH	PAH	Benzo(a)anthracene	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	<0.000015	-	-	-
BH 101	UMH	PAH	Chrysene	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	<0.000011	-	-	-
BH 101	UMH	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	-	-	-	-	-	-	<0.001	-	<0.000018	-	-	-
BH 101	UMH	PAH	Benzo(a)pyrene	0.00001	<0.01	-	-	-	-	-	-	-	<0.001	-	<0.000016	-	-	-
BH 101	UMH	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	-	-	-	-	-	-	<0.001	-	<0.000011	-	-	-
BH 101	UMH	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	<0.00001	-	-	-
BH 101	UMH	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	-	-	-	-	-	-	<0.0005	-	<0.000011	-	-	-
BH 101	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	-	-	-	-	-	-	<0.005	-	-	-	-	-
BH 101	UMH	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	-	-	-	-	-	-	<0.0015	-	-	-	-	-
BH 101	UMH	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Phthalates	Diethyl phthalate	0.2	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Phthalates	Dimethyl phthalate	0.8	<0.01	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	2-Nitroaniline	-	<0.01	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-
BH 101	UMH	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	-	-	-	-	-	-	<0.001	-	-	-	-	--
BH 101	UMH	Other SVOCs	3-Nitroaniline	-	<0.01	-	-	-	-	-	-	-	<0.001	-	-	-	-	--
BH 101	UMH	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	4-Chloroaniline	-	<0.01	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	4-Nitroaniline	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-
BH 101	UMH	Other SVOCs	Azobenzene	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-
BH 101	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-
BH 101	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	Carbazole	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-
BH 101	UMH	Other SVOCs	Dibenzofuran	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-
BH 101	UMH	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	Hexachloroethane	-	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	UMH	Other SVOCs	Isophorone	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-
BH 101	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-
BH 101	UMH	Other SVOCs	Nitrobenzene	-	<0.001	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Phenol	2-Chlorophenol	-	-	<0.001	<0.001	-	<0.0005	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Phenol	2-Methylphenol	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-
BH 101	LMH	Phenol	2-Nitrophenol	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-
BH 101	LMH	Phenol	2,4-Dichlorophenol	0.14	-	<0.0005	<0.0005	-	<0.001	-	-	-	<0.0005	-	-	-	-	-
BH 101	LMH	Phenol	2,4-Dimethylphenol	-	-	<0.01	<0.001	-	<0.0005	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Phenol	2,4,5-Trichlorophenol	-	-	<0.0005	<0.0005	-	<0.001	-	-	-	<0.0005	-	-	-	-	-
BH 101	LMH	Phenol	2,4,6-Trichlorophenol	-	-	<0.01	<0.001	-	<0.0005	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Phenol	4-Chloro-3-methylphenol	-	-	<0.0005	<0.0005	-	<0.001	-	-	-	<0.0005	-	-	-	-	-
BH 101	LMH	Phenol	4-Methylphenol	-	-	<0.01	<0.001	-	<0.01	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Phenol	4-Nitrophenol	-	-	<0.01	<0.01	-	<0.001	-	-	-	<0.01	-	-	-	-	-
BH 101	LMH	Phenol	Pentachlorophenol	0.009	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Phenol	Phenol	0.0077	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	PAH	2-Chloronaphthalene	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	PAH	2-Methylnaphthalene	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	PAH	Naphthalene	0.002	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002
BH 101	LMH	PAH	Acenaphthylene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000026
BH 101	LMH	PAH	Acenaphthene	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	<0.000013	<0.000013	<0.000013	<0.000013	<0.000026
BH 101	LMH	PAH	Fluorene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000014	0.000016	<0.000014	<0.000014	<0.000028
BH 101	LMH	PAH	Phenanthrene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	0.0001	<0.000011	<0.000011	<0.000022
BH 101	LMH	PAH	Anthracene	0.0001	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000026
BH 101	LMH	PAH	Fluoranthene	0.0000063	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000012	0.000018	<0.000012	<0.000012	<0.000024
BH 101	LMH	PAH	Pyrene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	0.000013	<0.000013	<0.000013	<0.000026
BH 101	LMH	PAH	Benzo(a)anthracene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000015	<0.000015	<0.000015	<0.000015	<0.000030
BH 101	LMH	PAH	Chrysene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000022
BH 101	LMH	PAH	Benzo(bk)fluoranthene	0.0001	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	<0.000018	<0.000018	<0.000018	<0.000018	<0.000036
BH 101	LMH	PAH	Benzo(a)pyrene	0.00001	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	<0.000016	<0.000016	<0.000016	<0.000016	<0.000032
BH 101	LMH	PAH	Indeno(123cd)pyrene	0.0001	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	<0.000011	<0.000011	<0.000011	<0.000011	<0.000022
BH 101	LMH	PAH	Dibenzo(ah)anthracene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002
BH 101	LMH	PAH	Benzo(ghi)perylene	0.0001	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000022
BH 101	LMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	<0.01	<0.005	-	<0.005	-	-	-	<0.005	-	-	-	-	-
BH 101	LMH	Phthalates	Butylbenzyl phthalate	0.02	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Phthalates	Di-n-butyl phthalate	0.008	-	<0.0015	<0.0015	-	<0.0015	-	-	-	<0.0015	-	-	-	-	-
BH 101	LMH	Phthalates	Di-n-Octyl phthalate	0.02	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Phthalates	Diethyl phthalate	0.2	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Phthalates	Dimethyl phthalate	0.8	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	1,2-Dichlorobenzene	1	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	1,3-Dichlorobenzene	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	2-Nitroaniline	-	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	2,4-Dinitrotoluene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-
BH 101	LMH	Other SVOCs	2,6-Dinitrotoluene	-	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	3-Nitroaniline	-	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	4-Bromophenylphenylether	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	4-Chloroaniline	-	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	4-Chlorophenylphenylether	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	4-Nitroaniline	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-
BH 101	LMH	Other SVOCs	Azobenzene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-
BH 101	LMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-
BH 101	LMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	Carbazole	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-
BH 101	LMH	Other SVOCs	Dibenzofuran	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-
BH 101	LMH	Other SVOCs	Hexachlorobenzene	0.00001	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	Hexachloroethane	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	LMH	Other SVOCs	Isophorone	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-
BH 101	LMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-
BH 101	LMH	Other SVOCs	Nitrobenzene	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH 101	CHK	Phenol	2-Chlorophenol	-	<0.001	-	<0.001	-	<0.0005	-	-	-	<0.001	-	-	-	-	-
BH 101	CHK	Phenol	2-Methylphenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-
BH 101	CHK	Phenol	2-Nitrophenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-
BH 101	CHK	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	<0.0005	-	<0.001	-	-	-	<0.0005	-	-	-	-	-
BH 101	CHK	Phenol	2,4-Dimethylphenol	-	<0.01	-	<0.001	-	<0.0005	-	-	-	<0.001	-	-	-	-	-
BH 101	CHK	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	<0.0005	-	<0.001	-	-	-	<0.0005	-	-	-	-	-
BH 101	CHK	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	<0.001	-	<0.0005	-	-	-	<0.001	-	-	-	-	-
BH 101	CHK	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	<0.0005	-	<0.001	-	-	-	<0.0005	-	-	-	-	-
BH 101	CHK	Phenol	4-Methylphenol	-	<0.01	-	<0.001	-	<0.01	-	-	-	<0.001	-	-	-	-	-
BH 101	CHK	Phenol	4-Nitrophenol	-	<0.01	-	<0.01	-	<0.001	-	-	-	<0.01	-	-	-	-	-
BH 101	CHK	Phenol	Pentachlorophenol	0.009	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	CHK	Phenol	Phenol	0.0077	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	CHK	PAH	2-Chloronaphthalene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	CHK	PAH	2-Methylnaphthalene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	-
BH 101	CHK	PAH	Naphthalene	0.002	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH 101	CHK	PAH	Acenaphthylene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 101	CHK	PAH	Acenaphthene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 101	CHK	PAH	Fluorene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000014	<0.000014	<0.000014	<0.000014	<0.000014
BH 101	CHK	PAH	Phenanthrene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 101	CHK	PAH	Anthracene	0.0001	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 101	CHK	PAH	Fluoranthene	0.0000063	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000012	<0.000012	<0.000012	<0.000012	<0.000012
BH 101	CHK	PAH	Pyrene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 101	CHK	PAH	Benzo(a)anthracene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
BH 101	CHK	PAH	Chrysene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 101	CHK	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000018	<0.000018	<0.000018	<0.000018	<0.000018
BH 101	CHK	PAH	Benzo(a)pyrene	0.00001	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000016	<0.000016	<0.000016	<0.000016	<0.000016
BH 101	CHK	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 101	CHK	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
BH 101	CHK	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 101	CHK	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	<0.005	-	<0.005	-	-	-	<0.005	-	-	-	-	
BH 101	CHK	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	<0.0015	-	<0.0015	-	-	-	<0.0015	-	-	-	-	
BH 101	CHK	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Phthalates	Diethyl phthalate	0.2	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Phthalates	Dimethyl phthalate	0.8	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	2-Nitroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 101	CHK	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	3-Nitroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	4-Chloroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	4-Nitroaniline	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 101	CHK	Other SVOCs	Azobenzene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 101	CHK	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 101	CHK	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	Carbazole	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 101	CHK	Other SVOCs	Dibenzofuran	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 101	CHK	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	Hexachloroethane	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 101	CHK	Other SVOCs	Isophorone	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 101	CHK	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 101	CHK	Other SVOCs	Nitrobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Phenol	2-Chlorophenol	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Phenol	2-Methylphenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 102	UMH	Phenol	2-Nitrophenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 102	UMH	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 102	UMH	Phenol	2,4-Dimethylphenol	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 102	UMH	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 102	UMH	Phenol	4-Methylphenol	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Phenol	4-Nitrophenol	-	<0.01	-	<0.01	-	<0.01	-	-	-	<0.01	-	-	-	-	
BH 102	UMH	Phenol	Pentachlorophenol	0.009	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Phenol	Phenol	0.0077	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	PAH	2-Chloronaphthalene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	PAH	2-Methylnaphthalene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	PAH	Naphthalene	0.002	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0003
BH 102	UMH	PAH	Acenaphthylene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000039
BH 102	UMH	PAH	Acenaphthene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000013	<0.000013	<0.000013	<0.000013	<0.000039
BH 102	UMH	PAH	Fluorene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000014	<0.000014	<0.000014	<0.000014	<0.000042
BH 102	UMH	PAH	Phenanthrene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000033
BH 102	UMH	PAH	Anthracene	0.0001	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000039
BH 102	UMH	PAH	Fluoranthene	0.0000063	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000012	<0.000012	<0.000012	<0.000012	<0.000036
BH 102	UMH	PAH	Pyrene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000039
BH 102	UMH	PAH	Benzo(a)anthracene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000015	<0.000015	<0.000015	<0.000015	<0.000045
BH 102	UMH	PAH	Chrysene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000033
BH 102	UMH	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000018	<0.000018	<0.000018	<0.000018	<0.000054
BH 102	UMH	PAH	Benzo(a)pyrene	0.00001	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000016	<0.000016	<0.000016	<0.000016	<0.000048
BH 102	UMH	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000011	<0.000011	<0.000011	<0.000011	<0.000033
BH 102	UMH	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00003
BH 102	UMH	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000033
BH 102	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	<0.005	-	<0.005	-	-	-	<0.005	-	-	-	-	
BH 102	UMH	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	<0.0015	-	<0.0015	-	-	-	<0.0015	-	-	-	-	
BH 102	UMH	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Phthalates	Diethyl phthalate	0.2	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Phthalates	Dimethyl phthalate	0.8	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	2-Nitroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 102	UMH	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	3-Nitroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	4-Chloroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	4-Nitroaniline	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 102	UMH	Other SVOCs	Azobenzene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 102	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 102	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	Carbazole	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 102	UMH	Other SVOCs	Dibenzofuran	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 102	UMH	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	Hexachloroethane	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 102	UMH	Other SVOCs	Isophorone	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 102	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 102	UMH	Other SVOCs	Nitrobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH 102	LMH	Phenol	2-Chlorophenol	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phenol	2-Methylphenol	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phenol	2-Nitrophenol	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phenol	2,4-Dichlorophenol	0.14	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phenol	2,4-Dimethylphenol	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phenol	2,4,5-Trichlorophenol	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phenol	2,4,6-Trichlorophenol	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phenol	4-Chloro-3-methylphenol	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phenol	4-Methylphenol	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phenol	4-Nitrophenol	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phenol	Pentachlorophenol	0.009	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phenol	Phenol	0.0077	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	2-Chloronaphthalene	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	2-Methylnaphthalene	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Naphthalene	0.002	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Acenaphthylene	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Acenaphthene	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Fluorene	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Phenanthrene	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Anthracene	0.0001	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Fluoranthene	0.0000063	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Pyrene	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Benzo(a)anthracene	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Chrysene	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Benzo(bk)fluoranthene	0.0001	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Benzo(a)pyrene	0.00001	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Indeno(123cd)pyrene	0.0001	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Dibenzo(ah)anthracene	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	PAH	Benzo(ghi)perylene	0.0001	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phthalates	Butylbenzyl phthalate	0.02	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phthalates	Di-n-butyl phthalate	0.008	-	<0.0015	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phthalates	Di-n-Octyl phthalate	0.02	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phthalates	Diethyl phthalate	0.2	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Phthalates	Dimethyl phthalate	0.8	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	1,2-Dichlorobenzene	1	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	1,3-Dichlorobenzene	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	2-Nitroaniline	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	2,4-Dinitrotoluene	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	2,6-Dinitrotoluene	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	3-Nitroaniline	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	4-Bromophenylphenylether	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	4-Chloroaniline	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	4-Chlorophenylphenylether	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	4-Nitroaniline	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	Azobenzene	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	Carbazole	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	Dibenzofuran	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	Hexachlorobenzene	0.00001	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	Hexachloroethane	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	Isophorone	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	
BH 102	LMH	Other SVOCs	Nitrobenzene	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phenol	2-Chlorophenol	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phenol	2-Methylphenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phenol	2-Nitrophenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phenol	2,4-Dimethylphenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phenol	4-Methylphenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phenol	4-Nitrophenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phenol	Pentachlorophenol	0.009	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phenol	Phenol	0.0077	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	2-Chloronaphthalene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	2-Methylnaphthalene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Naphthalene	0.002	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Acenaphthylene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Acenaphthene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Fluorene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Phenanthrene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Anthracene	0.0001	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Fluoranthene	0.0000063	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Pyrene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Benzo(a)anthracene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Chrysene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Benzo(a)pyrene	0.00001	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phthalates	Diethyl phthalate	0.2	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Phthalates	Dimethyl phthalate	0.8	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	2-Nitroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	3-Nitroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	4-Chloroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	4-Nitroaniline	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	Azobenzene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	Carbazole	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	Dibenzofuran	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	Hexachloroethane	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	Isophorone	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 102	CHK	Other SVOCs	Nitrobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH 103	UMH	Phenol	2-Chlorophenol	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Phenol	2-Methylphenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
BH 103	UMH	Phenol	2-Nitrophenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
BH 103	UMH	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
BH 103	UMH	Phenol	2,4-Dimethylphenol	-	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
BH 103	UMH	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
BH 103	UMH	Phenol	4-Methylphenol	-	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Phenol	4-Nitrophenol	-	<0.01	-	<0.01	-	<0.01	-	-	<0.01	-	-	-	-	-	
BH 103	UMH	Phenol	Pentachlorophenol	0.009	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Phenol	Phenol	0.0077	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	PAH	2-Chloronaphthalene	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	PAH	2-Methylnaphthalene	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	PAH	Naphthalene	0.002	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH 103	UMH	PAH	Acenaphthylene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 103	UMH	PAH	Acenaphthene	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 103	UMH	PAH	Fluorene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	<0.000014	<0.000014	<0.000014	<0.000014	<0.000014
BH 103	UMH	PAH	Phenanthrene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 103	UMH	PAH	Anthracene	0.0001	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 103	UMH	PAH	Fluoranthene	0.0000063	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	<0.000012	<0.000012	<0.000012	<0.000012	<0.000012
BH 103	UMH	PAH	Pyrene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 103	UMH	PAH	Benzo(a)anthracene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
BH 103	UMH	PAH	Chrysene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 103	UMH	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	<0.000018	<0.000018	<0.000018	<0.000018	<0.000018
BH 103	UMH	PAH	Benzo(a)pyrene	0.00001	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	<0.000016	<0.000016	<0.000016	<0.000016	<0.000016
BH 103	UMH	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 103	UMH	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
BH 103	UMH	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 103	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	<0.005	-	<0.005	-	-	<0.005	-	-	-	-	-	
BH 103	UMH	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	<0.0015	-	<0.0015	-	-	<0.0015	-	-	-	-	-	
BH 103	UMH	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Phthalates	Diethyl phthalate	0.2	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Phthalates	Dimethyl phthalate	0.8	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	2-Nitroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
BH 103	UMH	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	3-Nitroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	4-Chloroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	4-Nitroaniline	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
BH 103	UMH	Other SVOCs	Azobenzene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
BH 103	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
BH 103	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	Carbazole	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
BH 103	UMH	Other SVOCs	Dibenzofuran	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
BH 103	UMH	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	Hexachloroethane	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	UMH	Other SVOCs	Isophorone	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
BH 103	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	<0.0005	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
BH 103	UMH	Other SVOCs	Nitrobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Phenol	2-Chlorophenol	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Phenol	2-Methylphenol	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	LMH	Phenol	2-Nitrophenol	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	LMH	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	LMH	Phenol	2,4-Dimethylphenol	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	LMH	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	LMH	Phenol	4-Methylphenol	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Phenol	4-Nitrophenol	-	<0.01	-	<0.01	-	-	-	-	<0.01	-	-	-	-	-	
BH 103	LMH	Phenol	Pentachlorophenol	0.009	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Phenol	Phenol	0.0077	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	PAH	2-Chloronaphthalene	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	PAH	2-Methylnaphthalene	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	PAH	Naphthalene	0.002	<0.001	-	<0.001	-	-	-	-	<0.001	-	<0.0001	-	<0.0001	<0.0001	<0.0001
BH 103	LMH	PAH	Acenaphthylene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	<0.000013	-	<0.000013	<0.000013	<0.000013
BH 103	LMH	PAH	Acenaphthene	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	<0.000013	-	<0.000013	<0.000013	<0.000013
BH 103	LMH	PAH	Fluorene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	<0.000014	-	<0.000014	<0.000014	<0.000014
BH 103	LMH	PAH	Phenanthrene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	<0.000011	-	<0.000011	<0.000011	0.000015
BH 103	LMH	PAH	Anthracene	0.0001	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	<0.000013	-	<0.000013	<0.000013	<0.000013
BH 103	LMH	PAH	Fluoranthene	0.0000063	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	<0.000012	-	<0.000012	<0.000012	<0.000012
BH 103	LMH	PAH	Pyrene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	<0.000013	-	<0.000013	<0.000013	0.000025
BH 103	LMH	PAH	Benzo(a)anthracene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	<0.000015	-	<0.000015	<0.000015	<0.000015
BH 103	LMH	PAH	Chrysene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	<0.000011	-	<0.000011	<0.000011	<0.000011
BH 103	LMH	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	<0.001	-	-	-	-	<0.001	-	<0.000018	-	<0.000018	<0.000018	<0.000018
BH 103	LMH	PAH	Benzo(a)pyrene	0.00001	<0.01	-	<0.001	-	-	-	-	<0.001	-	<0.000016	-	<0.000016	<0.000016	<0.000016
BH 103	LMH	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	<0.001	-	-	-	-	<0.001	-	<0.000011	-	<0.000011	<0.000011	<0.000011
BH 103	LMH	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	<0.00001	-	<0.00001	<0.00001	<0.00001
BH 103	LMH	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	<0.000011	-	<0.000011	<0.000011	<0.000011
BH 103	LMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	<0.005	-	-	-	-	<0.005	-	-	-	-	-	
BH 103	LMH	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	<0.0015	-	-	-	-	<0.0015	-	-	-	-	-	
BH 103	LMH	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Phthalates	Diethyl phthalate	0.2	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Phthalates	Dimethyl phthalate	0.8	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	2-Nitroaniline	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	LMH	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	3-Nitroaniline	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	4-Chloroaniline	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	4-Nitroaniline	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	LMH	Other SVOCs	Azobenzene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	LMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	LMH	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	Carbazole	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	LMH	Other SVOCs	Dibenzofuran	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	LMH	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	Hexachloroethane	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	LMH	Other SVOCs	Isophorone	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	LMH	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	LMH	Other SVOCs	Nitrobenzene	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH 103	CHK	Phenol	2-Chlorophenol	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Phenol	2-Methylphenol	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	CHK	Phenol	2-Nitrophenol	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	CHK	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	CHK	Phenol	2,4-Dimethylphenol	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	CHK	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	CHK	Phenol	4-Methylphenol	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Phenol	4-Nitrophenol	-	<0.01	-	<0.01	-	-	-	-	<0.01	-	-	-	-	-	
BH 103	CHK	Phenol	Pentachlorophenol	0.009	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Phenol	Phenol	0.0077	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	PAH	2-Chloronaphthalene	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	PAH	2-Methylnaphthalene	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	PAH	Naphthalene	0.002	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	<0.0001	
BH 103	CHK	PAH	Acenaphthylene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	<0.000013	
BH 103	CHK	PAH	Acenaphthene	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	<0.000013	
BH 103	CHK	PAH	Fluorene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	<0.000014	
BH 103	CHK	PAH	Phenanthrene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	<0.000011	
BH 103	CHK	PAH	Anthracene	0.0001	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	<0.000013	
BH 103	CHK	PAH	Fluoranthene	0.0000063	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	<0.000012	
BH 103	CHK	PAH	Pyrene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	<0.000013	
BH 103	CHK	PAH	Benzo(a)anthracene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	<0.000015	
BH 103	CHK	PAH	Chrysene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	<0.000011	
BH 103	CHK	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	<0.000018	
BH 103	CHK	PAH	Benzo(a)pyrene	0.00001	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	<0.000016	
BH 103	CHK	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	<0.000011	
BH 103	CHK	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	<0.00001	
BH 103	CHK	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	<0.000011	
BH 103	CHK	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	<0.005	-	-	-	-	<0.005	-	-	-	-	-	
BH 103	CHK	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	<0.0015	-	-	-	-	<0.0015	-	-	-	-	-	
BH 103	CHK	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Phthalates	Diethyl phthalate	0.2	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Phthalates	Dimethyl phthalate	0.8	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	2-Nitroaniline	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	CHK	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	3-Nitroaniline	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	4-Chloroaniline	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	4-Nitroaniline	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	CHK	Other SVOCs	Azobenzene	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	CHK	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	CHK	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	Carbazole	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	CHK	Other SVOCs	Dibenzofuran	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	CHK	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	Hexachloroethane	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 103	CHK	Other SVOCs	Isophorone	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	CHK	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	-	
BH 103	CHK	Other SVOCs	Nitrobenzene	-	<0.001	-	<0.001	-	-	-	-	<0.001	-	-	-	-	-	
BH 104	UMH	Phenol	2-Chlorophenol	-	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Phenol	2-Methylphenol	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	
BH 104	UMH	Phenol	2-Nitrophenol	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	
BH 104	UMH	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	
BH 104	UMH	Phenol	2,4-Dimethylphenol	-	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	
BH 104	UMH	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	
BH 104	UMH	Phenol	4-Methylphenol	-	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Phenol	4-Nitrophenol	-	<0.01	-	-	<0.01	-	-	-	-	<0.01	-	-	-	-	
BH 104	UMH	Phenol	Pentachlorophenol	0.009	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Phenol	Phenol	0.0077	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	PAH	2-Chloronaphthalene	-	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	PAH	2-Methylnaphthalene	-	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	PAH	Naphthalene	0.002	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	<0.0001	<0.0001	<0.0002
BH 104	UMH	PAH	Acenaphthylene	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	<0.000013	<0.000013	<0.000026
BH 104	UMH	PAH	Acenaphthene	-	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	<0.000013	<0.000013	<0.000026
BH 104	UMH	PAH	Fluorene	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	<0.000014	<0.000014	<0.000028
BH 104	UMH	PAH	Phenanthrene	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	<0.000011	<0.000011	<0.000022
BH 104	UMH	PAH	Anthracene	0.0001	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	<0.000013	<0.000013	<0.000026
BH 104	UMH	PAH	Fluoranthene	0.0000063	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	<0.000012	<0.000012	<0.000024
BH 104	UMH	PAH	Pyrene	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	<0.000013	<0.000013	<0.000026
BH 104	UMH	PAH	Benzo(a)anthracene	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	<0.000015	<0.000015	<0.000030
BH 104	UMH	PAH	Chrysene	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	<0.000011	<0.000011	<0.000022
BH 104	UMH	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	<0.000018	<0.000018	<0.000036
BH 104	UMH	PAH	Benzo(a)pyrene	0.00001	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	<0.000016	<0.000016	<0.000032
BH 104	UMH	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	<0.000011	<0.000011	<0.000022
BH 104	UMH	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	<0.00001	<0.00001	<0.00002
BH 104	UMH	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	<0.000011	<0.000011	<0.000022
BH 104	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	-	<0.005	-	-	-	-	<0.005	-	-	-	-	
BH 104	UMH	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	-	<0.0015	-	-	-	-	<0.0015	-	-	-	-	
BH 104	UMH	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Phthalates	Diethyl phthalate	0.2	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Phthalates	Dimethyl phthalate	0.8	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	2-Nitroaniline	-	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	
BH 104	UMH	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	3-Nitroaniline	-	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	4-Chloroaniline	-	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	4-Nitroaniline	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	
BH 104	UMH	Other SVOCs	Azobenzene	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	
BH 104	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	
BH 104	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	Carbazole	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	
BH 104	UMH	Other SVOCs	Dibenzofuran	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	
BH 104	UMH	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	Hexachloroethane	-	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	
BH 104	UMH	Other SVOCs	Isophorone	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	
BH 104	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	-	<0.0005	-	-	-	-	<0.0005	-	-	-	-	
BH 104	UMH	Other SVOCs	Nitrobenzene	-	<0.001	-	-	<0.001	-	-	-	-	<0.001	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH 104	LMH	Phenol	2-Chlorophenol	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Phenol	2-Methylphenol	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	LMH	Phenol	2-Nitrophenol	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	LMH	Phenol	2,4-Dichlorophenol	0.14	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	LMH	Phenol	2,4-Dimethylphenol	-	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Phenol	2,4,5-Trichlorophenol	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	LMH	Phenol	2,4,6-Trichlorophenol	-	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Phenol	4-Chloro-3-methylphenol	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	LMH	Phenol	4-Methylphenol	-	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Phenol	4-Nitrophenol	-	-	<0.01	<0.01	-	<0.01	-	-	-	<0.01	-	-	-	-	
BH 104	LMH	Phenol	Pentachlorophenol	0.009	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Phenol	Phenol	0.0077	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	PAH	2-Chloronaphthalene	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	PAH	2-Methylnaphthalene	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	PAH	Naphthalene	0.002	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH 104	LMH	PAH	Acenaphthylene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 104	LMH	PAH	Acenaphthene	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 104	LMH	PAH	Fluorene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000014	<0.000014	<0.000014	<0.000014	<0.000014
BH 104	LMH	PAH	Phenanthrene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 104	LMH	PAH	Anthracene	0.0001	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 104	LMH	PAH	Fluoranthene	0.0000063	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000012	<0.000012	<0.000012	<0.000012	<0.000012
BH 104	LMH	PAH	Pyrene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 104	LMH	PAH	Benzo(a)anthracene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
BH 104	LMH	PAH	Chrysene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 104	LMH	PAH	Benzo(bk)fluoranthene	0.0001	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	<0.000018	<0.000018	<0.000018	<0.000018	<0.000018
BH 104	LMH	PAH	Benzo(a)pyrene	0.00001	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	<0.000016	<0.000016	<0.000016	<0.000016	<0.000016
BH 104	LMH	PAH	Indeno(123cd)pyrene	0.0001	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 104	LMH	PAH	Dibenzo(ah)anthracene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
BH 104	LMH	PAH	Benzo(ghi)perylene	0.0001	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 104	LMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	<0.01	<0.005	-	<0.005	-	-	-	<0.005	-	-	-	-	
BH 104	LMH	Phthalates	Butylbenzyl phthalate	0.02	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Phthalates	Di-n-butyl phthalate	0.008	-	<0.0015	<0.0015	-	<0.0015	-	-	-	<0.0015	-	-	-	-	
BH 104	LMH	Phthalates	Di-n-Octyl phthalate	0.02	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Phthalates	Diethyl phthalate	0.2	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Phthalates	Dimethyl phthalate	0.8	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	1,2-Dichlorobenzene	1	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	1,3-Dichlorobenzene	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	2-Nitroaniline	-	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	2,4-Dinitrotoluene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	LMH	Other SVOCs	2,6-Dinitrotoluene	-	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	3-Nitroaniline	-	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	4-Bromophenylphenylether	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	4-Chloroaniline	-	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	4-Chlorophenylphenylether	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	4-Nitroaniline	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	LMH	Other SVOCs	Azobenzene	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	LMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	LMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	Carbazole	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	LMH	Other SVOCs	Dibenzofuran	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	LMH	Other SVOCs	Hexachlorobenzene	0.00001	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	<0.01	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	Hexachloroethane	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	LMH	Other SVOCs	Isophorone	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	LMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	<0.0005	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	LMH	Other SVOCs	Nitrobenzene	-	-	<0.001	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Phenol	2-Chlorophenol	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Phenol	2-Methylphenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	CHK	Phenol	2-Nitrophenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	CHK	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	CHK	Phenol	2,4-Dimethylphenol	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	CHK	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	CHK	Phenol	4-Methylphenol	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Phenol	4-Nitrophenol	-	<0.01	-	<0.01	-	<0.01	-	-	-	<0.01	-	-	-	-	
BH 104	CHK	Phenol	Pentachlorophenol	0.009	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Phenol	Phenol	0.0077	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	PAH	2-Chloronaphthalene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	PAH	2-Methylnaphthalene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	PAH	Naphthalene	0.002	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH 104	CHK	PAH	Acenaphthylene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 104	CHK	PAH	Acenaphthene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 104	CHK	PAH	Fluorene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000014	<0.000014	<0.000014	<0.000014	<0.000014
BH 104	CHK	PAH	Phenanthrene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 104	CHK	PAH	Anthracene	0.0001	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 104	CHK	PAH	Fluoranthene	0.0000063	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000012	<0.000012	<0.000012	<0.000012	<0.000012
BH 104	CHK	PAH	Pyrene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 104	CHK	PAH	Benzo(a)anthracene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
BH 104	CHK	PAH	Chrysene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 104	CHK	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000018	<0.000018	<0.000018	<0.000018	<0.000018
BH 104	CHK	PAH	Benzo(a)pyrene	0.00001	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000016	<0.000016	<0.000016	<0.000016	<0.000016
BH 104	CHK	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 104	CHK	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
BH 104	CHK	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 104	CHK	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	<0.005	-	<0.005	-	-	-	<0.005	-	-	-	-	
BH 104	CHK	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	<0.0015	-	<0.0015	-	-	-	<0.0015	-	-	-	-	
BH 104	CHK	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Phthalates	Diethyl phthalate	0.2	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Phthalates	Dimethyl phthalate	0.8	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	2-Nitroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	CHK	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	3-Nitroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	4-Chloroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	4-Nitroaniline	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	CHK	Other SVOCs	Azobenzene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	CHK	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	CHK	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	Carbazole	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	CHK	Other SVOCs	Dibenzofuran	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	CHK	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	Hexachloroethane	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 104	CHK	Other SVOCs	Isophorone	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	CHK	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 104	CHK	Other SVOCs	Nitrobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH 105	LMH	Phenol	2-Chlorophenol	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Phenol	2-Methylphenol	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Phenol	2-Nitrophenol	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Phenol	2,4-Dimethylphenol	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Phenol	4-Methylphenol	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Phenol	4-Nitrophenol	-	<0.01	-	-	-	<0.01	-	-	-	-	-	-	-	-	
BH 105	LMH	Phenol	Pentachlorophenol	0.009	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Phenol	Phenol	0.0077	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	2-Chloronaphthalene	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	2-Methylnaphthalene	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Naphthalene	0.002	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Acenaphthylene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Acenaphthene	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Fluorene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Phenanthrene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Anthracene	0.0001	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Fluoranthene	0.0000063	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Pyrene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Benzo(a)anthracene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Chrysene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Benzo(a)pyrene	0.00001	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	-	-	<0.005	-	-	-	-	-	-	-	-	
BH 105	LMH	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	-	-	<0.0015	-	-	-	-	-	-	-	-	
BH 105	LMH	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Phthalates	Diethyl phthalate	0.2	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Phthalates	Dimethyl phthalate	0.8	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	2-Nitroaniline	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	3-Nitroaniline	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	4-Chloroaniline	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	4-Nitroaniline	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	Azobenzene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	Carbazole	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	Dibenzofuran	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	Hexachloroethane	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	Isophorone	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	LMH	Other SVOCs	Nitrobenzene	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Phenol	2-Chlorophenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Phenol	2-Methylphenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Phenol	2-Nitrophenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Phenol	2,4-Dichlorophenol	0.14	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Phenol	2,4-Dimethylphenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Phenol	2,4,5-Trichlorophenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Phenol	2,4,6-Trichlorophenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Phenol	4-Chloro-3-methylphenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Phenol	4-Methylphenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Phenol	4-Nitrophenol	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	
BH 105	UMH	Phenol	Pentachlorophenol	0.009	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Phenol	Phenol	0.0077	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	2-Chloronaphthalene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	2-Methylnaphthalene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Naphthalene	0.002	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Acenaphthylene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Acenaphthene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Fluorene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Phenanthrene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Anthracene	0.0001	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Fluoranthene	0.0000063	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Pyrene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Benzo(a)anthracene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Chrysene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Benzo(a)pyrene	0.00001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Dibenzo(ah)anthracene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	PAH	Benzo(ghi)perylene	0.0001	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	
BH 105	UMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	-	<0.0015	-	-	-	-	-	-	-	-	
BH 105	UMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Phthalates	Diethyl phthalate	0.2	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Phthalates	Dimethyl phthalate	0.8	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	2-Nitroaniline	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	3-Nitroaniline	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	4-Chloroaniline	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	4-Nitroaniline	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	Azobenzene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	Carbazole	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	Dibenzofuran	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	Hexachloroethane	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	Isophorone	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	UMH	Other SVOCs	Nitrobenzene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH 105	CHK	Phenol	2-Chlorophenol	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Phenol	2-Methylphenol	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Phenol	2-Nitrophenol	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Phenol	2,4-Dimethylphenol	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Phenol	4-Methylphenol	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Phenol	4-Nitrophenol	-	<0.01	-	-	-	<0.01	-	-	-	-	-	-	-	-	
BH 105	CHK	Phenol	Pentachlorophenol	0.009	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Phenol	Phenol	0.0077	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	2-Chloronaphthalene	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	2-Methylnaphthalene	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Naphthalene	0.002	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Acenaphthylene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Acenaphthene	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Fluorene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Phenanthrene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Anthracene	0.0001	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Fluoranthene	0.0000063	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Pyrene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Benzo(a)anthracene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Chrysene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Benzo(a)pyrene	0.00001	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	-	-	<0.005	-	-	-	-	-	-	-	-	
BH 105	CHK	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	-	-	<0.0015	-	-	-	-	-	-	-	-	
BH 105	CHK	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Phthalates	Diethyl phthalate	0.2	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Phthalates	Dimethyl phthalate	0.8	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	2-Nitroaniline	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	3-Nitroaniline	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	4-Chloroaniline	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	4-Nitroaniline	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	Azobenzene	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	Carbazole	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	Dibenzofuran	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	Hexachloroethane	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	Isophorone	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 105	CHK	Other SVOCs	Nitrobenzene	-	<0.001	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 106	UMH	Phenol	2-Chlorophenol	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phenol	2-Methylphenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phenol	2-Nitrophenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phenol	2,4-Dimethylphenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phenol	4-Methylphenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phenol	4-Nitrophenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phenol	Pentachlorophenol	0.009	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phenol	Phenol	0.0077	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	2-Chloronaphthalene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	2-Methylnaphthalene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Naphthalene	0.002	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Acenaphthylene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Acenaphthene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Fluorene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Phenanthrene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Anthracene	0.0001	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Fluoranthene	0.0000063	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Pyrene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Benzo(a)anthracene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Chrysene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Benzo(a)pyrene	0.00001	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phthalates	Diethyl phthalate	0.2	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Phthalates	Dimethyl phthalate	0.8	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	2-Nitroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	3-Nitroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	4-Chloroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	4-Nitroaniline	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	Azobenzene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	Carbazole	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	Dibenzofuran	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	Hexachloroethane	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	Isophorone	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
BH 106	UMH	Other SVOCs	Nitrobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH 106	LMH	Phenol	2-Chlorophenol	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Phenol	2-Methylphenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	LMH	Phenol	2-Nitrophenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	LMH	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	LMH	Phenol	2,4-Dimethylphenol	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	LMH	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	LMH	Phenol	4-Methylphenol	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Phenol	4-Nitrophenol	-	<0.01	-	<0.01	-	<0.01	-	-	-	<0.01	-	-	-	-	
BH 106	LMH	Phenol	Pentachlorophenol	0.009	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Phenol	Phenol	0.0077	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	PAH	2-Chloronaphthalene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	PAH	2-Methylnaphthalene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	PAH	Naphthalene	0.002	<0.001	-	<0.001	-	<0.0005	-	-	-	<0.001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH 106	LMH	PAH	Acenaphthylene	-	<0.0005	-	<0.0005	-	<0.001	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 106	LMH	PAH	Acenaphthene	-	<0.001	-	<0.001	-	<0.0005	-	-	-	<0.001	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 106	LMH	PAH	Fluorene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000014	<0.000014	<0.000014	<0.000014	<0.000014
BH 106	LMH	PAH	Phenanthrene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 106	LMH	PAH	Anthracene	0.0001	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 106	LMH	PAH	Fluoranthene	0.0000063	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000012	<0.000012	<0.000012	<0.000012	<0.000012
BH 106	LMH	PAH	Pyrene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 106	LMH	PAH	Benzo(a)anthracene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
BH 106	LMH	PAH	Chrysene	-	<0.0005	-	<0.0005	-	<0.001	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 106	LMH	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000018	<0.000018	<0.000018	<0.000018	<0.000018
BH 106	LMH	PAH	Benzo(a)pyrene	0.00001	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000016	<0.000016	<0.000016	<0.000016	<0.000016
BH 106	LMH	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	<0.001	-	<0.0005	-	-	-	<0.001	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 106	LMH	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
BH 106	LMH	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 106	LMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	<0.005	-	<0.005	-	-	-	<0.005	-	-	-	-	
BH 106	LMH	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	<0.0015	-	<0.0015	-	-	-	<0.0015	-	-	-	-	
BH 106	LMH	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Phthalates	Diethyl phthalate	0.2	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Phthalates	Dimethyl phthalate	0.8	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	2-Nitroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	LMH	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	3-Nitroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	4-Chloroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	4-Nitroaniline	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	LMH	Other SVOCs	Azobenzene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	LMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	LMH	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	Carbazole	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	LMH	Other SVOCs	Dibenzofuran	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	LMH	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	Hexachloroethane	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	LMH	Other SVOCs	Isophorone	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	LMH	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	LMH	Other SVOCs	Nitrobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Phenol	2-Chlorophenol	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Phenol	2-Methylphenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	CHK	Phenol	2-Nitrophenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	CHK	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	CHK	Phenol	2,4-Dimethylphenol	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	CHK	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	CHK	Phenol	4-Methylphenol	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Phenol	4-Nitrophenol	-	<0.01	-	<0.01	-	<0.01	-	-	-	<0.01	-	-	-	-	
BH 106	CHK	Phenol	Pentachlorophenol	0.009	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Phenol	Phenol	0.0077	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	PAH	2-Chloronaphthalene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	PAH	2-Methylnaphthalene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	PAH	Naphthalene	0.002	<0.001	-	<0.001	-	<0.001	-	-	-	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH 106	CHK	PAH	Acenaphthylene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 106	CHK	PAH	Acenaphthene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 106	CHK	PAH	Fluorene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000014	<0.000014	<0.000014	<0.000014	<0.000014
BH 106	CHK	PAH	Phenanthrene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 106	CHK	PAH	Anthracene	0.0001	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 106	CHK	PAH	Fluoranthene	0.0000063	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000012	<0.000012	<0.000012	<0.000012	<0.000012
BH 106	CHK	PAH	Pyrene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH 106	CHK	PAH	Benzo(a)anthracene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
BH 106	CHK	PAH	Chrysene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 106	CHK	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000018	<0.000018	<0.000018	<0.000018	<0.000018
BH 106	CHK	PAH	Benzo(a)pyrene	0.00001	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000016	<0.000016	<0.000016	<0.000016	<0.000016
BH 106	CHK	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 106	CHK	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
BH 106	CHK	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
BH 106	CHK	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	<0.005	-	<0.005	-	-	-	<0.005	-	-	-	-	
BH 106	CHK	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	<0.0015	-	<0.0015	-	-	-	<0.0015	-	-	-	-	
BH 106	CHK	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Phthalates	Diethyl phthalate	0.2	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Phthalates	Dimethyl phthalate	0.8	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	2-Nitroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	CHK	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	3-Nitroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	4-Chloroaniline	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	4-Nitroaniline	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	CHK	Other SVOCs	Azobenzene	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	CHK	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	CHK	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	Carbazole	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	CHK	Other SVOCs	Dibenzofuran	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	CHK	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	Hexachloroethane	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH 106	CHK	Other SVOCs	Isophorone	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	CHK	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH 106	CHK	Other SVOCs	Nitrobenzene	-	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH 108	LMH	Phenol	2-Chlorophenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Phenol	2-Methylphenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Phenol	2-Nitrophenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Phenol	2,4-Dichlorophenol	0.14	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Phenol	2,4-Dimethylphenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Phenol	2,4,5-Trichlorophenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Phenol	2,4,6-Trichlorophenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Phenol	4-Chloro-3-methylphenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Phenol	4-Methylphenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Phenol	4-Nitrophenol	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	
BH 108	LMH	Phenol	Pentachlorophenol	0.009	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Phenol	Phenol	0.0077	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	2-Chloronaphthalene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	2-Methylnaphthalene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Naphthalene	0.002	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Acenaphthylene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Acenaphthene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Fluorene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Phenanthrene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Anthracene	0.0001	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Fluoranthene	0.0000063	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Pyrene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Benzo(a)anthracene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Chrysene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Benzo(a)pyrene	0.00001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Dibenzo(ah)anthracene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	PAH	Benzo(ghi)perylene	0.0001	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	
BH 108	LMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	-	<0.0015	-	-	-	-	-	-	-	-	
BH 108	LMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Phthalates	Diethyl phthalate	0.2	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Phthalates	Dimethyl phthalate	0.8	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	2-Nitroaniline	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	3-Nitroaniline	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	4-Chloroaniline	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	4-Nitroaniline	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	Azobenzene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	Carbazole	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	Dibenzofuran	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	Hexachloroethane	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	Isophorone	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	LMH	Other SVOCs	Nitrobenzene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Phenol	2-Chlorophenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Phenol	2-Methylphenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Phenol	2-Nitrophenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Phenol	2,4-Dichlorophenol	0.14	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Phenol	2,4-Dimethylphenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Phenol	2,4,5-Trichlorophenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Phenol	2,4,6-Trichlorophenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Phenol	4-Chloro-3-methylphenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Phenol	4-Methylphenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Phenol	4-Nitrophenol	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	
BH 108	CHK	Phenol	Pentachlorophenol	0.009	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Phenol	Phenol	0.0077	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	2-Chloronaphthalene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	2-Methylnaphthalene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Naphthalene	0.002	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Acenaphthylene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Acenaphthene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Fluorene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Phenanthrene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Anthracene	0.0001	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Fluoranthene	0.0000063	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Pyrene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Benzo(a)anthracene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Chrysene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Benzo(a)pyrene	0.00001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Dibenzo(ah)anthracene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	PAH	Benzo(ghi)perylene	0.0001	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	
BH 108	CHK	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	-	<0.0015	-	-	-	-	-	-	-	-	
BH 108	CHK	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Phthalates	Diethyl phthalate	0.2	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Phthalates	Dimethyl phthalate	0.8	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	2-Nitroaniline	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	3-Nitroaniline	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	4-Chloroaniline	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	4-Nitroaniline	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	Azobenzene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	Carbazole	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	Dibenzofuran	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	Hexachloroethane	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	Isophorone	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
BH 108	CHK	Other SVOCs	Nitrobenzene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
FT101	UMH	Phenol	2-Chlorophenol	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phenol	2-Methylphenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phenol	2-Nitrophenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phenol	2,4-Dimethylphenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phenol	4-Methylphenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phenol	4-Nitrophenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phenol	Pentachlorophenol	0.009	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phenol	Phenol	0.0077	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	2-Chloronaphthalene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	2-Methylnaphthalene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Naphthalene	0.002	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Acenaphthylene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Acenaphthene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Fluorene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Phenanthrene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Anthracene	0.0001	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Fluoranthene	0.0000063	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Pyrene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Benzo(a)anthracene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Chrysene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Benzo(a)pyrene	0.00001	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phthalates	Diethyl phthalate	0.2	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Phthalates	Dimethyl phthalate	0.8	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	2-Nitroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	3-Nitroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	4-Chloroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	4-Nitroaniline	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	Azobenzene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	Carbazole	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	Dibenzofuran	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	Hexachloroethane	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	Isophorone	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT101	UMH	Other SVOCs	Nitrobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phenol	2-Chlorophenol	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phenol	2-Methylphenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phenol	2-Nitrophenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phenol	2,4-Dimethylphenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phenol	4-Methylphenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phenol	4-Nitrophenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phenol	Pentachlorophenol	0.009	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phenol	Phenol	0.0077	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	2-Chloronaphthalene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	2-Methylnaphthalene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Naphthalene	0.002	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Acenaphthylene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Acenaphthene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Fluorene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Phenanthrene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Anthracene	0.0001	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Fluoranthene	0.0000063	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Pyrene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Benzo(a)anthracene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Chrysene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Benzo(a)pyrene	0.00001	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phthalates	Diethyl phthalate	0.2	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Phthalates	Dimethyl phthalate	0.8	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	2-Nitroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	3-Nitroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	4-Chloroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	4-Nitroaniline	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	Azobenzene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	Carbazole	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	Dibenzofuran	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	Hexachloroethane	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	Isophorone	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT102	UMH	Other SVOCs	Nitrobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
FT103	UMH	Phenol	2-Chlorophenol	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phenol	2-Methylphenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phenol	2-Nitrophenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phenol	2,4-Dichlorophenol	0.14	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phenol	2,4-Dimethylphenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phenol	2,4,5-Trichlorophenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phenol	2,4,6-Trichlorophenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phenol	4-Chloro-3-methylphenol	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phenol	4-Methylphenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phenol	4-Nitrophenol	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phenol	Pentachlorophenol	0.009	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phenol	Phenol	0.0077	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	2-Chloronaphthalene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	2-Methylnaphthalene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Naphthalene	0.002	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Acenaphthylene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Acenaphthene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Fluorene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Phenanthrene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Anthracene	0.0001	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Fluoranthene	0.0000063	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Pyrene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Benzo(a)anthracene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Chrysene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Benzo(bk)fluoranthene	0.0001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Benzo(a)pyrene	0.00001	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Indeno(123cd)pyrene	0.0001	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Dibenzo(ah)anthracene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	PAH	Benzo(ghi)perylene	0.0001	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phthalates	Butylbenzyl phthalate	0.02	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phthalates	Di-n-butyl phthalate	0.008	<0.0015	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phthalates	Di-n-Octyl phthalate	0.02	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phthalates	Diethyl phthalate	0.2	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Phthalates	Dimethyl phthalate	0.8	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	1,3-Dichlorobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	2-Nitroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	2,4-Dinitrotoluene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	2,6-Dinitrotoluene	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	3-Nitroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	4-Bromophenylphenylether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	4-Chloroaniline	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	4-Chlorophenylphenylether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	4-Nitroaniline	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	Azobenzene	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	Carbazole	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	Dibenzofuran	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	Hexachlorobenzene	0.00001	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	Hexachloroethane	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	Isophorone	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	<0.0005	-	-	-	-	-	-	-	-	-	-	-	-	
FT103	UMH	Other SVOCs	Nitrobenzene	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phenol	2-Chlorophenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phenol	2-Methylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phenol	2-Nitrophenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phenol	2,4-Dichlorophenol	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phenol	2,4-Dimethylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phenol	2,4,5-Trichlorophenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phenol	2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phenol	4-Chloro-3-methylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phenol	4-Methylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phenol	4-Nitrophenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phenol	Pentachlorophenol	0.009	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phenol	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	PAH	2-Chloronaphthalene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	PAH	2-Methylnaphthalene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	PAH	Naphthalene	0.002	-	-	-	-	-	-	-	-	-	<0.0001	-	<0.0001	<0.0001	<0.0001
BH-A	UMH	PAH	Acenaphthylene	-	-	-	-	-	-	-	-	-	-	<0.000013	-	<0.000013	<0.000013	<0.000013
BH-A	UMH	PAH	Acenaphthene	-	-	-	-	-	-	-	-	-	-	<0.000013	-	<0.000013	<0.000013	<0.000013
BH-A	UMH	PAH	Fluorene	-	-	-	-	-	-	-	-	-	-	<0.000014	-	<0.000014	<0.000014	<0.000014
BH-A	UMH	PAH	Phenanthrene	-	-	-	-	-	-	-	-	-	-	<0.000011	-	<0.000011	<0.000011	<0.000011
BH-A	UMH	PAH	Anthracene	0.0001	-	-	-	-	-	-	-	-	-	<0.000013	-	<0.000013	<0.000013	<0.000013
BH-A	UMH	PAH	Fluoranthene	0.0000063	-	-	-	-	-	-	-	-	-	<0.000012	-	<0.000012	<0.000012	<0.000012
BH-A	UMH	PAH	Pyrene	-	-	-	-	-	-	-	-	-	-	<0.000013	-	<0.000013	<0.000013	<0.000013
BH-A	UMH	PAH	Benzo(a)anthracene	-	-	-	-	-	-	-	-	-	-	<0.000015	-	<0.000015	<0.000015	<0.000015
BH-A	UMH	PAH	Chrysene	-	-	-	-	-	-	-	-	-	-	<0.000011	-	<0.000011	<0.000011	<0.000011
BH-A	UMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	-	-	-	-	-	-	<0.000018	-	<0.000018	<0.000018	<0.000018
BH-A	UMH	PAH	Benzo(a)pyrene	0.00001	-	-	-	-	-	-	-	-	-	<0.000016	-	<0.000016	<0.000016	<0.000016
BH-A	UMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	-	-	-	-	-	-	<0.000011	-	<0.000011	<0.000011	<0.000011
BH-A	UMH	PAH	Dibenzo(ah)anthracene	-	-	-	-	-	-	-	-	-	-	<0.00001	-	<0.00001	<0.00001	<0.00001
BH-A	UMH	PAH	Benzo(ghi)perylene	0.0001	-	-	-	-	-	-	-	-	-	<0.000011	-	<0.000011	<0.000011	<0.000011
BH-A	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phthalates	Diethyl phthalate	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Phthalates	Dimethyl phthalate	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	2-Nitroaniline	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	3-Nitroaniline	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	4-Chloroaniline	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	4-Nitroaniline	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	Azobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	Carbazole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	Dibenzofuran	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	Hexachloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	Isophorone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH-A	UMH	Other SVOCs	Nitrobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH-E	UMH	Phenol	2-Chlorophenol	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Phenol	2-Methylphenol	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH-E	UMH	Phenol	2-Nitrophenol	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH-E	UMH	Phenol	2,4-Dichlorophenol	0.14	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH-E	UMH	Phenol	2,4-Dimethylphenol	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Phenol	2,4,5-Trichlorophenol	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH-E	UMH	Phenol	2,4,6-Trichlorophenol	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Phenol	4-Chloro-3-methylphenol	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH-E	UMH	Phenol	4-Methylphenol	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Phenol	4-Nitrophenol	-	-	-	<0.01	-	<0.01	-	-	-	<0.01	-	-	-	-	
BH-E	UMH	Phenol	Pentachlorophenol	0.009	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Phenol	Phenol	0.0077	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	PAH	2-Chloronaphthalene	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	PAH	2-Methylnaphthalene	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	PAH	Naphthalene	0.002	-	-	<0.001	-	<0.001	-	-	-	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BH-E	UMH	PAH	Acenaphthylene	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	0.000019
BH-E	UMH	PAH	Acenaphthene	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
BH-E	UMH	PAH	Fluorene	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000014	<0.000014	<0.000014	<0.000014	0.000014
BH-E	UMH	PAH	Phenanthrene	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	0.00006
BH-E	UMH	PAH	Anthracene	0.0001	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000013	<0.000013	<0.000013	<0.000013	0.00002
BH-E	UMH	PAH	Fluoranthene	0.0000063	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000012	<0.000012	<0.000012	<0.000012	0.000045
BH-E	UMH	PAH	Pyrene	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	0.000018	<0.000013	<0.000013	<0.000013	0.000067
BH-E	UMH	PAH	Benzo(a)anthracene	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000015	<0.000015	<0.000015	<0.000015	0.000031
BH-E	UMH	PAH	Chrysene	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	0.000034
BH-E	UMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000018	<0.000018	<0.000018	<0.000018	0.000039
BH-E	UMH	PAH	Benzo(a)pyrene	0.00001	-	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000016	<0.000016	<0.000016	<0.000016	0.000022
BH-E	UMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	<0.001	-	<0.001	-	-	-	<0.001	<0.000011	<0.000011	<0.000011	<0.000011	0.000015
BH-E	UMH	PAH	Dibenzo(ah)anthracene	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
BH-E	UMH	PAH	Benzo(ghi)perylene	0.0001	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	<0.000011	<0.000011	<0.000011	<0.000011	0.000015
BH-E	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	<0.005	-	<0.005	-	-	-	<0.005	-	-	-	-	
BH-E	UMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	<0.0015	-	<0.0015	-	-	-	<0.0015	-	-	-	-	
BH-E	UMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Phthalates	Diethyl phthalate	0.2	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Phthalates	Dimethyl phthalate	0.8	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	2-Nitroaniline	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH-E	UMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	3-Nitroaniline	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	4-Chloroaniline	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	4-Nitroaniline	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH-E	UMH	Other SVOCs	Azobenzene	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH-E	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH-E	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	Carbazole	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH-E	UMH	Other SVOCs	Dibenzofuran	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH-E	UMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	Hexachloroethane	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-E	UMH	Other SVOCs	Isophorone	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH-E	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005	-	-	-	-	
BH-E	UMH	Other SVOCs	Nitrobenzene	-	-	-	<0.001	-	<0.001	-	-	-	<0.001	-	-	-	-	
BH-K	UMH	Phenol	2-Chlorophenol	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phenol	2-Methylphenol	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phenol	2-Nitrophenol	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phenol	2,4-Dichlorophenol	0.14	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phenol	2,4-Dimethylphenol	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phenol	2,4,5-Trichlorophenol	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phenol	2,4,6-Trichlorophenol	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phenol	4-Chloro-3-methylphenol	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phenol	4-Methylphenol	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phenol	4-Nitrophenol	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phenol	Pentachlorophenol	0.009	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phenol	Phenol	0.0077	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	2-Chloronaphthalene	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	2-Methylnaphthalene	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Naphthalene	0.002	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Acenaphthylene	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Acenaphthene	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Fluorene	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Phenanthrene	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Anthracene	0.0001	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Fluoranthene	0.0000063	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Pyrene	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Benzo(a)anthracene	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Chrysene	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Benzo(a)pyrene	0.00001	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Dibenzo(ah)anthracene	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	PAH	Benzo(ghi)perylene	0.0001	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	<0.0015	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phthalates	Diethyl phthalate	0.2	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Phthalates	Dimethyl phthalate	0.8	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	2-Nitroaniline	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	3-Nitroaniline	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	4-Chloroaniline	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	4-Nitroaniline	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	Azobenzene	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	Carbazole	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	Dibenzofuran	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	Hexachloroethane	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	Isophorone	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	
BH-K	UMH	Other SVOCs	Nitrobenzene	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH301	LMH	Phenol	2-Chlorophenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phenol	2-Methylphenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phenol	2-Nitrophenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phenol	2,4-Dichlorophenol	0.14	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phenol	2,4-Dimethylphenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phenol	2,4,5-Trichlorophenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phenol	2,4,6-Trichlorophenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phenol	4-Chloro-3-methylphenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phenol	4-Methylphenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phenol	4-Nitrophenol	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phenol	Pentachlorophenol	0.009	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phenol	Phenol	0.0077	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	2-Chloronaphthalene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	2-Methylnaphthalene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Naphthalene	0.002	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Acenaphthylene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Acenaphthene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Fluorene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Phenanthrene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Anthracene	0.0001	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Fluoranthene	0.0000063	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Pyrene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Benzo(a)anthracene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Chrysene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Benzo(a)pyrene	0.00001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Dibenzo(ah)anthracene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	PAH	Benzo(ghi)perylene	0.0001	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	<0.0015	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phthalates	Diethyl phthalate	0.2	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Phthalates	Dimethyl phthalate	0.8	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	2-Nitroaniline	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	3-Nitroaniline	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	4-Chloroaniline	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	4-Nitroaniline	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	Azobenzene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	Carbazole	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	Dibenzofuran	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	Hexachloroethane	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	Isophorone	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	LMH	Other SVOCs	Nitrobenzene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phenol	2-Chlorophenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phenol	2-Methylphenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phenol	2-Nitrophenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phenol	2,4-Dichlorophenol	0.14	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phenol	2,4-Dimethylphenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phenol	2,4,5-Trichlorophenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phenol	2,4,6-Trichlorophenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phenol	4-Chloro-3-methylphenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phenol	4-Methylphenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phenol	4-Nitrophenol	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phenol	Pentachlorophenol	0.009	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phenol	Phenol	0.0077	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	2-Chloronaphthalene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	2-Methylnaphthalene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Naphthalene	0.002	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Acenaphthylene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Acenaphthene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Fluorene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Phenanthrene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Anthracene	0.0001	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Fluoranthene	0.0000063	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Pyrene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Benzo(a)anthracene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Chrysene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Benzo(a)pyrene	0.00001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Dibenzo(ah)anthracene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	PAH	Benzo(ghi)perylene	0.0001	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	<0.0015	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phthalates	Diethyl phthalate	0.2	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Phthalates	Dimethyl phthalate	0.8	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	2-Nitroaniline	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	3-Nitroaniline	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	4-Chloroaniline	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	4-Nitroaniline	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	Azobenzene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	Carbazole	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	Dibenzofuran	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	Hexachloroethane	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	Isophorone	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH301	CHK	Other SVOCs	Nitrobenzene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH302	LMH	Phenol	2-Chlorophenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Phenol	2-Methylphenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Phenol	2-Nitrophenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Phenol	2,4-Dichlorophenol	0.14	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Phenol	2,4-Dimethylphenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Phenol	2,4,5-Trichlorophenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Phenol	2,4,6-Trichlorophenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Phenol	4-Chloro-3-methylphenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Phenol	4-Methylphenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Phenol	4-Nitrophenol	-	-	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	
BH302	LMH	Phenol	Pentachlorophenol	0.009	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Phenol	Phenol	0.0077	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	PAH	2-Chloronaphthalene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	PAH	2-Methylnaphthalene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	PAH	Naphthalene	0.002	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	PAH	Acenaphthylene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	PAH	Acenaphthene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	PAH	Fluorene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	PAH	Phenanthrene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	PAH	Anthracene	0.0001	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	PAH	Fluoranthene	0.0000063	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	PAH	Pyrene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	PAH	Benzo(a)anthracene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	PAH	Chrysene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	PAH	Benzo(a)pyrene	0.00001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	PAH	Dibenzo(ah)anthracene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	PAH	Benzo(ghi)perylene	0.0001	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	
BH302	LMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	<0.0015	-	-	-	<0.0015	-	-	-	-	-	
BH302	LMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Phthalates	Diethyl phthalate	0.2	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Phthalates	Dimethyl phthalate	0.8	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	2-Nitroaniline	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	3-Nitroaniline	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	4-Chloroaniline	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	4-Nitroaniline	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Other SVOCs	Azobenzene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	Carbazole	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Other SVOCs	Dibenzofuran	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	Hexachloroethane	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	LMH	Other SVOCs	Isophorone	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	LMH	Other SVOCs	Nitrobenzene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Phenol	2-Chlorophenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Phenol	2-Methylphenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Phenol	2-Nitrophenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Phenol	2,4-Dichlorophenol	0.14	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Phenol	2,4-Dimethylphenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Phenol	2,4,5-Trichlorophenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Phenol	2,4,6-Trichlorophenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Phenol	4-Chloro-3-methylphenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Phenol	4-Methylphenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Phenol	4-Nitrophenol	-	-	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	
BH302	CHK	Phenol	Pentachlorophenol	0.009	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Phenol	Phenol	0.0077	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	PAH	2-Chloronaphthalene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	PAH	2-Methylnaphthalene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	PAH	Naphthalene	0.002	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	PAH	Acenaphthylene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	PAH	Acenaphthene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	PAH	Fluorene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	PAH	Phenanthrene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	PAH	Anthracene	0.0001	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	PAH	Fluoranthene	0.0000063	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	PAH	Pyrene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	PAH	Benzo(a)anthracene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	PAH	Chrysene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	PAH	Benzo(a)pyrene	0.00001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	PAH	Dibenzo(ah)anthracene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	PAH	Benzo(ghi)perylene	0.0001	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	
BH302	CHK	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	<0.0015	-	-	-	<0.0015	-	-	-	-	-	
BH302	CHK	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Phthalates	Diethyl phthalate	0.2	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Phthalates	Dimethyl phthalate	0.8	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	2-Nitroaniline	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	3-Nitroaniline	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	4-Chloroaniline	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	4-Nitroaniline	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Other SVOCs	Azobenzene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	Carbazole	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Other SVOCs	Dibenzofuran	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	Hexachloroethane	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH302	CHK	Other SVOCs	Isophorone	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH302	CHK	Other SVOCs	Nitrobenzene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH305	LMH	Phenol	2-Chlorophenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Phenol	2-Methylphenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Phenol	2-Nitrophenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Phenol	2,4-Dichlorophenol	0.14	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Phenol	2,4-Dimethylphenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Phenol	2,4,5-Trichlorophenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Phenol	2,4,6-Trichlorophenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Phenol	4-Chloro-3-methylphenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Phenol	4-Methylphenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Phenol	4-Nitrophenol	-	-	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	
BH305	LMH	Phenol	Pentachlorophenol	0.009	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Phenol	Phenol	0.0077	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	PAH	2-Chloronaphthalene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	PAH	2-Methylnaphthalene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	PAH	Naphthalene	0.002	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	PAH	Acenaphthylene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	PAH	Acenaphthene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	PAH	Fluorene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	PAH	Phenanthrene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	PAH	Anthracene	0.0001	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	PAH	Fluoranthene	0.0000063	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	PAH	Pyrene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	PAH	Benzo(a)anthracene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	PAH	Chrysene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	PAH	Benzo(a)pyrene	0.00001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	PAH	Dibenzo(ah)anthracene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	PAH	Benzo(ghi)perylene	0.0001	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	
BH305	LMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	<0.0015	-	-	-	<0.0015	-	-	-	-	-	
BH305	LMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Phthalates	Diethyl phthalate	0.2	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Phthalates	Dimethyl phthalate	0.8	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	2-Nitroaniline	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	3-Nitroaniline	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	4-Chloroaniline	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	4-Nitroaniline	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Other SVOCs	Azobenzene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	Carbazole	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Other SVOCs	Dibenzofuran	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	Hexachloroethane	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	LMH	Other SVOCs	Isophorone	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	LMH	Other SVOCs	Nitrobenzene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Phenol	2-Chlorophenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Phenol	2-Methylphenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Phenol	2-Nitrophenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Phenol	2,4-Dichlorophenol	0.14	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Phenol	2,4-Dimethylphenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Phenol	2,4,5-Trichlorophenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Phenol	2,4,6-Trichlorophenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Phenol	4-Chloro-3-methylphenol	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Phenol	4-Methylphenol	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Phenol	4-Nitrophenol	-	-	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	
BH305	CHK	Phenol	Pentachlorophenol	0.009	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Phenol	Phenol	0.0077	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	PAH	2-Chloronaphthalene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	PAH	2-Methylnaphthalene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	PAH	Naphthalene	0.002	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	PAH	Acenaphthylene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	PAH	Acenaphthene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	PAH	Fluorene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	PAH	Phenanthrene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	PAH	Anthracene	0.0001	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	PAH	Fluoranthene	0.0000063	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	PAH	Pyrene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	PAH	Benzo(a)anthracene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	PAH	Chrysene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	PAH	Benzo(a)pyrene	0.00001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	PAH	Dibenzo(ah)anthracene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	PAH	Benzo(ghi)perylene	0.0001	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	
BH305	CHK	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	<0.0015	-	-	-	<0.0015	-	-	-	-	-	
BH305	CHK	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Phthalates	Diethyl phthalate	0.2	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Phthalates	Dimethyl phthalate	0.8	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	2-Nitroaniline	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	3-Nitroaniline	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	4-Chloroaniline	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	4-Nitroaniline	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Other SVOCs	Azobenzene	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	Carbazole	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Other SVOCs	Dibenzofuran	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	Hexachloroethane	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	
BH305	CHK	Other SVOCs	Isophorone	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	-	-	
BH305	CHK	Other SVOCs	Nitrobenzene	-	-	-	-	<0.001	-	-	-	<0.001	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
BH306	UMH	Phenol	2-Chlorophenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phenol	2-Methylphenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phenol	2-Nitrophenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phenol	2,4-Dichlorophenol	0.14	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phenol	2,4-Dimethylphenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phenol	2,4,5-Trichlorophenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phenol	2,4,6-Trichlorophenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phenol	4-Chloro-3-methylphenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phenol	4-Methylphenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phenol	4-Nitrophenol	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phenol	Pentachlorophenol	0.009	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phenol	Phenol	0.0077	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	2-Chloronaphthalene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	2-Methylnaphthalene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Naphthalene	0.002	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Acenaphthylene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Acenaphthene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Fluorene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Phenanthrene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Anthracene	0.0001	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Fluoranthene	0.0000063	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Pyrene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Benzo(a)anthracene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Chrysene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Benzo(a)pyrene	0.00001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Dibenzo(ah)anthracene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	PAH	Benzo(ghi)perylene	0.0001	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	<0.0015	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phthalates	Diethyl phthalate	0.2	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Phthalates	Dimethyl phthalate	0.8	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	2-Nitroaniline	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	3-Nitroaniline	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	4-Chloroaniline	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	4-Nitroaniline	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	Azobenzene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	Carbazole	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	Dibenzofuran	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	Hexachloroethane	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	Isophorone	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH306	UMH	Other SVOCs	Nitrobenzene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phenol	2-Chlorophenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phenol	2-Methylphenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phenol	2-Nitrophenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phenol	2,4-Dichlorophenol	0.14	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phenol	2,4-Dimethylphenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phenol	2,4,5-Trichlorophenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phenol	2,4,6-Trichlorophenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phenol	4-Chloro-3-methylphenol	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phenol	4-Methylphenol	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phenol	4-Nitrophenol	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phenol	Pentachlorophenol	0.009	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phenol	Phenol	0.0077	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	2-Chloronaphthalene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	2-Methylnaphthalene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Naphthalene	0.002	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Acenaphthylene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Acenaphthene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Fluorene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Phenanthrene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Anthracene	0.0001	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Fluoranthene	0.0000063	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Pyrene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Benzo(a)anthracene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Chrysene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Benzo(a)pyrene	0.00001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Dibenzo(ah)anthracene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	PAH	Benzo(ghi)perylene	0.0001	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	<0.0015	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phthalates	Diethyl phthalate	0.2	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Phthalates	Dimethyl phthalate	0.8	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	2-Nitroaniline	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	3-Nitroaniline	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	4-Chloroaniline	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	4-Nitroaniline	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	Azobenzene	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	Carbazole	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	Dibenzofuran	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	Hexachloroethane	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	Isophorone	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	
BH307	UMH	Other SVOCs	Nitrobenzene	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
GMW103	UMH	Phenol	2-Chlorophenol	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Phenol	2-Methylphenol	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Phenol	2-Nitrophenol	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Phenol	2,4-Dichlorophenol	0.14	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Phenol	2,4-Dimethylphenol	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Phenol	2,4,5-Trichlorophenol	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Phenol	2,4,6-Trichlorophenol	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Phenol	4-Chloro-3-methylphenol	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Phenol	4-Methylphenol	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Phenol	4-Nitrophenol	-	-	-	-	-	<0.01	-	-	<0.01	-	-	-	-	-	
GMW103	UMH	Phenol	Pentachlorophenol	0.009	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Phenol	Phenol	0.0077	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	PAH	2-Chloronaphthalene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	PAH	2-Methylnaphthalene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	PAH	Naphthalene	0.002	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	PAH	Acenaphthylene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	PAH	Acenaphthene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	PAH	Fluorene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	PAH	Phenanthrene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	PAH	Anthracene	0.0001	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	PAH	Fluoranthene	0.0000063	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	PAH	Pyrene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	PAH	Benzo(a)anthracene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	PAH	Chrysene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	PAH	Benzo(a)pyrene	0.00001	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	PAH	Dibenzo(ah)anthracene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	PAH	Benzo(ghi)perylene	0.0001	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	-	<0.005	-	-	<0.005	-	-	-	-	-	
GMW103	UMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	-	<0.0015	-	-	<0.0015	-	-	-	-	-	
GMW103	UMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Phthalates	Diethyl phthalate	0.2	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Phthalates	Dimethyl phthalate	0.8	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	2-Nitroaniline	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	3-Nitroaniline	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	4-Chloroaniline	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	4-Nitroaniline	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Other SVOCs	Azobenzene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	Carbazole	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Other SVOCs	Dibenzofuran	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	Hexachloroethane	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	UMH	Other SVOCs	Isophorone	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	UMH	Other SVOCs	Nitrobenzene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Phenol	2-Chlorophenol	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Phenol	2-Methylphenol	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Phenol	2-Nitrophenol	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Phenol	2,4-Dichlorophenol	0.14	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Phenol	2,4-Dimethylphenol	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Phenol	2,4,5-Trichlorophenol	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Phenol	2,4,6-Trichlorophenol	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Phenol	4-Chloro-3-methylphenol	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Phenol	4-Methylphenol	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Phenol	4-Nitrophenol	-	-	-	-	-	<0.01	-	-	<0.01	-	-	-	-	-	
GMW103	LMH	Phenol	Pentachlorophenol	0.009	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Phenol	Phenol	0.0077	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	PAH	2-Chloronaphthalene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	PAH	2-Methylnaphthalene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	PAH	Naphthalene	0.002	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	PAH	Acenaphthylene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	PAH	Acenaphthene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	PAH	Fluorene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	PAH	Phenanthrene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	PAH	Anthracene	0.0001	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	PAH	Fluoranthene	0.0000063	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	PAH	Pyrene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	PAH	Benzo(a)anthracene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	PAH	Chrysene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	PAH	Benzo(a)pyrene	0.00001	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	PAH	Dibenzo(ah)anthracene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	PAH	Benzo(ghi)perylene	0.0001	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	-	<0.005	-	-	<0.005	-	-	-	-	-	
GMW103	LMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	-	<0.0015	-	-	<0.0015	-	-	-	-	-	
GMW103	LMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Phthalates	Diethyl phthalate	0.2	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Phthalates	Dimethyl phthalate	0.8	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	2-Nitroaniline	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	3-Nitroaniline	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	4-Chloroaniline	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	4-Nitroaniline	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Other SVOCs	Azobenzene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	Carbazole	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Other SVOCs	Dibenzofuran	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	Hexachloroethane	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW103	LMH	Other SVOCs	Isophorone	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW103	LMH	Other SVOCs	Nitrobenzene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	

Hatfield Road Quarry
Groundwater Quality Data- SVOCs

Borehole	Aquifer	Analysis	Analysis2	WQS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19
GMW104	UMH	Phenol	2-Chlorophenol	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Phenol	2-Methylphenol	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Phenol	2-Nitrophenol	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Phenol	2,4-Dichlorophenol	0.14	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Phenol	2,4-Dimethylphenol	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Phenol	2,4,5-Trichlorophenol	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Phenol	2,4,6-Trichlorophenol	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Phenol	4-Chloro-3-methylphenol	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Phenol	4-Methylphenol	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Phenol	4-Nitrophenol	-	-	-	-	-	<0.01	-	-	<0.01	-	-	-	-	-	
GMW104	UMH	Phenol	Pentachlorophenol	0.009	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Phenol	Phenol	0.0077	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	PAH	2-Chloronaphthalene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	PAH	2-Methylnaphthalene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	PAH	Naphthalene	0.002	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	PAH	Acenaphthylene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	PAH	Acenaphthene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	PAH	Fluorene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	PAH	Phenanthrene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	PAH	Anthracene	0.0001	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	PAH	Fluoranthene	0.0000063	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	PAH	Pyrene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	PAH	Benzo(a)anthracene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	PAH	Chrysene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	PAH	Benzo(a)pyrene	0.00001	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	PAH	Dibenzo(ah)anthracene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	PAH	Benzo(ghi)perylene	0.0001	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	-	<0.005	-	-	<0.005	-	-	-	-	-	
GMW104	UMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	-	<0.0015	-	-	<0.0015	-	-	-	-	-	
GMW104	UMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Phthalates	Diethyl phthalate	0.2	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Phthalates	Dimethyl phthalate	0.8	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	2-Nitroaniline	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	3-Nitroaniline	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	4-Chloroaniline	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	4-Nitroaniline	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Other SVOCs	Azobenzene	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	Carbazole	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Other SVOCs	Dibenzofuran	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	Hexachloroethane	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW104	UMH	Other SVOCs	Isophorone	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	-	<0.0005	-	-	<0.0005	-	-	-	-	-	
GMW104	UMH	Other SVOCs	Nitrobenzene	-	-	-	-	-	<0.001	-	-	<0.001	-	-	-	-	-	
GMW105	UMH	Phenol	2-Chlorophenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Phenol	2-Methylphenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Phenol	2-Nitrophenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Phenol	2,4-Dichlorophenol	0.14	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Phenol	2,4-Dimethylphenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Phenol	2,4,5-Trichlorophenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Phenol	2,4,6-Trichlorophenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Phenol	4-Chloro-3-methylphenol	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Phenol	4-Methylphenol	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Phenol	4-Nitrophenol	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	
GMW105	UMH	Phenol	Pentachlorophenol	0.009	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Phenol	Phenol	0.0077	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	2-Chloronaphthalene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	2-Methylnaphthalene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Naphthalene	0.002	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Acenaphthylene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Acenaphthene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Fluorene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Phenanthrene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Anthracene	0.0001	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Fluoranthene	0.0000063	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Pyrene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Benzo(a)anthracene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Chrysene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Benzo(bk)fluoranthene	0.0001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Benzo(a)pyrene	0.00001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Indeno(123cd)pyrene	0.0001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Dibenzo(ah)anthracene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	PAH	Benzo(ghi)perylene	0.0001	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Phthalates	Bis(2-ethylhexyl) phthalate	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	
GMW105	UMH	Phthalates	Butylbenzyl phthalate	0.02	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Phthalates	Di-n-butyl phthalate	0.008	-	-	-	-	<0.0015	-	-	-	-	-	-	-	-	
GMW105	UMH	Phthalates	Di-n-Octyl phthalate	0.02	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Phthalates	Diethyl phthalate	0.2	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Phthalates	Dimethyl phthalate	0.8	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	1,2,4-Trichlorobenzene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	1,3-Dichlorobenzene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	1,4-Dichlorobenzene	0.3	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	2-Nitroaniline	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	2,4-Dinitrotoluene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	2,6-Dinitrotoluene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	3-Nitroaniline	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	4-Bromophenylphenylether	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	4-Chloroaniline	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	4-Chlorophenylphenylether	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	4-Nitroaniline	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	Azobenzene	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	Bis(2-chloroethoxy)methane	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	Bis(2-chloroethyl)ether	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	Carbazole	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	Dibenzofuran	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	Hexachlorobenzene	0.00001	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	Hexachlorobutadiene	0.0006	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	Hexachlorocyclopentadiene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	Hexachloroethane	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	Isophorone	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	N-nitrosodi-n-propylamine	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	
GMW105	UMH	Other SVOCs	Nitrobenzene	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	

PHENOLS

Hatfield Road Quarry
Groundwater Quality Data- Speciated Phenols

Borehole	Aquifer	Analysis	DWS / Freshwater	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH101	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-		
BH101	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-		
BH101	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-		
BH101	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-		
BH101	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-		
BH101	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-		
BH101	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-		
BH101	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-		
BH101	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-		
BH101	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-		
BH101	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-		
BH101	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH101	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH101	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	<0.01	<0.01	<0.01
BH101	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-	<0.0005	<0.0005	-		
BH101	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH101	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	<0.0005	<0.0005	-		
BH101	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	-	-	<0.0005	<0.0005	-		
BH101	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH101	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH101	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH101	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.005	<0.005	-		
BH101	CHK	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH101	CHK	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH101	CHK	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	<0.01		<0.01
BH101	CHK	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-	<0.0005	<0.0005	-		
BH101	CHK	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH101	CHK	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	<0.0005	<0.0005	-		
BH101	CHK	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	-	-	<0.0005	<0.0005	-		
BH101	CHK	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH101	CHK	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH101	CHK	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH101	CHK	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.005	<0.005	-		
BH102	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH102	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH102	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	<0.01	<0.01	<0.01
BH102	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-	<0.0005	<0.0005	-		
BH102	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH102	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	<0.0005	<0.0005	-		
BH102	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	-	-	<0.0005	<0.0005	-		
BH102	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH102	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH102	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH102	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.005	<0.005	-		
BH102	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	CHK	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	CHK	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	CHK	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	CHK	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	CHK	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	CHK	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	CHK	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	CHK	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	CHK	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	CHK	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH102	CHK	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH103	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.01	<0.01	DRY
BH103	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	<0.06	<0.06	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	<0.005	<0.005	-		
BH103	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.01	<0.01	<0.01
BH103	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	<0.06	<0.06	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.0005	<0.0005	-		
BH103	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	<0.005	<0.005	-		

Hatfield Road Quarry
Groundwater Quality Data- Speciated Phenols

Borehole	Aquifer	Analysis	DWS / Freshwater	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH103	CHK	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	<0.01	-	-	-	-	-	-	<0.0005	-		
BH103	CHK	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	<0.01	-	-	-	-	-	-	<0.0005	-		
BH103	CHK	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	<0.01	-	-	-	-	-	-	<0.0005	-		
BH103	CHK	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	-	<0.02	-	-	-	-	-	-	<0.0005	-		
BH103	CHK	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	<0.01	-	-	-	-	-	-	<0.0005	-		
BH103	CHK	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	-	<0.03	-	-	-	-	-	-	<0.0005	-		
BH103	CHK	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	<0.06	<0.06	-	<0.06	-	-	-	-	-	-	<0.0005	-		
BH103	CHK	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	<0.01	-	-	-	-	-	-	<0.0005	-		
BH103	CHK	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	<0.01	-	-	-	-	-	-	<0.0005	-		
BH103	CHK	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	<0.01	-	-	-	-	-	-	<0.0005	-		
BH103	CHK	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.01	-	-	-	-	-	-	<0.005	-		
BH104	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	<0.0005	<0.0005	-		
BH104	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	<0.0005	<0.0005	-		
BH104	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	<0.0005	<0.0005	<0.01	<0.01	<0.01
BH104	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	<0.02	-	-	<0.0005	<0.0005	-		
BH104	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	<0.0005	<0.0005	-		
BH104	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	<0.03	-	-	<0.0005	<0.0005	-		
BH104	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	<0.06	-	-	<0.0005	<0.0005	-		
BH104	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	<0.0005	<0.0005	-		
BH104	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	<0.0005	<0.0005	-		
BH104	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	<0.0005	<0.0005	-		
BH104	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	<0.005	<0.005	-		
BH104	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH104	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH104	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	<0.01	<0.01	<0.01
BH104	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.0005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-	<0.0005	<0.0005	-		
BH104	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH104	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.0005	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	<0.0005	<0.0005	-		
BH104	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	<0.0005	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	-	-	<0.0005	<0.0005	-		
BH104	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH104	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH104	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH104	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.005	<0.005	-		
BH104	CHK	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH104	CHK	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH104	CHK	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	<0.01	<0.01	<0.01
BH104	CHK	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.0005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-	<0.0005	<0.0005	-		
BH104	CHK	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH104	CHK	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.0005	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	<0.0005	<0.0005	-		
BH104	CHK	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	<0.0005	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	-	-	<0.0005	<0.0005	-		
BH104	CHK	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH104	CHK	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH104	CHK	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH104	CHK	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.005	<0.005	-		
BH105X	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105X	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105X	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105X	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105X	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105X	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105X	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105X	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105X	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105X	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105X	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	CHK	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	CHK	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	CHK	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	CHK	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	CHK	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	CHK	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	CHK	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	CHK	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	CHK	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	CHK	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH105	CHK	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH106	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH106	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH106	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH106	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH106	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH106	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH106	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH106	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH106	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH106	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH106	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

Hatfield Road Quarry
Groundwater Quality Data- Speciated Phenols

Borehole	Aquifer	Analysis	DWS / Freshwater	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH106	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH106	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH106	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	<0.01	<0.01	<0.01
BH106	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-	<0.0005	<0.0005	-		
BH106	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH106	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	<0.0005	<0.0005	-		
BH106	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	-	-	<0.0005	<0.0005	-		
BH106	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH106	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH106	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH106	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.005	<0.005	-		
BH106	CHK	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH106	CHK	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH106	CHK	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	<0.01	<0.01	<0.01
BH106	CHK	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-	<0.0005	<0.0005	-		
BH106	CHK	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH106	CHK	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	<0.0005	<0.0005	-		
BH106	CHK	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	-	-	<0.0005	<0.0005	-		
BH106	CHK	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH106	CHK	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH106	CHK	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-		
BH106	CHK	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.005	<0.005	-		
BH107	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	CHK	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	CHK	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	CHK	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	CHK	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	CHK	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	CHK	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	CHK	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	CHK	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	CHK	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	CHK	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH107	CHK	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	CHK	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	CHK	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	CHK	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	CHK	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	CHK	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	CHK	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	CHK	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	CHK	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	CHK	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	CHK	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH108	CHK	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

Hatfield Road Quarry
Groundwater Quality Data- Speciated Phenols

Borehole	Aquifer	Analysis	DWS / Freshwater	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH201 S	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 S	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 S	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 S	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 S	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 S	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 S	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 S	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 S	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 S	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 S	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 D	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 D	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 D	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 D	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 D	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 D	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 D	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 D	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 D	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 D	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH201 D	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BH301	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-		
BH301	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-		
BH301	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-		
BH301	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-		
BH301	CHALK	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	CHALK	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	CHALK	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	CHALK	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-		
BH301	CHALK	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	CHALK	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-		
BH301	CHALK	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-		
BH301	CHALK	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	CHALK	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	CHALK	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH301	CHALK	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-		
BH302	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-		
BH302	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-		
BH302	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-		
BH302	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-		
BH302	CHALK	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	CHALK	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	CHALK	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	CHALK	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-		
BH302	CHALK	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	CHALK	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-		
BH302	CHALK	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-		
BH302	CHALK	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	CHALK	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	CHALK	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH302	CHALK	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-		
BH305	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-		
BH305	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-		
BH305	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-		
BH305	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-		
BH305	CHALK	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	CHALK	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	CHALK	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	CHALK	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-		
BH305	CHALK	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	CHALK	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-		
BH305	CHALK	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-		
BH305	CHALK	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	CHALK	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	CHALK	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH305	CHALK	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-		

Hatfield Road Quarry
Groundwater Quality Data- Speciated Phenols

Borehole	Aquifer	Analysis	DWS / Freshwater	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH306	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH306	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH306	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH306	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-		
BH306	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH306	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-		
BH306	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-		
BH306	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH306	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH306	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH306	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-		
BH307	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH307	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH307	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH307	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-		
BH307	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH307	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-		
BH307	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-		
BH307	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH307	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH307	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BH307	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-		
GMW103	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-		
GMW103	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-		
GMW103	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-		
GMW103	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-		
GMW103 L	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103 L	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103 L	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103 L	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-		
GMW103 L	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103 L	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-		
GMW103 L	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-		
GMW103 L	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103 L	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103 L	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW103 L	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-		
GMW113	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW113	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW113	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW113	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-		
GMW113	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW113	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-		
GMW113	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-		
GMW113	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW113	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW113	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW113	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-		
GMW114	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW114	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW114	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW114	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-		
GMW114	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW114	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-		
GMW114	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-		
GMW114	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW114	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW114	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
GMW114	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-		
BHA	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	
BHA	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	
BHA	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.01	<0.01	<0.01
BHA	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	
BHA	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	
BHA	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	
BHA	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	
BHA	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	
BHA	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	
BHA	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	
BHA	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.005	<0.005	-	-	
BHB	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHB	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHB	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHB	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHB	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHB	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHB	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHB	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHB	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHB	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHB	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

Hatfield Road Quarry
Groundwater Quality Data- Speciated Phenols

Borehole	Aquifer	Analysis	DWS / Freshwater	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BHC	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHC	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHC	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHC	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHC	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHC	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHC	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHC	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHC	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHC	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHC	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHD	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHD	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHD	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHD	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHD	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHD	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHD	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHD	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHD	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHD	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHD	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHE	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-	-	
BHE	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-	-	
BHE	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	<0.01	<0.01	<0.01
BHE	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-	<0.0005	<0.0005	-	-	
BHE	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-	-	
BHE	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	<0.0005	<0.0005	-	-	
BHE	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	-	-	<0.0005	<0.0005	-	-	
BHE	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-	-	
BHE	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-	-	
BHE	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.0005	<0.0005	-	-	
BHE	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.005	<0.005	-	-	
BHF	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BHF	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BHF	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BHF	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-		
BHF	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BHF	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-		
BHF	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-		
BHF	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BHF	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BHF	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-		
BHF	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-		
BHG	LMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHG	LMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHG	LMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHG	LMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHG	LMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHG	LMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHG	LMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHG	LMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHG	LMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHG	LMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHG	LMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHH	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHH	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHH	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHH	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHH	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHH	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHH	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHH	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHH	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHH	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHH	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHJ	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-		
BHJ	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-		
BHJ	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-		
BHJ	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-		
BHJ	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-		
BHJ	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	-	-	-	-	-	-	-	-	-	-	-		
BHJ	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	-	-	-	-	-	-	-	-	-	-	-		
BHJ	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-		
BHJ	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-		
BHJ	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-		
BHJ	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-		
BHK	UMH	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHK	UMH	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHK	UMH	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHK	UMH	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHK	UMH	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHK	UMH	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHK	UMH	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHK	UMH	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHK	UMH	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHK	UMH	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-		
BHK	UMH	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-		

Hatfield Road Quarry
Groundwater Quality Data- Speciated Phenols

Borehole	Aquifer	Analysis	DWS / Freshwater	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
SW11	SW	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	<0.0005	-		
SW11	SW	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	<0.0005	-		
SW11	SW	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	-		<0.01
SW11	SW	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	-		
SW11	SW	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	-		
SW11	SW	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	-		
SW11	SW	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	-		
SW11	SW	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	-		
SW11	SW	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	-		
SW11	SW	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	-		
SW11	SW	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.005	-		

PESTICIDES

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 101	UMH	OPP	Azinphos ethyl	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Azinphos methyl	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Carbophenothion	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Chlorpyrifos-methyl	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Diazinon	1.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Dichlorvos	7.0E-07	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Dimethoate	6.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Ethion	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Etrimphos	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Fenitrothion	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Fenthion	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Malathion	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Methyl Parathion	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Mevinphos	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Phosalone	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Propetamphos	3.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OPP	Triazophos	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Aldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Alpha-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Beta-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Chlorothalonil	1.0E-04	<0.00001	-	-	-	-	-	-	-	<0.00250
BH 101	UMH	OCP	cis-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Dieldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Endosulphan I	1.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Endosulphan II	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Endosulphan sulphate	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Endrin	6.0E-04	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Gamma-BHC	2.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Heptachlor	3.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Isodrin	1.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	o,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	o,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	o,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	o,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	p,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	p,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	p,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	p,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Pendimethalin	2.0E-02	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Permethrin I	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Permethrin II	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Quintozene	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Tecnazene	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Telodrin	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	trans-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Triadimefon	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Triallate	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	OCP	Trifluralin	2.0E-02	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 101	UMH	TDT	Dibutyltin	-	<0.0001	-	-	-	-	-	-	-	<0.0001
BH 101	UMH	TDT	Tributyltin	-	<0.0001	-	-	-	-	-	-	-	<0.0001
BH 101	UMH	TDT	Triphenyltin	-	<0.0001	-	-	-	-	-	-	-	<0.0001
BH 101	UMH	-	Total cyclodiene pesticides*	-	<0.00001	-	-	-	-	-	-	-	-
BH 101	UMH	-	Total DDT compounds**	-	<0.00001	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 101	LMH	OPP	Azinphos ethyl	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Azinphos methyl	-	<0.00001	-	<0.00001	-	<0.00005	-	-	-	<0.00001
BH 101	LMH	OPP	Carbophenothion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Chlorpyrifos-methyl	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Diazinon	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Dichlorvos	7.0E-07	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Disulfoton	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Dimethoate	6.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Ethion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Etrimphos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Fenitrothion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Fenthion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Malathion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Methyl Parathion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Mevinphos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Phosalone	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Propetamphos	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OPP	Triazophos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Aldrin	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Alpha-BHC	2.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Beta-BHC	2.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Chlorothalonil	1.0E-04	<0.00001	-	<0.00005	-	<0.00250	-	-	-	<0.00250
BH 101	LMH	OCP	cis-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Delta-HCH (BHC)	-	-	-	<0.00001	-	<0.00001	-	-	-	-
BH 101	LMH	OCP	Dieldrin	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Endosulphan I	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Endosulphan II	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Endosulphan sulphate	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Endrin	6.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Gamma-BHC	2.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Heptachlor	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Isodrin	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	o,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	o,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	o,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	o,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	p,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	p,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	p,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	p,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Pendimethalin	2.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Permethrin I	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Permethrin II	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Quintozene	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Tecnazene	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Telodrin	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	trans-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Triadimefon	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Triallate	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	OCP	Trifluralin	2.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	LMH	TDT	Dibutyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	<0.0001
BH 101	LMH	TDT	Tributyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	<0.0001
BH 101	LMH	TDT	Triphenyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	<0.0001
BH 101	LMH	-	Total cyclodiene pesticides*	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 101	LMH	-	Total DDT compounds**	-	<0.00001	-	<0.00001	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 101	CHK	OPP	Azinphos ethyl	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Azinphos methyl	-	<0.00001	-	<0.00001	-	<0.00005	-	-	-	<0.00001
BH 101	CHK	OPP	Carbophenothion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Chlorpyrifos-methyl	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Diazinon	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Dichlorvos	7.0E-07	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Disulfoton	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Dimethoate	6.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Ethion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Etrimphos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Fenitrothion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Fenthion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Malathion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Methyl Parathion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Mevinphos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Phosalone	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Propetamphos	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OPP	Triazophos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Aldrin	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Alpha-BHC	2.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Beta-BHC	2.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Chlorothalonil	1.0E-04	<0.00001	-	<0.00005	-	<0.00250	-	-	-	<0.00250
BH 101	CHK	OCP	cis-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Delta-HCH (BHC)	-	-	-	<0.00001	-	<0.00001	-	-	-	-
BH 101	CHK	OCP	Dieldrin	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Endosulphan I	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Endosulphan II	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Endosulphan sulphate	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Endrin	6.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Gamma-BHC	2.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Heptachlor	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Isodrin	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	o,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	o,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	o,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	o,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	p,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	p,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	p,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	p,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Pendimethalin	2.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Permethrin I	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Permethrin II	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Quintozene	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Tecnazene	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Telodrin	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	trans-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Triadimefon	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Triallate	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	OCP	Trifluralin	2.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 101	CHK	TDT	Dibutyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	<0.0001
BH 101	CHK	TDT	Tributyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	<0.0001
BH 101	CHK	TDT	Triphenyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	<0.0001
BH 101	CHK	-	Total cyclodiene pesticides*	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 101	CHK	-	Total DDT compounds**	-	<0.00001	-	<0.00001	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 102	UMH	OPP	Azinphos ethyl	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Azinphos methyl	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Carbophenothion	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Chlorpyrifos-methyl	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Diazinon	1.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Dichlorvos	7.0E-07	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Disulfoton	-	-	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Dimethoate	6.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Ethion	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Etrimphos	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Fenitrothion	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Fenthion	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Malathion	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Methyl Parathion	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Mevinphos	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Phosalone	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Propetamphos	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OPP	Triazophos	-	<0.00001	-	<0.00001	-	-	-	-	-	<0.00001
BH 102	UMH	OCP	Aldrin	3.0E-05	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Alpha-BHC	2.0E-05	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Beta-BHC	2.0E-05	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Chlorothalonil	1.0E-04	<0.00001	-	<0.00005	<0.00250	<0.00250	-	-	-	<0.00250
BH 102	UMH	OCP	cis-Chlordane	2.0E-04	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Delta-HCH (BHC)	-	-	-	<0.00001	<0.00001	<0.00001	-	-	-	-
BH 102	UMH	OCP	Dieldrin	3.0E-05	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Endosulphan I	1.0E-05	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Endosulphan II	-	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Endosulphan sulphate	-	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Endrin	6.0E-04	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Gamma-BHC	2.0E-03	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Heptachlor	3.0E-05	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Isodrin	1.0E-05	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	o,p'-DDE	1.0E-03	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	o,p'-DDT	1.0E-03	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	o,p'-Methoxychlor	-	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	o,p'-TDE	1.0E-03	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	p,p'-DDE	1.0E-03	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	p,p'-DDT	1.0E-03	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	p,p'-Methoxychlor	-	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	p,p'-TDE	1.0E-03	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Pendimethalin	2.0E-02	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Permethrin I	-	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Permethrin II	-	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Quintozene	-	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Tecnazene	1.0E-03	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Telodrin	-	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	trans-Chlordane	2.0E-04	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Triadimefon	-	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Triallate	-	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	OCP	Trifluralin	2.0E-02	<0.00001	-	<0.00001	<0.00001	<0.00001	-	-	-	<0.00001
BH 102	UMH	TDT	Dibutyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	<0.0001
BH 102	UMH	TDT	Tributyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	<0.0001
BH 102	UMH	TDT	Triphenyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	<0.0001
BH 102	UMH	-	Total cyclodiene pesticides*	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 102	UMH	-	Total DDT compounds**	-	<0.00001	-	<0.00001	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 102	LMH	OPP	Azinphos ethyl	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Azinphos methyl	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Carbophenothion	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Chlorfenvinphos	1.0E-04	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Chlorpyrifos	3.0E-02	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Chlorpyrifos-methyl	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Diazinon	1.0E-05	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Dichlorvos	7.0E-07	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH 102	LMH	OPP	Dimethoate	6.0E-03	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Ethion	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Ethyl Parathion (Parathion)	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Etrimphos	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Fenitrothion	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Fenthion	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Malathion	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Methyl Parathion	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Mevinphos	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Phosalone	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Pirimiphos Methyl	1.5E-05	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Propetamphos	3.0E-05	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OPP	Triazophos	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Aldrin	3.0E-05	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Alpha-BHC	2.0E-05	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Beta-BHC	2.0E-05	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Chlorothalonil	1.0E-04	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	cis-Chlordane	2.0E-04	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
BH 102	LMH	OCP	Dieldrin	3.0E-05	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Endosulphan I	1.0E-05	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Endosulphan II	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Endosulphan sulphate	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Endrin	6.0E-04	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Gamma-BHC	2.0E-03	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Heptachlor	3.0E-05	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Heptachlor Epoxide	3.0E-05	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Hexachlorobenzene	1.0E-05	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Isodrin	1.0E-05	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	o,p'-DDE	1.0E-03	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	o,p'-DDT	1.0E-03	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	o,p'-Methoxychlor	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	o,p'-TDE	1.0E-03	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	p,p'-DDE	1.0E-03	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	p,p'-DDT	1.0E-03	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	p,p'-Methoxychlor	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	p,p'-TDE	1.0E-03	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Pendimethalin	2.0E-02	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Permethrin I	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Permethrin II	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Quintozene	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Tecnazene	1.0E-03	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Telodrin	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	trans-Chlordane	2.0E-04	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Triadimefon	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Triallate	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	OCP	Trifluralin	2.0E-02	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	TDT	Dibutyltin	-	-	<0.0001	-	-	-	-	-	-	-
BH 102	LMH	TDT	Tributyltin	-	-	<0.0001	-	-	-	-	-	-	-
BH 102	LMH	TDT	Triphenyltin	-	-	<0.0001	-	-	-	-	-	-	-
BH 102	LMH	-	Total cyclodiene pesticides*	-	-	<0.00001	-	-	-	-	-	-	-
BH 102	LMH	-	Total DDT compounds**	-	-	<0.00001	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 102	CHK	OPP	Azinphos ethyl	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Azinphos methyl	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Carbophenothion	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Chlorpyrifos-methyl	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Diazinon	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Dichlorvos	7.0E-07	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Dimethoate	6.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Ethion	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Etrimphos	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Fenitrothion	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Fenthion	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Malathion	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Methyl Parathion	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Mevinphos	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Phosalone	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Propetamphos	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OPP	Triazophos	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Aldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Alpha-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Beta-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Chlorothalonil	1.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	cis-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Dieldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Endosulphan I	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Endosulphan II	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Endosulphan sulphate	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Endrin	6.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Gamma-BHC	2.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Heptachlor	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Isodrin	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	o,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	o,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	o,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	o,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	p,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	p,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	p,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	p,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Pendimethalin	2.0E-02	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Permethrin I	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Permethrin II	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Quintozene	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Tecnazene	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Telodrin	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	trans-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Triadimefon	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Triallate	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	OCP	Trifluralin	2.0E-02	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	TDT	Dibutyltin	-	<0.0001	-	-	-	-	-	-	-	-
BH 102	CHK	TDT	Tributyltin	-	<0.0001	-	-	-	-	-	-	-	-
BH 102	CHK	TDT	Triphenyltin	-	<0.0001	-	-	-	-	-	-	-	-
BH 102	CHK	-	Total cyclodiene pesticides*	-	<0.00001	-	-	-	-	-	-	-	-
BH 102	CHK	-	Total DDT compounds**	-	<0.00001	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 103	UMH	OPP	Azinphos ethyl	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Azinphos methyl	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Carbophenothion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Chlorpyrifos-methyl	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Diazinon	1.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Dichlorvos	7.0E-07	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Disulfoton	-	-	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Dimethoate	6.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Ethion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Etrimphos	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Fenitrothion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Fenthion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Malathion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Methyl Parathion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Mevinphos	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Phosalone	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Propetamphos	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OPP	Triazophos	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Aldrin	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Alpha-BHC	2.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Beta-BHC	2.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Chlorothalonil	1.0E-04	<0.00001	-	<0.00005	-	-	-	-	-	-
BH 103	UMH	OCP	cis-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Delta-HCH (BHC)	-	-	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Dieldrin	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Endosulphan I	1.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Endosulphan II	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Endosulphan sulphate	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Endrin	6.0E-04	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Gamma-BHC	2.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Heptachlor	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Isodrin	1.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	o,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	o,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	o,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	o,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	p,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	p,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	p,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	p,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Pendimethalin	2.0E-02	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Permethrin I	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Permethrin II	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Quintozene	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Tecnazene	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Telodrin	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	trans-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Triadimefon	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Triallate	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	OCP	Trifluralin	2.0E-02	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	TDT	Dibutyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	-
BH 103	UMH	TDT	Tributyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	-
BH 103	UMH	TDT	Triphenyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	-
BH 103	UMH	-	Total cyclodiene pesticides*	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	UMH	-	Total DDT compounds**	-	<0.00001	-	<0.00001	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 103	LMH	OPP	Azinphos ethyl	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Azinphos methyl	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Carbophenothion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Chlorpyrifos-methyl	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Diazinon	1.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Dichlorvos	7.0E-07	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Disulfoton	-	-	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Dimethoate	6.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Ethion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Etrimphos	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Fenitrothion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Fenthion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Malathion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Methyl Parathion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Mevinphos	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Phosalone	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Propetamphos	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OPP	Triazophos	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Aldrin	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Alpha-BHC	2.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Beta-BHC	2.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Chlorothalonil	1.0E-04	<0.00001	-	<0.00005	-	-	-	-	-	-
BH 103	LMH	OCP	cis-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Delta-HCH (BHC)	-	-	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Dieldrin	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Endosulphan I	1.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Endosulphan II	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Endosulphan sulphate	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Endrin	6.0E-04	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Gamma-BHC	2.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Heptachlor	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Isodrin	1.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	o,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	o,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	o,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	o,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	p,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	p,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	p,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	p,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Pendimethalin	2.0E-02	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Permethrin I	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Permethrin II	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Quintozene	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Tecnazene	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Telodrin	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	trans-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Triadimefon	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Triallate	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	OCP	Trifluralin	2.0E-02	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	TDT	Dibutyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	-
BH 103	LMH	TDT	Tributyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	-
BH 103	LMH	TDT	Triphenyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	-
BH 103	LMH	-	Total cyclodiene pesticides*	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	LMH	-	Total DDT compounds**	-	<0.00001	-	<0.00001	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 103	CHK	OPP	Azinphos ethyl	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Azinphos methyl	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Carbophenothion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Chlorpyrifos-methyl	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Diazinon	1.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Dichlorvos	7.0E-07	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Disulfoton	-	-	-	<0.00005	-	-	-	-	-	-
BH 103	CHK	OPP	Dimethoate	6.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Ethion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Etrimphos	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Fenitrothion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Fenthion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Malathion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Methyl Parathion	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Mevinphos	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Phosalone	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Propetamphos	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OPP	Triazophos	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Aldrin	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Alpha-BHC	2.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Beta-BHC	2.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Chlorothalonil	1.0E-04	<0.00001	-	<0.00005	-	-	-	-	-	-
BH 103	CHK	OCP	cis-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Delta-HCH (BHC)	-	-	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Dieldrin	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Endosulphan I	1.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Endosulphan II	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Endosulphan sulphate	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Endrin	6.0E-04	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Gamma-BHC	2.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Heptachlor	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Isodrin	1.0E-05	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	o,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	o,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	o,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	o,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	p,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	p,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	p,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	p,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Pendimethalin	2.0E-02	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Permethrin I	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Permethrin II	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Quintozene	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Tecnazene	1.0E-03	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Telodrin	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	trans-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Triadimefon	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Triallate	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	OCP	Trifluralin	2.0E-02	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	TDT	Dibutyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	-
BH 103	CHK	TDT	Tributyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	-
BH 103	CHK	TDT	Triphenyltin	-	<0.0001	-	<0.0001	-	-	-	-	-	-
BH 103	CHK	-	Total cyclodiene pesticides*	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 103	CHK	-	Total DDT compounds**	-	<0.00001	-	<0.00001	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 104	UMH	OPP	Azinphos ethyl	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Azinphos methyl	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Carbophenothion	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Chlorpyrifos-methyl	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Diazinon	1.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Dichlorvos	7.0E-07	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Dimethoate	6.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Ethion	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Etrimphos	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Fenitrothion	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Fenthion	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Malathion	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Methyl Parathion	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Mevinphos	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Phosalone	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Propetamphos	3.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OPP	Triazophos	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Aldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Alpha-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Beta-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Chlorothalonil	1.0E-04	<0.00001	-	-	-	-	-	-	-	<0.00250
BH 104	UMH	OCP	cis-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Dieldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Endosulphan I	1.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Endosulphan II	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Endosulphan sulphate	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Endrin	6.0E-04	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Gamma-BHC	2.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Heptachlor	3.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Isodrin	1.0E-05	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	o,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	o,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	o,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	o,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	p,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	p,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	p,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	p,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Pendimethalin	2.0E-02	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Permethrin I	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Permethrin II	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Quintozene	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Tecnazene	1.0E-03	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Telodrin	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	trans-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Triadimefon	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Triallate	-	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	OCP	Trifluralin	2.0E-02	<0.00001	-	-	-	-	-	-	-	<0.00001
BH 104	UMH	TDT	Dibutyltin	-	<0.0001	-	-	-	-	-	-	-	<0.0001
BH 104	UMH	TDT	Tributyltin	-	<0.0001	-	-	-	-	-	-	-	<0.0001
BH 104	UMH	TDT	Triphenyltin	-	<0.0001	-	-	-	-	-	-	-	<0.0001
BH 104	UMH	-	Total cyclodiene pesticides*	-	<0.00001	-	-	-	-	-	-	-	-
BH 104	UMH	-	Total DDT compounds**	-	<0.00001	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 104	LMH	OPP	Azinphos ethyl	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Azinphos methyl	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Carbophenothion	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Chlorfenvinphos	1.0E-04	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Chlorpyrifos	3.0E-02	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Chlorpyrifos-methyl	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Diazinon	1.0E-05	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Dichlorvos	7.0E-07	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Disulfoton	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Dimethoate	6.0E-03	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Ethion	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Ethyl Parathion (Parathion)	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Etrimphos	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Fenitrothion	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Fenthion	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Malathion	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Methyl Parathion	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Mevinphos	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Phosalone	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Pirimiphos Methyl	1.5E-05	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Propetamphos	3.0E-05	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OPP	Triazophos	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Aldrin	3.0E-05	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Alpha-BHC	2.0E-05	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Beta-BHC	2.0E-05	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Chlorothalonil	1.0E-04	-	<0.00001	<0.00005	-	<0.00005	-	-	-	<0.00250
BH 104	LMH	OCP	cis-Chlordane	2.0E-04	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Delta-HCH (BHC)	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Dieldrin	3.0E-05	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Endosulphan I	1.0E-05	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Endosulphan II	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Endosulphan sulphate	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Endrin	6.0E-04	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Gamma-BHC	2.0E-03	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Heptachlor	3.0E-05	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Heptachlor Epoxide	3.0E-05	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Hexachlorobenzene	1.0E-05	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Isodrin	1.0E-05	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	o,p'-DDE	1.0E-03	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	o,p'-DDT	1.0E-03	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	o,p'-Methoxychlor	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	o,p'-TDE	1.0E-03	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	p,p'-DDE	1.0E-03	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	p,p'-DDT	1.0E-03	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	p,p'-Methoxychlor	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	p,p'-TDE	1.0E-03	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Pendimethalin	2.0E-02	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Permethrin I	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Permethrin II	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Quintozene	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Tecnazene	1.0E-03	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Telodrin	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	trans-Chlordane	2.0E-04	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Triadimefon	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Triallate	-	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	OCP	Trifluralin	2.0E-02	-	<0.00001	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	LMH	TDT	Dibutyltin	-	-	<0.0001	<0.0001	-	<0.0001	-	-	-	<0.0001
BH 104	LMH	TDT	Tributyltin	-	-	<0.0001	<0.0001	-	<0.0001	-	-	-	<0.0001
BH 104	LMH	TDT	Triphenyltin	-	-	<0.0001	<0.0001	-	<0.0001	-	-	-	<0.0001
BH 104	LMH	-	Total cyclodiene pesticides*	-	-	<0.00001	<0.00001	-	-	-	-	-	-
BH 104	LMH	-	Total DDT compounds**	-	-	<0.00001	<0.00001	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 104	CHK	OPP	Azinphos ethyl	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Azinphos methyl	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Carbophenothion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Chlorpyrifos-methyl	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Diazinon	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Dichlorvos	7.0E-07	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Disulfoton	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Dimethoate	6.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Ethion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Etrimphos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Fenitrothion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Fenthion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Malathion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Methyl Parathion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Mevinphos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Phosalone	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Propetamphos	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OPP	Triazophos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Aldrin	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Alpha-BHC	2.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Beta-BHC	2.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Chlorothalonil	1.0E-04	<0.00001	-	<0.00005	-	<0.00005	-	-	-	<0.00250
BH 104	CHK	OCP	cis-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Delta-HCH (BHC)	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Dieldrin	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Endosulphan I	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Endosulphan II	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Endosulphan sulphate	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Endrin	6.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Gamma-BHC	2.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Heptachlor	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Isodrin	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	o,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	o,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	o,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	o,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	p,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	p,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	p,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	p,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Pendimethalin	2.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Permethrin I	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Permethrin II	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Quintozene	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Tecnazene	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Telodrin	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	trans-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Triadimefon	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Triallate	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	OCP	Trifluralin	2.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 104	CHK	TDT	Dibutyltin	-	<0.0001	-	<0.0001	-	<0.0001	-	-	-	<0.0001
BH 104	CHK	TDT	Tributyltin	-	<0.0001	-	<0.0001	-	<0.0001	-	-	-	<0.0001
BH 104	CHK	TDT	Triphenyltin	-	<0.0001	-	<0.0001	-	<0.0001	-	-	-	<0.0001
BH 104	CHK	-	Total cyclodiene pesticides*	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 104	CHK	-	Total DDT compounds**	-	<0.00001	-	<0.00001	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 105X	UMH	OPP	Azinphos ethyl	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Azinphos methyl	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Carbophenothion	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Chlorpyrifos-methyl	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Diazinon	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Dichlorvos	7.0E-07	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Disulfoton	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Dimethoate	6.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Ethion	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Etrimphos	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Fenitrothion	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Fenthion	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Malathion	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Methyl Parathion	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Mevinphos	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Phosalone	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Propetamphos	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OPP	Triazophos	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Aldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Alpha-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Beta-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Chlorothalonil	1.0E-04	-	-	-	-	<0.00005	-	-	-	-
BH 105X	UMH	OCP	cis-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Dieldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Endosulphan I	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Endosulphan II	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Endosulphan sulphate	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Endrin	6.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Gamma-BHC	2.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Heptachlor	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Isodrin	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	o,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	o,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	o,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	o,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	p,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	p,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	p,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	p,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Pendimethalin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Permethrin I	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Permethrin II	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Quintozene	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Tecnazene	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Telodrin	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	trans-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Triadimefon	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Triallate	-	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	OCP	Trifluralin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
BH 105X	UMH	TDT	Dibutyltin	-	-	-	-	-	<0.0001	-	-	-	-
BH 105X	UMH	TDT	Tributyltin	-	-	-	-	-	<0.0001	-	-	-	-
BH 105X	UMH	TDT	Triphenyltin	-	-	-	-	-	<0.0001	-	-	-	-
BH 105X	UMH	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
BH 105X	UMH	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 105	LMH	OPP	Azinphos ethyl	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Azinphos methyl	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Carbophenothion	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Chlorpyrifos-methyl	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Diazinon	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Dichlorvos	7.0E-07	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Dimethoate	6.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Ethion	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Etrimphos	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Fenitrothion	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Fenthion	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Malathion	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Methyl Parathion	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Mevinphos	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Phosalone	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Propetamphos	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OPP	Triazophos	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Aldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Alpha-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Beta-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Chlorothalonil	1.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	cis-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Dieldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Endosulphan I	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Endosulphan II	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Endosulphan sulphate	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Endrin	6.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Gamma-BHC	2.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Heptachlor	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Isodrin	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	o,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	o,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	o,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	o,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	p,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	p,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	p,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	p,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Pendimethalin	2.0E-02	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Permethrin I	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Permethrin II	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Quintozene	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Tecnazene	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Telodrin	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	trans-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Triadimefon	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Triallate	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	OCP	Trifluralin	2.0E-02	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	TDT	Dibutyltin	-	<0.0001	-	-	-	-	-	-	-	-
BH 105	LMH	TDT	Tributyltin	-	<0.0001	-	-	-	-	-	-	-	-
BH 105	LMH	TDT	Triphenyltin	-	<0.0001	-	-	-	-	-	-	-	-
BH 105	LMH	-	Total cyclodiene pesticides*	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	LMH	-	Total DDT compounds**	-	<0.00001	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 105	CHK	OPP	Azinphos ethyl	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Azinphos methyl	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Carbophenothion	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Chlorpyrifos-methyl	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Diazinon	1.0E-05	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Dichlorvos	7.0E-07	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Disulfoton	-	-	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Dimethoate	6.0E-03	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Ethion	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Etrimphos	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Fenitrothion	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Fenthion	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Malathion	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Methyl Parathion	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Mevinphos	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Phosalone	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Propetamphos	3.0E-05	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OPP	Triazophos	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Aldrin	3.0E-05	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Alpha-BHC	2.0E-05	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Beta-BHC	2.0E-05	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Chlorothalonil	1.0E-04	<0.00001	-	-	-	<0.00005	-	-	-	-
BH 105	CHK	OCP	cis-Chlordane	2.0E-04	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Delta-HCH (BHC)	-	-	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Dieldrin	3.0E-05	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Endosulphan I	1.0E-05	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Endosulphan II	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Endosulphan sulphate	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Endrin	6.0E-04	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Gamma-BHC	2.0E-03	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Heptachlor	3.0E-05	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Isodrin	1.0E-05	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	o,p'-DDE	1.0E-03	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	o,p'-DDT	1.0E-03	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	o,p'-Methoxychlor	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	o,p'-TDE	1.0E-03	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	p,p'-DDE	1.0E-03	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	p,p'-DDT	1.0E-03	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	p,p'-Methoxychlor	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	p,p'-TDE	1.0E-03	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Pendimethalin	2.0E-02	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Permethrin I	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Permethrin II	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Quintozene	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Tecnazene	1.0E-03	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Telodrin	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	trans-Chlordane	2.0E-04	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Triadimefon	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Triallate	-	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	OCP	Trifluralin	2.0E-02	<0.00001	-	-	-	<0.00001	-	-	-	-
BH 105	CHK	TDT	Dibutyltin	-	<0.0001	-	-	-	<0.0001	-	-	-	-
BH 105	CHK	TDT	Tributyltin	-	<0.0001	-	-	-	<0.0001	-	-	-	-
BH 105	CHK	TDT	Triphenyltin	-	<0.0001	-	-	-	<0.0001	-	-	-	-
BH 105	CHK	-	Total cyclodiene pesticides*	-	<0.00001	-	-	-	-	-	-	-	-
BH 105	CHK	-	Total DDT compounds**	-	<0.00001	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 106	UMH	OPP	Azinphos ethyl	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Azinphos methyl	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Carbophenothion	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Chlorpyrifos-methyl	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Diazinon	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Dichlorvos	7.0E-07	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Dimethoate	6.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Ethion	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Etrimphos	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Fenitrothion	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Fenthion	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Malathion	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Methyl Parathion	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Mevinphos	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Phosalone	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Propetamphos	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OPP	Triazophos	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Aldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Alpha-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Beta-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Chlorothalonil	1.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	cis-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Dieldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Endosulphan I	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Endosulphan II	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Endosulphan sulphate	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Endrin	6.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Gamma-BHC	2.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Heptachlor	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Isodrin	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	o,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	o,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	o,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	o,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	p,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	p,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	p,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	p,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Pendimethalin	2.0E-02	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Permethrin I	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Permethrin II	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Quintozene	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Tecnazene	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Telodrin	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	trans-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Triadimefon	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Triallate	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	OCP	Trifluralin	2.0E-02	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	TDT	Dibutyltin	-	<0.0001	-	-	-	-	-	-	-	-
BH 106	UMH	TDT	Tributyltin	-	<0.0001	-	-	-	-	-	-	-	-
BH 106	UMH	TDT	Triphenyltin	-	<0.0001	-	-	-	-	-	-	-	-
BH 106	UMH	-	Total cyclodiene pesticides*	-	<0.00001	-	-	-	-	-	-	-	-
BH 106	UMH	-	Total DDT compounds**	-	<0.00001	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 106	LMH	OPP	Azinphos ethyl	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Azinphos methyl	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Carbophenothion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Chlorpyrifos-methyl	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Diazinon	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Dichlorvos	7.0E-07	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Disulfoton	-	-	-	<0.00005	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Dimethoate	6.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Ethion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Etrimphos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Fenitrothion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Fenthion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Malathion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Methyl Parathion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Mevinphos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Phosalone	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Propetamphos	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OPP	Triazophos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Aldrin	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Alpha-BHC	2.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Beta-BHC	2.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Chlorothalonil	1.0E-04	<0.00001	-	<0.00005	-	<0.00005	-	-	-	<0.00250
BH 106	LMH	OCP	cis-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Delta-HCH (BHC)	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Dieldrin	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Endosulphan I	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Endosulphan II	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Endosulphan sulphate	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Endrin	6.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Gamma-BHC	2.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Heptachlor	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Isodrin	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	o,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	o,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	o,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	o,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	p,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	p,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	p,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	p,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Pendimethalin	2.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Permethrin I	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Permethrin II	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Quintozene	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Tecnazene	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Telodrin	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	trans-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Triadimefon	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Triallate	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	OCP	Trifluralin	2.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	LMH	TDT	Dibutyltin	-	<0.0001	-	<0.0001	-	<0.0001	-	-	-	<0.0001
BH 106	LMH	TDT	Tributyltin	-	<0.0001	-	<0.0001	-	<0.0001	-	-	-	<0.0001
BH 106	LMH	TDT	Triphenyltin	-	<0.0001	-	<0.0001	-	<0.0001	-	-	-	<0.0001
BH 106	LMH	-	Total cyclodiene pesticides*	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 106	LMH	-	Total DDT compounds**	-	<0.00001	-	<0.00001	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 106	CHK	OPP	Azinphos ethyl	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Azinphos methyl	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Carbophenothion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Chlorpyrifos-methyl	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Diazinon	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Dichlorvos	7.0E-07	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Disulfoton	-	-	-	<0.00005	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Dimethoate	6.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Ethion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Etrimphos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Fenitrothion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Fenthion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Malathion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Methyl Parathion	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Mevinphos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Phosalone	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Propetamphos	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OPP	Triazophos	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Aldrin	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Alpha-BHC	2.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Beta-BHC	2.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Chlorothalonil	1.0E-04	<0.00001	-	<0.00005	-	<0.00005	-	-	-	<0.00250
BH 106	CHK	OCP	cis-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Delta-HCH (BHC)	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Dieldrin	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Endosulphan I	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Endosulphan II	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Endosulphan sulphate	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Endrin	6.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Gamma-BHC	2.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Heptachlor	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Isodrin	1.0E-05	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	o,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	o,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	o,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	o,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	p,p'-DDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	p,p'-DDT	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	p,p'-Methoxychlor	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	p,p'-TDE	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Pendimethalin	2.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Permethrin I	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Permethrin II	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Quintozene	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Tecnazene	1.0E-03	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Telodrin	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	trans-Chlordane	2.0E-04	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Triadimefon	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Triallate	-	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	OCP	Trifluralin	2.0E-02	<0.00001	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH 106	CHK	TDT	Dibutyltin	-	<0.0001	-	<0.0001	-	<0.0001	-	-	-	<0.0001
BH 106	CHK	TDT	Tributyltin	-	<0.0001	-	<0.0001	-	<0.0001	-	-	-	<0.0001
BH 106	CHK	TDT	Triphenyltin	-	<0.0001	-	<0.0001	-	<0.0001	-	-	-	<0.0001
BH 106	CHK	-	Total cyclodiene pesticides*	-	<0.00001	-	<0.00001	-	-	-	-	-	-
BH 106	CHK	-	Total DDT compounds**	-	<0.00001	-	<0.00001	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 107	UMH	OPP	Azinphos ethyl	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Azinphos methyl	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Carbophenothion	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Diazinon	1.0E-05	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Dichlorvos	7.0E-07	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Dimethoate	6.0E-03	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Ethion	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Etrimphos	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Fenitrothion	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Fenthion	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Malathion	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Methyl Parathion	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Mevinphos	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Phosalone	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Propetamphos	3.0E-05	-	-	-	-	-	-	-	-	-
BH 107	UMH	OPP	Triazophos	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	OCP	Aldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Alpha-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Beta-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Chlorothalonil	1.0E-04	-	-	-	-	<0.00005	-	-	-	-
BH 107	UMH	OCP	cis-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Dieldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Endosulphan I	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Endosulphan II	-	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Endosulphan sulphate	-	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Endrin	6.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Gamma-BHC	2.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Heptachlor	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Isodrin	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	o,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	o,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	o,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	o,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	p,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	p,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	p,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	p,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Pendimethalin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Permethrin I	-	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Permethrin II	-	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Quintozene	-	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Tecnazene	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Telodrin	-	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	trans-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Triadimefon	-	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Triallate	-	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	OCP	Trifluralin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
BH 107	UMH	TDT	Dibutyltin	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	TDT	Tributyltin	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	TDT	Triphenyltin	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
BH 107	UMH	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 108	LMH	OPP	Azinphos ethyl	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Azinphos methyl	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Carbophenothion	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Chlorpyrifos-methyl	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Diazinon	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Dichlorvos	7.0E-07	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Disulfoton	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Dimethoate	6.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Ethion	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Etrimphos	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Fenitrothion	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Fenthion	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Malathion	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Methyl Parathion	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Mevinphos	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Phosalone	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Propetamphos	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OPP	Triazophos	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Aldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Alpha-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Beta-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Chlorothalonil	1.0E-04	-	-	-	-	<0.00005	-	-	-	-
BH 108	LMH	OCP	cis-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Dieldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Endosulphan I	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Endosulphan II	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Endosulphan sulphate	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Endrin	6.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Gamma-BHC	2.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Heptachlor	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Isodrin	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	o,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	o,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	o,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	o,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	p,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	p,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	p,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	p,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Pendimethalin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Permethrin I	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Permethrin II	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Quintozene	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Tecnazene	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Telodrin	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	trans-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Triadimefon	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Triallate	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	OCP	Trifluralin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
BH 108	LMH	TDT	Dibutyltin	-	-	-	-	-	<0.0001	-	-	-	-
BH 108	LMH	TDT	Tributyltin	-	-	-	-	-	<0.0001	-	-	-	-
BH 108	LMH	TDT	Triphenyltin	-	-	-	-	-	<0.0001	-	-	-	-
BH 108	LMH	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
BH 108	LMH	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 108	CHK	OPP	Azinphos ethyl	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Azinphos methyl	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Carbophenothion	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Chlorpyrifos-methyl	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Diazinon	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Dichlorvos	7.0E-07	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Disulfoton	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Dimethoate	6.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Ethion	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Etrimphos	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Fenitrothion	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Fenthion	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Malathion	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Methyl Parathion	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Mevinphos	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Phosalone	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Propetamphos	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OPP	Triazophos	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Aldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Alpha-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Beta-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Chlorothalonil	1.0E-04	-	-	-	-	<0.00005	-	-	-	-
BH 108	CHK	OCP	cis-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Delta-HCH (BHC)	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Dieldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Endosulphan I	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Endosulphan II	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Endosulphan sulphate	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Endrin	6.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Gamma-BHC	2.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Heptachlor	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Isodrin	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	o,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	o,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	o,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	o,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	p,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	p,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	p,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	p,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Pendimethalin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Permethrin I	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Permethrin II	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Quintozene	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Tecnazene	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Telodrin	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	trans-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Triadimefon	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Triallate	-	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	OCP	Trifluralin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
BH 108	CHK	TDT	Dibutyltin	-	-	-	-	-	<0.0001	-	-	-	-
BH 108	CHK	TDT	Tributyltin	-	-	-	-	-	<0.0001	-	-	-	-
BH 108	CHK	TDT	Triphenyltin	-	-	-	-	-	<0.0001	-	-	-	-
BH 108	CHK	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
BH 108	CHK	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
FT 101	UMH	OPP	Azinphos ethyl	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Azinphos methyl	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Carbophenothion	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Chlorpyrifos-methyl	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Diazinon	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Dichlorvos	7.0E-07	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Dimethoate	6.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Ethion	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Etrimphos	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Fenitrothion	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Fenthion	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Malathion	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Methyl Parathion	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Mevinphos	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Phosalone	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Propetamphos	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OPP	Triazophos	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Aldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Alpha-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Beta-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Chlorothalonil	1.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	cis-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Dieldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Endosulphan I	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Endosulphan II	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Endosulphan sulphate	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Endrin	6.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Gamma-BHC	2.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Heptachlor	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Isodrin	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	o,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	o,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	o,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	o,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	p,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	p,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	p,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	p,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Pendimethalin	2.0E-02	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Permethrin I	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Permethrin II	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Quintozene	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Tecnazene	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Telodrin	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	trans-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Triadimefon	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Triallate	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	OCP	Trifluralin	2.0E-02	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	TDT	Dibutyltin	-	<0.0001	-	-	-	-	-	-	-	-
FT 101	UMH	TDT	Tributyltin	-	<0.0001	-	-	-	-	-	-	-	-
FT 101	UMH	TDT	Triphenyltin	-	<0.0001	-	-	-	-	-	-	-	-
FT 101	UMH	-	Total cyclodiene pesticides*	-	<0.00001	-	-	-	-	-	-	-	-
FT 101	UMH	-	Total DDT compounds**	-	<0.00001	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
FT 102	UMH	OPP	Azinphos ethyl	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Azinphos methyl	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Carbophenothion	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Chlorpyrifos-methyl	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Diazinon	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Dichlorvos	7.0E-07	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Dimethoate	6.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Ethion	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Etrimphos	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Fenitrothion	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Fenthion	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Malathion	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Methyl Parathion	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Mevinphos	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Phosalone	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Propetamphos	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OPP	Triazophos	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Aldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Alpha-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Beta-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Chlorothalonil	1.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	cis-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Dieldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Endosulphan I	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Endosulphan II	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Endosulphan sulphate	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Endrin	6.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Gamma-BHC	2.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Heptachlor	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Isodrin	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	o,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	o,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	o,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	o,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	p,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	p,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	p,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	p,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Pendimethalin	2.0E-02	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Permethrin I	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Permethrin II	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Quintozene	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Tecnazene	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Telodrin	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	trans-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Triadimefon	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Triallate	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	OCP	Trifluralin	2.0E-02	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	TDT	Dibutyltin	-	<0.0001	-	-	-	-	-	-	-	-
FT 102	UMH	TDT	Tributyltin	-	<0.0001	-	-	-	-	-	-	-	-
FT 102	UMH	TDT	Triphenyltin	-	<0.0001	-	-	-	-	-	-	-	-
FT 102	UMH	-	Total cyclodiene pesticides*	-	<0.00001	-	-	-	-	-	-	-	-
FT 102	UMH	-	Total DDT compounds**	-	<0.00001	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
FT 103	UMH	OPP	Azinphos ethyl	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Azinphos methyl	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Carbophenothion	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Chlorfenvinphos	1.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Chlorpyrifos	3.0E-02	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Chlorpyrifos-methyl	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Diazinon	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Dichlorvos	7.0E-07	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Dimethoate	6.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Ethion	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Ethyl Parathion (Parathion)	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Etrimphos	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Fenitrothion	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Fenthion	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Malathion	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Methyl Parathion	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Mevinphos	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Phosalone	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Pirimiphos Methyl	1.5E-05	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Propetamphos	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OPP	Triazophos	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Aldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Alpha-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Beta-BHC	2.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Chlorothalonil	1.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	cis-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Dieldrin	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Endosulphan I	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Endosulphan II	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Endosulphan sulphate	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Endrin	6.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Gamma-BHC	2.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Heptachlor	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Heptachlor Epoxide	3.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Hexachlorobenzene	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Isodrin	1.0E-05	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	o,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	o,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	o,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	o,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	p,p'-DDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	p,p'-DDT	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	p,p'-Methoxychlor	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	p,p'-TDE	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Pendimethalin	2.0E-02	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Permethrin I	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Permethrin II	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Quintozene	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Tecnazene	1.0E-03	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Telodrin	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	trans-Chlordane	2.0E-04	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Triadimefon	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Triallate	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	OCP	Trifluralin	2.0E-02	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	TDT	Dibutyltin	-	<0.0001	-	-	-	-	-	-	-	-
FT 103	UMH	TDT	Tributyltin	-	<0.0001	-	-	-	-	-	-	-	-
FT 103	UMH	TDT	Triphenyltin	-	<0.0001	-	-	-	-	-	-	-	-
FT 103	UMH	-	Total cyclodiene pesticides*	-	<0.00001	-	-	-	-	-	-	-	-
FT 103	UMH	-	Total DDT compounds**	-	<0.00001	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH E	UMH	OPP	Azinphos ethyl	-	-	-	<0.00005	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Azinphos methyl	-	-	-	<0.00001	-	<0.00005	-	-	-	<0.00001
BH E	UMH	OPP	Carbophenothion	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Chlorfenvinphos	1.0E-04	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Chlorpyrifos	3.0E-02	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Chlorpyrifos-methyl	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Diazinon	1.0E-05	-	-	<0.00005	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Dichlorvos	7.0E-07	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Disulfoton	-	-	-	<0.00100	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Dimethoate	6.0E-03	-	-	<0.00005	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Ethion	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Ethyl Parathion (Parathion)	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Etrimphos	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Fenitrothion	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Fenthion	-	-	-	<0.00100	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Malathion	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Methyl Parathion	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Mevinphos	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Phosalone	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Pirimiphos Methyl	1.5E-05	-	-	<0.00005	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Propetamphos	3.0E-05	-	-	<0.00100	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OPP	Triazophos	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Aldrin	3.0E-05	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Alpha-BHC	2.0E-05	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Beta-BHC	2.0E-05	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Chlorothalonil	1.0E-04	-	-	<0.00001	-	<0.00250	-	-	-	<0.00250
BH E	UMH	OCP	cis-Chlordane	2.0E-04	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Delta-HCH (BHC)	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Dieldrin	3.0E-05	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Endosulphan I	1.0E-05	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Endosulphan II	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Endosulphan sulphate	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Endrin	6.0E-04	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Gamma-BHC	2.0E-03	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Heptachlor	3.0E-05	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Heptachlor Epoxide	3.0E-05	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Hexachlorobenzene	1.0E-05	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Isodrin	1.0E-05	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	o,p'-DDE	1.0E-03	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	o,p'-DDT	1.0E-03	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	o,p'-Methoxychlor	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	o,p'-TDE	1.0E-03	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	p,p'-DDE	1.0E-03	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	p,p'-DDT	1.0E-03	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	p,p'-Methoxychlor	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	p,p'-TDE	1.0E-03	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Pendimethalin	2.0E-02	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Permethrin I	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Permethrin II	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Quintozene	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Tecnazene	1.0E-03	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Telodrin	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	trans-Chlordane	2.0E-04	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Triadimefon	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Triallate	-	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	OCP	Trifluralin	2.0E-02	-	-	<0.00001	-	<0.00001	-	-	-	<0.00001
BH E	UMH	TDT	Dibutyltin	-	-	-	<0.0001	-	-	-	-	-	<0.0001
BH E	UMH	TDT	Tributyltin	-	-	-	<0.0001	-	-	-	-	-	<0.0001
BH E	UMH	TDT	Triphenyltin	-	-	-	<0.0001	-	-	-	-	-	<0.0001
BH E	UMH	-	Total cyclodiene pesticides*	-	-	-	<0.00001	-	-	-	-	-	-
BH E	UMH	-	Total DDT compounds**	-	-	-	<0.00001	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH F	UMH	OPP	Azinphos ethyl	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Azinphos methyl	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Carbophenothion	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Diazinon	1.0E-05	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Dichlorvos	7.0E-07	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Dimethoate	6.0E-03	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Ethion	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Etrimphos	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Fenitrothion	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Fenthion	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Malathion	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Methyl Parathion	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Mevinphos	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Phosalone	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Propetamphos	3.0E-05	-	-	-	-	-	-	-	-	-
BH F	UMH	OPP	Triazophos	-	-	-	-	-	-	-	-	-	-
BH F	UMH	OCP	Aldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Alpha-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Beta-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Chlorothalonil	1.0E-04	-	-	-	-	<0.00250	-	-	-	-
BH F	UMH	OCP	cis-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Dieldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Endosulphan I	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Endosulphan II	-	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Endosulphan sulphate	-	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Endrin	6.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Gamma-BHC	2.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Heptachlor	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Isodrin	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	o,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	o,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	o,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	o,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	p,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	p,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	p,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	p,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Pendimethalin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Permethrin I	-	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Permethrin II	-	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Quintozene	-	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Tecnazene	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Telodrin	-	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	trans-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Triadimefon	-	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Triallate	-	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	OCP	Trifluralin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
BH F	UMH	TDT	Dibutyltin	-	-	-	-	-	-	-	-	-	-
BH F	UMH	TDT	Tributyltin	-	-	-	-	-	-	-	-	-	-
BH F	UMH	TDT	Triphenyltin	-	-	-	-	-	-	-	-	-	-
BH F	UMH	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
BH F	UMH	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH K	UMH	OPP	Azinphos ethyl	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Azinphos methyl	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Carbophenothion	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Chlorfenvinphos	1.0E-04	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Chlorpyrifos	3.0E-02	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Chlorpyrifos-methyl	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Diazinon	1.0E-05	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Dichlorvos	7.0E-07	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Disulfoton	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Dimethoate	6.0E-03	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Ethion	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Ethyl Parathion (Parathion)	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Etrimphos	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Fenitrothion	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Fenthion	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Malathion	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Methyl Parathion	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Mevinphos	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Phosalone	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Pirimiphos Methyl	1.5E-05	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Propetamphos	3.0E-05	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OPP	Triazophos	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Aldrin	3.0E-05	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Alpha-BHC	2.0E-05	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Beta-BHC	2.0E-05	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Chlorothalonil	1.0E-04	-	-	<0.00005	-	-	-	-	-	-
BH K	UMH	OCP	cis-Chlordane	2.0E-04	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Delta-HCH (BHC)	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Dieldrin	3.0E-05	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Endosulphan I	1.0E-05	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Endosulphan II	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Endosulphan sulphate	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Endrin	6.0E-04	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Gamma-BHC	2.0E-03	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Heptachlor	3.0E-05	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Heptachlor Epoxide	3.0E-05	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Hexachlorobenzene	1.0E-05	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Isodrin	1.0E-05	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	o,p'-DDE	1.0E-03	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	o,p'-DDT	1.0E-03	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	o,p'-Methoxychlor	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	o,p'-TDE	1.0E-03	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	p,p'-DDE	1.0E-03	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	p,p'-DDT	1.0E-03	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	p,p'-Methoxychlor	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	p,p'-TDE	1.0E-03	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Pendimethalin	2.0E-02	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Permethrin I	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Permethrin II	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Quintozene	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Tecnazene	1.0E-03	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Telodrin	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	trans-Chlordane	2.0E-04	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Triadimefon	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Triallate	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	OCP	Trifluralin	2.0E-02	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	TDT	Dibutyltin	-	-	-	<0.0001	-	-	-	-	-	-
BH K	UMH	TDT	Tributyltin	-	-	-	<0.0001	-	-	-	-	-	-
BH K	UMH	TDT	Triphenyltin	-	-	-	<0.0001	-	-	-	-	-	-
BH K	UMH	-	Total cyclodiene pesticides*	-	-	-	<0.00001	-	-	-	-	-	-
BH K	UMH	-	Total DDT compounds**	-	-	-	<0.00001	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 301	LMH	OPP	Azinphos ethyl	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Azinphos methyl	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Carbophenothion	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Diazinon	1.0E-05	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Dichlorvos	7.0E-07	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Dimethoate	6.0E-03	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Ethion	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Etrimphos	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Fenitrothion	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Fenthion	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Malathion	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Methyl Parathion	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Mevinphos	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Phosalone	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Propetamphos	3.0E-05	-	-	-	-	-	-	-	-	-
BH 301	LMH	OPP	Triazophos	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Aldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Alpha-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Beta-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Chlorothalonil	1.0E-04	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	cis-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Dieldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Endosulphan I	1.0E-05	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Endosulphan II	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Endosulphan sulphate	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Endrin	6.0E-04	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Gamma-BHC	2.0E-03	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Heptachlor	3.0E-05	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Isodrin	1.0E-05	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	o,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	o,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	o,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	o,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	p,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	p,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	p,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	p,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Pendimethalin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Permethrin I	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Permethrin II	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Quintozene	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Tecnazene	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Telodrin	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	trans-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Triadimefon	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Triallate	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	OCP	Trifluralin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 301	LMH	TDT	Dibutyltin	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	TDT	Tributyltin	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	TDT	Triphenyltin	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
BH 301	LMH	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 301	CHK	OPP	Azinphos ethyl	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Azinphos methyl	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Carbophenothion	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Diazinon	1.0E-05	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Dichlorvos	7.0E-07	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Dimethoate	6.0E-03	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Ethion	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Etrimphos	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Fenitrothion	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Fenthion	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Malathion	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Methyl Parathion	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Mevinphos	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Phosalone	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Propetamphos	3.0E-05	-	-	-	-	-	-	-	-	-
BH 301	CHK	OPP	Triazophos	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Aldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Alpha-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Beta-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Chlorothalonil	1.0E-04	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	cis-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Dieldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Endosulphan I	1.0E-05	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Endosulphan II	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Endosulphan sulphate	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Endrin	6.0E-04	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Gamma-BHC	2.0E-03	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Heptachlor	3.0E-05	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Isodrin	1.0E-05	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	o,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	o,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	o,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	o,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	p,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	p,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	p,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	p,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Pendimethalin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Permethrin I	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Permethrin II	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Quintozene	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Tecnazene	1.0E-03	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Telodrin	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	trans-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Triadimefon	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Triallate	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	OCP	Trifluralin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 301	CHK	TDT	Dibutyltin	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	TDT	Tributyltin	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	TDT	Triphenyltin	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
BH 301	CHK	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 302	LMH	OPP	Azinphos ethyl	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Azinphos methyl	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Carbophenothion	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Diazinon	1.0E-05	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Dichlorvos	7.0E-07	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Dimethoate	6.0E-03	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Ethion	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Etrimphos	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Fenitrothion	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Fenthion	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Malathion	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Methyl Parathion	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Mevinphos	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Phosalone	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Propetamphos	3.0E-05	-	-	-	-	-	-	-	-	-
BH 302	LMH	OPP	Triazophos	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Aldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Alpha-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Beta-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Chlorothalonil	1.0E-04	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	cis-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Dieldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Endosulphan I	1.0E-05	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Endosulphan II	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Endosulphan sulphate	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Endrin	6.0E-04	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Gamma-BHC	2.0E-03	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Heptachlor	3.0E-05	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Isodrin	1.0E-05	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	o,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	o,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	o,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	o,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	p,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	p,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	p,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	p,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Pendimethalin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Permethrin I	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Permethrin II	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Quintozene	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Tecnazene	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Telodrin	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	trans-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Triadimefon	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Triallate	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	OCP	Trifluralin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 302	LMH	TDT	Dibutyltin	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	TDT	Tributyltin	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	TDT	Triphenyltin	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
BH 302	LMH	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 302	CHK	OPP	Azinphos ethyl	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Azinphos methyl	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Carbophenothion	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Diazinon	1.0E-05	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Dichlorvos	7.0E-07	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Dimethoate	6.0E-03	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Ethion	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Etrimphos	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Fenitrothion	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Fenthion	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Malathion	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Methyl Parathion	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Mevinphos	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Phosalone	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Propetamphos	3.0E-05	-	-	-	-	-	-	-	-	-
BH 302	CHK	OPP	Triazophos	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Aldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Alpha-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Beta-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Chlorothalonil	1.0E-04	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	cis-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Dieldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Endosulphan I	1.0E-05	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Endosulphan II	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Endosulphan sulphate	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Endrin	6.0E-04	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Gamma-BHC	2.0E-03	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Heptachlor	3.0E-05	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Isodrin	1.0E-05	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	o,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	o,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	o,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	o,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	p,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	p,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	p,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	p,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Pendimethalin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Permethrin I	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Permethrin II	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Quintozene	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Tecnazene	1.0E-03	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Telodrin	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	trans-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Triadimefon	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Triallate	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	OCP	Trifluralin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 302	CHK	TDT	Dibutyltin	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	TDT	Tributyltin	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	TDT	Triphenyltin	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
BH 302	CHK	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 305	LMH	OPP	Azinphos ethyl	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Azinphos methyl	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Carbophenothion	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Diazinon	1.0E-05	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Dichlorvos	7.0E-07	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Dimethoate	6.0E-03	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Ethion	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Etrimphos	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Fenitrothion	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Fenthion	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Malathion	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Methyl Parathion	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Mevinphos	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Phosalone	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Propetamphos	3.0E-05	-	-	-	-	-	-	-	-	-
BH 305	LMH	OPP	Triazophos	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Aldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Alpha-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Beta-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Chlorothalonil	1.0E-04	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	cis-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Dieldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Endosulphan I	1.0E-05	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Endosulphan II	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Endosulphan sulphate	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Endrin	6.0E-04	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Gamma-BHC	2.0E-03	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Heptachlor	3.0E-05	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Isodrin	1.0E-05	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	o,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	o,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	o,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	o,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	p,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	p,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	p,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	p,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Pendimethalin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Permethrin I	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Permethrin II	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Quintozene	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Tecnazene	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Telodrin	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	trans-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Triadimefon	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Triallate	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	OCP	Trifluralin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 305	LMH	TDT	Dibutyltin	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	TDT	Tributyltin	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	TDT	Triphenyltin	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
BH 305	LMH	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 305	CHK	OPP	Azinphos ethyl	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Azinphos methyl	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Carbophenothion	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Diazinon	1.0E-05	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Dichlorvos	7.0E-07	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Dimethoate	6.0E-03	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Ethion	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Etrimphos	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Fenitrothion	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Fenthion	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Malathion	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Methyl Parathion	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Mevinphos	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Phosalone	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Propetamphos	3.0E-05	-	-	-	-	-	-	-	-	-
BH 305	CHK	OPP	Triazophos	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Aldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Alpha-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Beta-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Chlorothalonil	1.0E-04	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	cis-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Dieldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Endosulphan I	1.0E-05	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Endosulphan II	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Endosulphan sulphate	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Endrin	6.0E-04	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Gamma-BHC	2.0E-03	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Heptachlor	3.0E-05	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Isodrin	1.0E-05	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	o,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	o,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	o,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	o,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	p,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	p,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	p,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	p,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Pendimethalin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Permethrin I	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Permethrin II	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Quintozene	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Tecnazene	1.0E-03	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Telodrin	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	trans-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Triadimefon	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Triallate	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	OCP	Trifluralin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 305	CHK	TDT	Dibutyltin	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	TDT	Tributyltin	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	TDT	Triphenyltin	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
BH 305	CHK	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 306	UMH	OPP	Azinphos ethyl	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Azinphos methyl	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Carbophenothion	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Diazinon	1.0E-05	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Dichlorvos	7.0E-07	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Dimethoate	6.0E-03	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Ethion	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Etrimphos	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Fenitrothion	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Fenthion	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Malathion	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Methyl Parathion	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Mevinphos	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Phosalone	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Propetamphos	3.0E-05	-	-	-	-	-	-	-	-	-
BH 306	UMH	OPP	Triazophos	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Aldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Alpha-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Beta-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Chlorothalonil	1.0E-04	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	cis-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Dieldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Endosulphan I	1.0E-05	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Endosulphan II	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Endosulphan sulphate	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Endrin	6.0E-04	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Gamma-BHC	2.0E-03	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Heptachlor	3.0E-05	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Isodrin	1.0E-05	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	o,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	o,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	o,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	o,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	p,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	p,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	p,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	p,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Pendimethalin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Permethrin I	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Permethrin II	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Quintozene	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Tecnazene	1.0E-03	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Telodrin	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	trans-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Triadimefon	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Triallate	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	OCP	Trifluralin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 306	UMH	TDT	Dibutyltin	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	TDT	Tributyltin	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	TDT	Triphenyltin	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
BH 306	UMH	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
BH 307	UMH	OPP	Azinphos ethyl	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Azinphos methyl	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Carbophenothion	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Diazinon	1.0E-05	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Dichlorvos	7.0E-07	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Dimethoate	6.0E-03	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Ethion	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Etrimphos	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Fenitrothion	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Fenthion	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Malathion	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Methyl Parathion	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Mevinphos	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Phosalone	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Propetamphos	3.0E-05	-	-	-	-	-	-	-	-	-
BH 307	UMH	OPP	Triazophos	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Aldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Alpha-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Beta-BHC	2.0E-05	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Chlorothalonil	1.0E-04	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	cis-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Dieldrin	3.0E-05	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Endosulphan I	1.0E-05	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Endosulphan II	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Endosulphan sulphate	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Endrin	6.0E-04	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Gamma-BHC	2.0E-03	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Heptachlor	3.0E-05	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Isodrin	1.0E-05	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	o,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	o,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	o,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	o,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	p,p'-DDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	p,p'-DDT	1.0E-03	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	p,p'-Methoxychlor	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	p,p'-TDE	1.0E-03	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Pendimethalin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Permethrin I	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Permethrin II	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Quintozene	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Tecnazene	1.0E-03	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Telodrin	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	trans-Chlordane	2.0E-04	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Triadimefon	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Triallate	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	OCP	Trifluralin	2.0E-02	-	-	-	-	-	-	-	-	-
BH 307	UMH	TDT	Dibutyltin	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	TDT	Tributyltin	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	TDT	Triphenyltin	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
BH 307	UMH	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
GMW113	UMH	OPP	Azinphos ethyl	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Azinphos methyl	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Carbophenothion	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Diazinon	1.0E-05	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Dichlorvos	7.0E-07	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Dimethoate	6.0E-03	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Ethion	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Etrimphos	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Fenitrothion	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Fenthion	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Malathion	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Methyl Parathion	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Mevinphos	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Phosalone	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Propetamphos	3.0E-05	-	-	-	-	-	-	-	-	-
GMW113	UMH	OPP	Triazophos	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	OCP	Aldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Alpha-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Beta-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Chlorothalonil	1.0E-04	-	-	-	-	<0.00250	-	-	-	-
GMW113	UMH	OCP	cis-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Dieldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Endosulphan I	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Endosulphan II	-	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Endosulphan sulphate	-	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Endrin	6.0E-04	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Gamma-BHC	2.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Heptachlor	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Isodrin	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	o,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	o,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	o,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	o,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	p,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	p,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	p,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	p,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Pendimethalin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Permethrin I	-	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Permethrin II	-	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Quintozene	-	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Tecnazene	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Telodrin	-	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	trans-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Triadimefon	-	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Triallate	-	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	OCP	Trifluralin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
GMW113	UMH	TDT	Dibutyltin	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	TDT	Tributyltin	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	TDT	Triphenyltin	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
GMW113	UMH	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
GMW114	UMH	OPP	Azinphos ethyl	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Azinphos methyl	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Carbophenothion	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Diazinon	1.0E-05	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Dichlorvos	7.0E-07	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Dimethoate	6.0E-03	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Ethion	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Etrimphos	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Fenitrothion	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Fenthion	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Malathion	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Methyl Parathion	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Mevinphos	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Phosalone	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Propetamphos	3.0E-05	-	-	-	-	-	-	-	-	-
GMW114	UMH	OPP	Triazophos	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	OCP	Aldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Alpha-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Beta-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Chlorothalonil	1.0E-04	-	-	-	-	<0.00250	-	-	-	-
GMW114	UMH	OCP	cis-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Delta-HCH (BHC)	-	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Dieldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Endosulphan I	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Endosulphan II	-	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Endosulphan sulphate	-	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Endrin	6.0E-04	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Gamma-BHC	2.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Heptachlor	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Isodrin	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	o,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	o,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	o,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	o,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	p,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	p,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	p,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	p,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Pendimethalin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Permethrin I	-	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Permethrin II	-	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Quintozene	-	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Tecnazene	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Telodrin	-	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	trans-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Triadimefon	-	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Triallate	-	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	OCP	Trifluralin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
GMW114	UMH	TDT	Dibutyltin	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	TDT	Tributyltin	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	TDT	Triphenyltin	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
GMW114	UMH	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Groundwater Quality Data- Pesticides

Borehole	Aquifer	Analysis	Analysis2	DWS / Freshwater	Aug-13	Sep-13	Jan-16	Nov-16	Feb-17	May-17	Aug-17	Nov-17	Feb-18
SW11	SW	OPP	Azinphos ethyl	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Azinphos methyl	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Carbophenothion	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Chlorfenvinphos	1.0E-04	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Chlorpyrifos	3.0E-02	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Diazinon	1.0E-05	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Dichlorvos	7.0E-07	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Disulfoton	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Dimethoate	6.0E-03	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Ethion	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Etrimphos	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Fenitrothion	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Fenthion	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Malathion	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Methyl Parathion	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Mevinphos	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Phosalone	-	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Pirimiphos Methyl	1.5E-05	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Propetamphos	3.0E-05	-	-	-	-	-	-	-	-	-
SW11	SW	OPP	Triazophos	-	-	-	-	-	-	-	-	-	-
SW11	SW	OCP	Aldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Alpha-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Beta-BHC	2.0E-05	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Chlorothalonil	1.0E-04	-	-	-	-	<0.00250	-	-	-	-
SW11	SW	OCP	cis-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Delta-HCH (BHC)	-	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Dieldrin	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Endosulphan I	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Endosulphan II	-	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Endosulphan sulphate	-	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Endrin	6.0E-04	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Gamma-BHC	2.0E-03	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Heptachlor	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Heptachlor Epoxide	3.0E-05	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Hexachlorobenzene	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Isodrin	1.0E-05	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	o,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	o,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	o,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	o,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	p,p'-DDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	p,p'-DDT	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	p,p'-Methoxychlor	-	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	p,p'-TDE	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Pendimethalin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Permethrin I	-	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Permethrin II	-	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Quintozene	-	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Tecnazene	1.0E-03	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Telodrin	-	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	trans-Chlordane	2.0E-04	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Triadimefon	-	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Triallate	-	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	OCP	Trifluralin	2.0E-02	-	-	-	-	<0.00001	-	-	-	-
SW11	SW	TDT	Dibutyltin	-	-	-	-	-	-	-	-	-	-
SW11	SW	TDT	Tributyltin	-	-	-	-	-	-	-	-	-	-
SW11	SW	TDT	Triphenyltin	-	-	-	-	-	-	-	-	-	-
SW11	SW	-	Total cyclodiene pesticides*	-	-	-	-	-	-	-	-	-	-
SW11	SW	-	Total DDT compounds**	-	-	-	-	-	-	-	-	-	-

Key

All results are in milligram per litre (mg/l).*

–	Not sampled/analysed
DWS	Drinking Water Standard (SLR EIC GAC 2014)
–	No DWS available.
888	Freshwater Standard
888	**Exceeds Water Quality Standard
888	Exceeds Detection Limit
UMH	Upper Mineral Horison Aquifer
LMH	Lower Mineral Horizon Aquifer
Chalk	Chalk Aquifer
D	Borehole Dry
OPP	Organophosphorous Pesticides
OCP	Organochlorine Pesticides

*Units – All results are reported in mg/l (milligrams per litre). Note: 1mg/l = 1,000ug/l

**Concentration exceeds the relevant standard (DWS – Drinking Water Standard) or EQS – Environmental Quality Standard

global environmental solutions

Former Hatfield Aerodrome

Hertfordshire

Water Framework Directive Compliance Assessment

SLR Ref: 403.09885.00024

June 2021

built on relationships

Version: Rev 1.1

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ACRONYMS

UMH Upper Mineral Horizon

LMH Lower Mineral Horizon

1.0 INTRODUCTION

1.1 Context

SLR Consulting has been commissioned by Brett Aggregates Limited to undertake a Water Framework Directive Compliance Assessment (WFDCA) to support a planning application for a proposed sand and gravel quarry to include new access onto the A1057, an aggregate processing plant, concrete batching plant and other ancillary facilities on land at the former Hatfield aerodrome, Hertfordshire (the application site).

1.2 Background

The application site is located within an area bounded by the A1057 (Hatfield Road/St Albans Road) to the south, Oaklands Lane to the west, Coopers Green Lane to the north and the western fringe of Hatfield to the east.

The proposals would involve the winning and working, together with processing for sale, of approximately 8Mt of sand and gravel over a period of around 30 years (based on an annual output of around 250,000tpa). In parallel with the extraction of minerals would be the importation of low permeability inert material to infill the mineral workings to facilitate the restoration of the application site to a beneficial after use, combining recreation and nature consideration. The imported material would typically comprise excavation wastes from construction and engineering projects (soils, overburden, clays etc.) within the region.

The quarry would be worked on a phased basis to allow for progressive restoration from the east.

The WFD compliance assessment has been completed to demonstrate that the proposed development at Hatfield aerodrome will not cause deterioration to the status of the adjacent surface water and groundwater bodies. Guidance on the preparation of WFDCA is currently in preparation. However, past discussions with the Environment Agency indicate that the assessment should follow the following five stages:

1. **development impacts** – how development would impact on water quality elements and thresholds that trigger detailed assessment;
2. **cumulative impacts** – how the proposed development together with existing physical modifications might lead to deterioration;
3. **sensitive water habitat** – how development would affect water habitat including protected areas; and where the water body is already at less than good status;
4. **risk of preventing improvement** – whether the proposed development would prevent implementation of any measures in the RBMP;
5. **improving water bodies** – other practical opportunities to improve the water body as part of the proposed development.

1.3 Legislative Background

The Water Framework Directive[1] requires all natural water bodies to achieve good 'status' by 2027. The status of a water body is a function of its chemical, ecological and physical (hydromorphological) condition based on a number of 'supporting elements'.

New activities and schemes that might lead to deterioration in water body status or compromise the ability of a water body to meet its overall status objective or render ineffective proposed improvement measures would be contrary to the Directive.

The overall ecological status of a water body is primarily based on consideration of its biological quality elements and determined by their lowest scoring. Biological elements are, however, in turn supported by the physio-chemical and hydromorphological quality elements. Assessment of hydromorphological quality is not explicitly required for a water body to achieve lower or moderate ecological status, however, to achieve the overall WFD aim of good status or higher, hydromorphological quality must be considered within the classification assessment.

In addition, to achieve the overall WFD aim of good status, a water body must pass a separate chemical assessment, relating to pass/fail checks on the concentrations of various identified priority/dangerous substances.

[1] Water Framework Directive (2006/60/EC)

2.0 BASELINE WATER ENVIRONMENT

2.1 Hydrology

Details of the baseline conditions can be found in the environmental statement submitted in support of the planning application. In general, the application site is located within the hydrological catchment of the River Colne.

With reference to the 1:25,000 scale Ordnance Survey mapping, a tributary of the Ellenbrook flows in a southerly direction some 200m to the east of the application site. This water feature is believed to be principally fed by surface water originating from developments east of the tributary via a network of balancing lagoons designed to control flow.

With reference to the Catchment Data Explorer on the Environment Agency website[2], approximately 600m to the east of the application site, the Ellenbrook is shown to flow within a culvert in a south westerly direction to the junction of the A1057 (Hatfield Road/St Albans Road) and Albatross Way. SLR understands the Ellenbrook tributary described above joins the Ellenbrook culvert at this approximate location and then continues south within a culvert 170m parallel with Ellenbrook Lane until it joins the Nast at the junction of Ellenbrook Lane and Ellenbrook Crescent (discussed further below).

The Nast, an ephemeral groundwater fed watercourse, flows as an open channel in a general south easterly direction through the northern part of the application site. When groundwater levels are near their seasonal high the Nast flows and combines with surface water flow fed from the adjacent Hatfield Quarry lagoons located just beyond the northwest boundary of the site at Home Covert, which is then transferred by culvert beneath the application site and adjacent sports playing fields to the southeast of the site. The culvert daylights and then continues beneath and parallel with the A1057 (Hatfield Road/St Albans Road) before joining an open concrete box channel alongside Ellenbrook Lane. The Nast then combines with the Ellenbrook approximately 170m along Ellenbrook Lane as referred to above.

2.1.1 Environment Agency Hydrology Classification

The application site is located within the River Colne Management Catchment area of the Thames River Basin District. The assessed waterbody name is the 'Ellen Brook'. However, the Nast and the tributary of the Ellenbrook have not been assessed under the WFD.

The current (2019) ecological and chemical status of the Ellenbrook completed by the Environment Agency is summarised below in Table 2-1.

[2] Environment Agency Website (Accessed on 22 June 2021) https://environment.data.gov.uk/catchment-planning/WaterBody/GB106039029820

Table 2-1
Upper Colne and Ellenbrook WFD Status 2019

Category	Details
Water Body Name	Upper Colne and Ellen Brook
Water Body Identifier Code	GB106039029820
River Basin District	Thames River
Hydromorphological Designation: Heavily Modified / Artificial	Not designated artificial or heavily modified
Current Ecological Status of Water Body	Moderate
Current Chemical Status of Water Body	Fail
Status Objective (Overall)	Good by 2027
Protected Area*	Yes

* Protected Areas are defined by the Environment Agency as 'areas that have been designated as requiring special protection under Community legislation for the protection of their surface water and groundwater or for the protection of habitats and species directly depending on water'.

The Ellenbrook has a current ecological quality of '*Moderate*' and an overall '*Moderate*' physiochemical quality while the overall specific pollutants quality is '*High*'. It has been assessed with an overall '*Moderate*' biological quality.

The chemical status has been assessed as a *'Fail*' in 2019. Priority substances have been assessed as 'Good'. Priority hazardous substances have been assessed as a 'Fail' due to exceedances of Polybrominated diphenyl ethers (PBDE) and Perfluoro octane sulphonate (PFOS). Other pollutants have been recorded as *'Does not require assessment'.*

2.1.2 Surface Water Quality

Surface water quality data has been recorded at the application site from August 2013 to April 2021. The findings are discussed in Chapter 6 of the Environmental Statement but in summary, the surface water quality monitoring data to date indicate that the overall quality of watercourses around the application site is good, with most locations recording a calcium bicarbonate type water typical of chalk areas.

2.2 Hydromorphology

An overall *'Supports good'* status has been assigned in 2019 with respect to hydromorphical supporting elements. A *'Supports good'* status has been set for morphology. A *'Does not support good'* status has been set for the hydrological regime. This may be due to the Ellenbrook being culverted through the University of Hertfordshire De Havilland campus and the Hatfield Business Park to the east of the application site, north of the A1057, which may alter the flow regime of the watercourse.

Although not assessed under the WFD, the Nast is likely to have a *'Does not support good'* status for the hydrological regime due to having been historically culverted through the application site and parallel to the residential development to the south.

2.3 Hydrogeology

Published geological mapping[3] indicates the geology comprises a superficial deposit of *Lowestoft Formation - Diamicton* overlain along the Nast by *Alluvium - Clay, Silt, Sand and Gravel*. A bedrock geology comprising the *Lewes Nodular Chalk Formation and Seaford Chalk Formation (undifferentiated) - Chalk* extends beneath the application site.

The Environment Agency classifies the Lowestoft Formation as a '*Secondary (undifferentiated)*' aquifer which '*has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type'*. The Alluvium however, is classified as a '*Secondary A*' aquifer which is defined as '*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers'*.

The Lewes Nodular Chalk Formation and Seaford Chalk Formation are classified as a '*Principal*' aquifer with '*layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer*.'

Groundwater levels within the Chalk are routinely recorded within monitoring boreholes within the application site as shown on Drawing HQ 6/4 of Chapter 6 of the Environmental Statement.

A review of the groundwater level data within the Chalk indicates the highest recorded groundwater elevation at the application site to be 71.87m AOD (northwest of the application site).

[3] BGS Website (Accessed on 22 June 2021) http://mapapps.bgs.ac.uk/geologyofbritain/home.html

2.3.1 Environment Agency Groundwater Classification

The Environment Agency Catchment Data Explorer indicates that the application site is located within the Mid-Chilterns Chalk groundwater body[4]. The Environment Agency classification of current (2019) conditions for this groundwater body is summarised below in Table 2-2.

Table 2-2
Mid-Chilterns Chalk WFD Status 2019

Category	Details
Water Body Name	Mid-Chilterns Chalk
Water Body Identifier Code	GB40601G601200
River Basin District	Thames River
Overall Classification	Poor
Current Quantitative Quality	Poor
Current Chemical Quality	Poor
Protected Area	Yes – Drinking Water Protected Area, Nitrates Directive

2.3.2 Groundwater Quality

Regionally the Environment Agency have identified a bromate plume in the Chalk; the source being a former industrial site at Sandridge approximately 2.6km northwest of the application site. The plume passes from northwest to southeast parallel with the northeast boundary of the application site. The centre of the plume is approximately 900m to the north of the application site.

Groundwater quality in the chalk and overlying mineral horizons has been monitored at locations on and adjacent to the application site since August 2013. Results are discussed in Chapter 6 of the Environmental Statement however, in summary; groundwater in the Chalk is good within the application site.

3.0 DETAILS OF PROPOSED WORKS POTENTIALLY AFFECTING WATERBODIES

A full application site description is presented within the Environmental Statement.

The key aspects of the proposed development that are considered relevant to this WFDCA are described in the following sections.

[4] Environment Agency Website (Accessed on 22 June 2021) https://environment.data.gov.uk/catchment-planning/WaterBody/GB40601G601200

3.1 The Nast

During the operational phase, to enable the construction of the proposed processing facility, the open reach of the Nast to the north of the quarry workings will be diverted along the northern perimeter of the working areas. The culverted reach of the Nast, that passes through the excavation phases of the site, will also need to be diverted to allow the mineral workings and infilling to take place. As such, it is proposed that the culvert be diverted to the east of the proposed infiltration lagoons.

Upon restoration of the application site, the Nast to the north of the excavation phases will be reinstated along its pre-quarry alignment within the northern part of the application site. The remaining, diverted part of the Nast, will be retained as a culverted watercourse around north-eastern boundary of the site.

Notwithstanding the above, during operational and restoration phases, a secondary outfall will be provided into the Nast at the southeast boundary of the application site to allow for management of groundwater and surface water during an exceedance event, should one occur.

Flow regime along the Nast will therefore not be significantly changed as a result of the proposed works.

3.2 Groundwater Quality

As the mineral workings will be infilled with inert waste, a Hydrogeological Risk Assessment (HRA) has been completed to assess the impact of the waste on groundwater quality. It was concluded in the HRA that the site will not significantly impact groundwater quality.

3.3 Dewatering

The UMH will be dewatered to allow the mineral to be worked dry, however all water will be recharged back into the aquifer. It is concluded in the ES that the proposed works will not significantly affect groundwater resources.

4.0 WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT

4.1 Overview

This WFDCA aims to determine the impact of the proposed development on the status of water bodies (surface waters and groundwater) within the catchment or catchments in which it lies. In particular it aims to identify those impacts that may cause deterioration of the status of the waterbodies, or that could hinder these water bodies from meeting their overall WFD objectives.

4.2 Approach

This assessment has been completed using a qualitative approach and is based on the extensive hydrological and hydrogeological investigations that have been completed in support of the Environmental Statement.

The approach focuses on an assessment of potential impacts from the proposed development on the following key WFD parameters.

Table 4-1
Details of Key WFD Parameters

WFD Parameters	Definition	Potential Pressures
Biological Quality Elements in Rivers and Lakes	Phytoplankton, macrophytes, phytobenthos, macro-invertebrates (algae, water plants, insects, worms, molluscs, crustacean, benthic invertebrates etc.) and fish living in or on the banks of rivers and lakes	Nutrient enrichment, morphological alterations, organic enrichment, pollution by toxic chemicals, acidification, abstraction of water. Significant change of flow regime. Significant change in surface water runoff quality and/or groundwater baseflow quality, abstraction of water.
Hydromorphological Elements	Morphological conditions comprising depth variation and bed conditions.	
Chemical and Physio-chemical Elements supporting Biological Elements	Transparency, thermal conditions, oxygenated conditions, salinity, nutrient conditions, specific pollutants & specific priority substances	
Protected Areas	Significant aquatic species, recreational water bodies, nutrient-sensitive areas, areas designated for the protection of habitats (e.g. SAC)	

4.3 Assessment of Impacts on WFD Quality Elements

The assessment of impacts on WFD elements for the surface water and groundwater within the immediate vicinity of the application site are presented within Table 4-2.

Table 4-2
Assessment of Impacts on WFD Quality Elements

WFD Parameters	Current Status (2019)	Potential Causal Link	Likelihood of Significant Effect due to Proposed Development	Basis for Assessment Conclusions
Upper Colne and Ellenbrook				
Current Ecological Status - Moderate				
Biological Elements		Yes –Diversion of the Nast.[5]		Mitigation measures identified within Environmental Statement (Ref 1) Flood Risk Assessment and Surface Water Management Plans (Appendix 6-1 of Environmental Statement) (Ref 2)
Invertebrates	Moderate		Near Zero / Low (Ref 1)	
Physio-Chemical Supporting Elements& Conditions				
Ammonia	High		Near Zero / Low (Ref 1)	
Dissolved Oxygen	Moderate			
pH	High			
Phosphate	Moderate			
Temperature	High			
Morphology	Supports Good			
Current Chemical Status – Does not require assessment			Low	

[5] Ref. Section 3.1.

WFD Parameters	Current Status	Potential Causal Link	Likelihood of Significant Effect due to Proposed Development	Basis for Assessment Conclusions
Mid-Chilterns Chalk				
Current Quantitative Status - Poor				
Current Chemical Status - Poor				
Chemical Elements		Yes –Groundwater dewatering and recharge.[6]		Mitigation measures identified within Environmental Statement (Ref 1) Flood Risk Assessment and Surface Water Management Plans (Appendix 6-1 of Environmental Statement) (Ref 2)
Drinking Water Protected Area	Poor		Low (Ref 1 & 2)	
General Chemical Test	Poor			
Saline Intrusion	Good			
Pressures & Risks				
Hazardous Substances and other pollutants (point source and pesticides)			Low (Ref 1)	
Nutrients (Nitrate)				

[6] Ref. Section 3.3.

4.4 Assessments of Impacts on WFD Objectives

Based on the above, it is concluded that the proposed development would not have any significant impacts on the following WFD Objectives:

Objective 1: The proposed scheme will not cause deterioration in the status of the biological elements of the adjacent surface water bodies.

Objective 2: The proposed scheme will not compromise the ability of the waterbody to meet its WFD status objectives.

Objective 3: The proposed scheme will not cause a permanent exclusion or compromise achieving the WFD objectives in other bodies of water in the same River Basin District.

Objective 4: The proposed scheme contributes to the delivery of the WFD objectives.

5.0 CLOSURE

This report has been prepared by SLR Consulting Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

SLR disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

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Hatfield Road Quarry
Surface Water Dip Data

Date	Monitoring Number	SW1	SW2	SW3	SW4	SW5	SW6	SW7A	SW7B	SW8	SW9	SW10	SW11	SW12	SW13	SW14	SW15	SW16	SW17	SW18
	Location Type	N	Lagoon	EB	Pond	EB	EB	N	SWD	Pond	N	N?	HQ Ditch	Pond	Pond	HQ	Nast	Nast	Pond	Pond
	Datum Elevation (mAOD)	75.352	72.480	76.911	76.115	74.790	72.587	72.420	72.373	77.500	74.000		-	-	-	-	-	-	-	-
	Base of Channel (mAOD)	75.122	-	74.246	-	73.255	71.319	71.788	71.896	-	73.449		76.630	75.133	75.848	74.383	75.071	74.097	75.459	78.061
28/08/2013	Surface Water Depth (mbdp)		0.000		2.355	1.434	1.134			0.000										
	Surface Water Elevation (mAOD)		72.480		73.760	73.356	71.453			77.500										
26/09/2013	Surface Water Depth (mbdp)		0.000		2.455	1.510	1.156			0.000										
	Surface Water Elevation (mAOD)		72.480		73.660	73.280	71.431			77.500										
22/10/2013	Surface Water Depth (mbdp)		0.000	2.640	2.159	1.439	1.108			0.000										
	Surface Water Elevation (mAOD)		72.480	74.271	73.956	73.351	71.479			77.500										
19/11/2013	Surface Water Depth (mbdp)		0.000	2.379	2.394	1.499	1.179			0.000										
	Surface Water Elevation (mAOD)		72.480	74.532	73.721	73.291	71.408			77.500										
09/12/2013	Surface Water Depth (mbdp)		0.000	2.501	2.428	1.495	1.176			0.000										
	Surface Water Elevation (mAOD)		72.480	74.410	73.687	73.295	71.411			77.500										
10/01/2014	Surface Water Depth (mbdp)	0.050	*	1.993	2.241	1.321	1.065	0.525	0.475	0.050	0.182									
	Surface Water Elevation (mAOD)	75.402	*	74.918	73.874	73.469	71.522	71.895	71.898	77.550	73.818									
03/02/2014	Surface Water Depth (mbdp)	0.108	*	1.944	2.263	1.337	1.054	0.566	0.464	0.087	0.133									
	Surface Water Elevation (mAOD)	75.460	*	74.967	73.852	73.453	71.533	71.854	71.909	77.587	73.867									
03/03/2014	Surface Water Depth (mbdp)	0.123	*	1.925	2.205	1.295	1.020	0.489	0.462	0.104	0.150									
	Surface Water Elevation (mAOD)	75.475	*	74.986	73.910	73.495	71.567	71.931	71.911	77.604	73.850									
09/04/2014	Surface Water Depth (mbdp)	-0.020	-0.260	2.140	2.386	1.470	1.150	0.590			-0.300									
	Surface Water Elevation (mAOD)	75.332	72.740	74.771	73.729	73.320	71.437	71.830			74.300									
13/05/2014	Surface Water Depth (mbdp)	0.040	-0.200	2.170	2.100	1.470	1.130			0.230										
	Surface Water Elevation (mAOD)	75.312	72.680	74.741	74.015	73.320	71.457			77.270										
02/06/2014	Surface Water Depth (mbdp)		-0.150	2.350	2.390	1.480	1.230			0.225										
	Surface Water Elevation (mAOD)		72.630	74.561	73.725	73.310	71.357			77.275										
03/07/2014	Surface Water Depth (mbdp)		0.016		2.380	1.452	1.185			0.230										
	Surface Water Elevation (mAOD)		72.464		73.735	73.338	71.402			77.270										
06/08/2014	Surface Water Depth (mbdp)		0.144		2.220	1.460	1.174			0.240										
	Surface Water Elevation (mAOD)		72.336		73.895	73.330	71.413			77.260										
27/10/2014	Surface Water Depth (mbdp)		0.300		2.090	1.490	1.170			0.260										
	Surface Water Elevation (mAOD)		72.180		74.025	73.300	71.417			77.240										
23/01/2015	Surface Water Depth (mbdp)	0.061	*	2.149	2.170	1.432	1.141	0.549		*	0.191	Running								
	Surface Water Elevation (mAOD)	75.291	*	74.762	73.945	73.358	71.446	71.871		*	73.809									
27/04/2015	Surface Water Depth (mbdp)		0.030		2.400	1.500	1.160			0.260										
	Surface Water Elevation (mAOD)		72.450		73.715	73.290	71.427			77.240										
21/07/2015	Surface Water Depth (mbdp)		0.200		2.100	1.525	1.150													
	Surface Water Elevation (mAOD)		72.280		74.015	73.265	71.437													
09+16/10/2015	Surface Water Depth (mbdp)		0.500		2.080	1.590	1.115													
	Surface Water Elevation (mAOD)		71.980		74.035	73.200	71.472													
27/01/2016	Surface Water Depth (mbdp)	0.080		2.070	2.385	1.450	1.130	0.570												
	Surface Water Elevation (mAOD)	75.272		74.841	73.730	73.340	71.457	71.850												
04/02/2016	Surface Water Depth (mbdp)													0.435	0.020		0.070	0.190	0.450	0.100
	Surface Water Elevation (mAOD)													75.568	75.868		75.141	74.287	75.909	78.161
11-12/04/2016	Surface Water Depth (mbdp)	0.072		2.115	2.380	1.487	1.140	0.576								0.03		0.22	0.37	
	Surface Water Elevation (mAOD)	75.280		74.796	73.735	73.303	71.447	71.844								74.413		74.317	75.829	
18/04/2016	Surface Water Depth (mbdp)										0.260				0.015					0.11
	Surface Water Elevation (mAOD)										73.740				75.863					78.171
25/07/2016	Surface Water Depth (mbdp)				2.450	1.490	1.160													
	Surface Water Elevation (mAOD)				73.665	73.300	71.427													
07/03/2017	Surface Water Depth (mbdp)		0.095	2.353	2.046	1.400	1.080			0.190					0.037					
	Surface Water Elevation (mAOD)		72.385	74.558	74.069	73.390	71.507			77.310			76.690							

Key	
-0.3	Negative value indicates water level above datum
	Water level above datum elevation
*	Unable to measure from datum
	Sample Point DRY
	Not Recorded

BROMATE AND BROMIDE

June 2021

Hatfield Road Quarry
Surface Water Quality Data - Bromate and Bromide

Brett Aggregates Ltd

Location	Analysis	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Nov-17	Feb-18	May-18	Mar-19	May-19
SW1	Bromide	-			0.12	0.2		0.144				0.188	0.168								
SW1	Bromate (DWS)	0.01			<0.1	<0.1		<0.0005				<0.0005	<0.0005								
SW2	Bromide	-	0.058	<0.05	<0.05	<0.05	0.047	0.018	0.038	0.037	0.031										
SW2	Bromate (DWS)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005										
SW3	Bromide	-		<0.05	<0.05	<0.05		0.064	0.074			0.082	0.082			0.158		0.34	0.066		
SW3	Bromate (DWS)	0.01		<0.1	<0.1	<0.1		<0.0005	<0.0005			<0.0005	<0.0005			<0.0005		0.0018	<0.0005		
SW4	Bromide	-	0.054	<0.05	<0.05	0.078	0.159	0.128	0.252	0.127	0.267	0.362	0.156	0.241	0.271	0.318	0.346	0.381	0.244		
SW4	Bromate (DWS)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.005		
SW5	Bromide	-	0.051	<0.05	<0.05	0.064	0.162	0.088	0.256	0.126	0.242	0.220	0.140	0.242	0.274	0.331		0.155	0.242		
SW5	Bromate (DWS)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005		
SW6	Bromide	-	<0.05	<0.05	0.07	0.056	0.158	0.088	0.253	0.126	0.259	0.108	0.138	0.234	0.274	0.116	0.348	0.148	0.038		
SW6	Bromate (DWS)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0014	<0.0005		
SW7	Bromide	-			<0.05			0.054				0.096	0.144								
SW7	Bromate (DWS)	0.01			<0.1			<0.0005				<0.0005	<0.0005								
SW8	Bromide	-	<0.05	<0.05	<0.05	<0.05	0.049	0.094	0.046	0.041	0.041										
SW8	Bromate (DWS)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005										
SW9	Bromide	-			0.081			0.093	0.038												
SW9	Bromate (DWS)	0.01			<0.1			<0.0005	<0.0005												
SW10	Bromide	-																			
SW10	Bromate (DWS)	0.01																			
SW11	Bromide	-														0.085				0.08	0.24
SW11	Bromate (DWS)	0.01														<0.0005				0.0006	<0.0005
SW12	Bromide	-										0.048	0.03	0.066							
SW12	Bromate (DWS)	0.01										<0.0005	<0.0005	<0.0005							
SW14	Bromide	-											0.11								
SW14	Bromate (DWS)	0.01											<0.0005								

KEY	
0.404	Sample above laboratory detection limit but below DWS
0.0253	Sample exceeds DWS
	Not sampled

METALS

Hatfield Road Quarry
Surface Water Quality Data - Metals

LOCATION	ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW1	Arsenic	0.05	-	-	0.002	<0.0009	-	-	-	-	-	-	-	-	-	-	-	-	-
SW1	Boron	2	-	-	0.084	0.023	-	-	-	-	-	-	-	-	-	-	-	-	-
SW1	Cadmium	0.00008	-	-	0.00019	<0.00003	-	-	-	-	-	<0.00003	<0.00003	-	-	-	-	-	-
SW1	Total Chromium	0.0047	-	-	0.00081	<0.0002	-	-	-	-	-	0.0059	<0.0002	-	-	-	-	-	-
SW1	Copper (Hardness dependent)	1	-	-	0.0061	<0.003	-	-	-	-	-	<0.003	<0.003	-	-	-	-	-	-
SW1	Total Iron	1	-	-	2.4	0.12	-	-	-	-	-	0.027	0.13	-	-	-	-	-	-
SW1	Lead	0.0012	-	-	0.0055	0.00078	-	-	-	-	-	<0.0004	<0.0004	-	-	-	-	-	-
SW1	Mercury	0.00005	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	-	-	-	-
SW1	Nickel	0.004	-	-	0.0026	0.0021	-	-	-	-	-	0.0006	0.0009	-	-	-	-	-	-
SW1	Selenium	0.01	-	-	<0.0012	<0.0012	-	-	-	-	-	<0.0012	<0.0012	-	-	-	-	-	-
SW1	Vanadium	0.02	-	-	0.0017	<0.0006	-	-	-	-	-	-	-	-	-	-	-	-	-
SW1	Zinc (Hardness dependent)	0.0109	-	-	0.023	0.0043	-	-	-	-	-	0.0075	0.0034	-	-	-	-	-	-
SW1	Manganese	0.03	-	-	-	-	-	-	-	-	-	0.086	0.23	-	-	-	-	-	-
SW2	Arsenic	0.05	-	0.0055	0.0013	<0.0009	-	-	-	-	<0.0025	-	-	-	-	-	-	-	-
SW2	Boron	2	-	0.02	0.023	0.12	-	-	-	-	0.051	-	-	-	-	-	-	-	-
SW2	Cadmium	0.00008	-	<0.00003	0.00015	<0.00003	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-
SW2	Total Chromium	0.0047	-	<0.0002	0.00028	<0.0002	-	-	-	-	<0.0015	-	-	-	-	-	-	-	-
SW2	Copper (Hardness dependent)	1	-	<0.003	0.0031	<0.003	-	-	-	-	<0.007	-	-	-	-	-	-	-	-
SW2	Total Iron	1	-	0.073	0.27	0.34	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2	Lead	0.0012	-	<0.0004	0.0022	<0.0004	-	-	-	-	<0.005	-	-	-	-	-	-	-	-
SW2	Mercury	0.00005	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-
SW2	Nickel	0.004	-	<0.0002	0.0006	0.00094	-	-	-	-	<0.002	-	-	-	-	-	-	-	-
SW2	Selenium	0.01	-	<0.0012	<0.0012	<0.0012	-	-	-	-	<0.003	-	-	-	-	-	-	-	-
SW2	Vanadium	0.02	-	0.0024	0.0013	0.0016	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2	Zinc (Hardness dependent)	0.0109	-	0.0024	0.0044	0.0018	-	-	-	-	<0.003	-	-	-	-	-	-	-	-
SW2	Manganese	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Arsenic	0.05	-	0.0098	<0.0009	<0.0009	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Boron	2	-	0.032	0.027	0.023	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Cadmium	0.00008	-	0.00014	<0.00003	<0.00003	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Total Chromium	0.0047	-	0.0002	0.00031	<0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Copper (Hardness dependent)	1	-	<0.003	0.0032	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Total Iron	1	-	0.074	0.097	0.28	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Lead	0.0012	-	0.0033	0.003	0.0021	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Mercury	0.00005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Nickel	0.004	-	0.0013	0.0014	0.0016	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Selenium	0.01	-	<0.0012	<0.0012	<0.0012	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Vanadium	0.02	-	0.0024	0.002	0.0014	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Zinc (Hardness dependent)	0.0109	-	0.007	0.0097	0.0062	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Manganese	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4	Arsenic	0.05	-	0.0044	<0.0009	<0.0009	-	-	-	-	<0.0009	-	-	-	-	-	-	-	-
SW4	Boron	2	-	0.032	0.022	0.008	-	-	-	-	0.024	-	-	-	-	-	-	-	-
SW4	Cadmium	0.00008	-	<0.00003	<0.00003	<0.00003	-	-	-	-	<0.00003	-	-	-	-	-	-	-	-
SW4	Total Chromium	0.0047	-	<0.0002	0.0003	<0.0002	-	-	-	-	<0.0002	-	-	-	-	-	-	-	-
SW4	Copper (Hardness dependent)	1	-	<0.003	<0.003	<0.003	-	-	-	-	<0.003	-	-	-	-	-	-	-	-
SW4	Total Iron	1	-	0.12	0.023	0.15	-	-	-	-	0.11	-	-	-	-	-	-	-	-
SW4	Lead	0.0012	-	<0.0004	0.0011	0.0011	-	-	-	-	0.002	-	-	-	-	-	-	-	-
SW4	Mercury	0.00005	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-
SW4	Nickel	0.004	-	<0.0002	0.00034	0.0011	-	-	-	-	0.0005	-	-	-	-	-	-	-	-
SW4	Selenium	0.01	-	<0.0012	<0.0012	<0.0012	-	-	-	-	<0.0012	-	-	-	-	-	-	-	-
SW4	Vanadium	0.02	-	0.0009	0.0016	0.0017	-	-	-	-	<0.0006	-	-	-	-	-	-	-	-
SW4	Zinc (Hardness dependent)	0.0109	-	0.02	0.034	0.03	-	-	-	-	0.012	-	-	-	-	-	-	-	-
SW4	Manganese	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hatfield Road Quarry
Surface Water Quality Data - Metals

LOCATION	ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW5	Arsenic	0.05	-	0.0042	<0.0009	<0.0009	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Boron	2	-	0.028	0.023	0.0072	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Cadmium	0.00008	-	<0.00003	<0.00003	<0.00003	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Total Chromium	0.0047	-	0.00022	0.0012	<0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Copper (Hardness dependent)	1	-	<0.003	0.004	0.0033	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Total Iron	1	-	0.12	0.68	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Lead	0.0012	-	0.00073	0.0049	0.0021	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Mercury	0.00005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Nickel	0.004	-	<0.0002	0.001	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Selenium	0.01	-	<0.0012	<0.0012	<0.0012	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Vanadium	0.02	-	0.0015	0.0031	<0.0006	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Zinc (Hardness dependent)	0.0109	-	0.023	0.027	0.037	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Manganese	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Arsenic	0.05	-	0.0041	<0.0009	<0.0009	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Boron	2	-	0.027	0.034	0.014	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Cadmium	0.00008	-	<0.00003	<0.00003	<0.00003	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Total Chromium	0.0047	-	0.00032	0.00081	<0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Copper (Hardness dependent)	1	-	<0.003	0.0031	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Total Iron	1	-	0.11	0.7	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Lead	0.0012	-	<0.0004	0.0056	0.00072	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Mercury	0.00005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Nickel	0.004	-	0.00034	0.0007	0.00092	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Selenium	0.01	-	<0.0012	<0.0012	<0.0012	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Vanadium	0.02	-	0.0015	0.0023	<0.0006	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Zinc (Hardness dependent)	0.0109	-	0.023	0.015	0.025	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Manganese	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW7A	Arsenic	0.05	-	-	0.0012	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW7A	Boron	2	-	-	0.042	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW7A	Cadmium	0.00008	-	-	<0.00003	-	-	-	-	-	-	<0.00003	<0.00003	-	-	-	-	-	-
SW7A	Total Chromium	0.0047	-	-	0.00078	-	-	-	-	-	-	0.011	<0.0002	-	-	-	-	-	-
SW7A	Copper (Hardness dependent)	1	-	-	<0.003	-	-	-	-	-	-	0.003	<0.003	-	-	-	-	-	-
SW7A	Total Iron	1	-	-	0.7	-	-	-	-	-	-	0.054	0.071	-	-	-	-	-	-
SW7A	Lead	0.0012	-	-	0.0051	-	-	-	-	-	-	<0.0004	<0.0004	-	-	-	-	-	-
SW7A	Mercury	0.00005	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	-	-	-	-	-
SW7A	Nickel	0.004	-	-	0.0011	-	-	-	-	-	-	0.0009	0.001	-	-	-	-	-	-
SW7A	Selenium	0.01	-	-	<0.0012	-	-	-	-	-	-	<0.0012	<0.0012	-	-	-	-	-	-
SW7A	Vanadium	0.02	-	-	0.0028	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW7A	Zinc (Hardness dependent)	0.0109	-	-	0.0067	-	-	-	-	-	-	0.0056	0.0023	-	-	-	-	-	-
SW7A	Manganese	0.03	-	-	-	-	-	-	-	-	-	0.072	0.092	-	-	-	-	-	-
SW8	Arsenic	0.05	-	0.0039	<0.0009	0.0012	-	-	-	-	<0.0025	-	-	-	-	-	-	-	-
SW8	Boron	2	-	0.017	0.023	0.034	-	-	-	-	0.021	-	-	-	-	-	-	-	-
SW8	Cadmium	0.00008	-	<0.00003	<0.00003	<0.00003	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-
SW8	Total Chromium	0.0047	-	<0.0002	0.0013	0.0054	-	-	-	-	0.0067	-	-	-	-	-	-	-	-
SW8	Copper (Hardness dependent)	1	-	<0.003	<0.003	<0.003	-	-	-	-	<0.007	-	-	-	-	-	-	-	-
SW8	Total Iron	1	-	0.48	0.41	0.55	-	-	-	-		-	-	-	-	-	-	-	-
SW8	Lead	0.0012	-	0.0029	0.0043	0.0028	-	-	-	-	<0.005	-	-	-	-	-	-	-	-
SW8	Mercury	0.00005	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-
SW8	Nickel	0.004	-	<0.0002	0.00055	0.0015	-	-	-	-	<0.002	-	-	-	-	-	-	-	-
SW8	Selenium	0.01	-	<0.0012	<0.0012	<0.0012	-	-	-	-	<0.003	-	-	-	-	-	-	-	-
SW8	Vanadium	0.02	-	0.0019	0.0013	0.0041	-	-	-	-		-	-	-	-	-	-	-	-
SW8	Zinc (Hardness dependent)	0.0109	-	0.0017	0.0035	0.0056	-	-	-	-	0.007	-	-	-	-	-	-	-	-
SW8	Manganese	0.03	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-

Hatfield Road Quarry
Surface Water Quality Data - Metals

LOCATION	ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW9	Arsenic	0.05	-		<0.0009	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Boron	2	-		0.044	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Cadmium	0.00008	-		<0.00003	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Total Chromium	0.0047	-		<0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Copper (Hardness dependent)	1	-		<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Total Iron	1	-		0.071	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Lead	0.0012	-		0.0017	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Mercury	0.00005	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Nickel	0.004	-		0.00032	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Selenium	0.01	-		<0.0012	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Vanadium	0.02	-		0.0007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Zinc (Hardness dependent)	0.0109	-		0.0042	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Manganese	0.03	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Arsenic	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Boron	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Cadmium	0.00008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Total Chromium	0.0047	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Copper (Hardness dependent)	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Total Iron	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Lead	0.0012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Mercury	0.00005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Nickel	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Selenium	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Vanadium	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Zinc (Hardness dependent)	0.0109	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Manganese	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	Arsenic	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	Boron	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	Cadmium	0.00008	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00003	<0.00003	<0.00003	<0.00003
SW11	Total Chromium	0.0047	-	-	-	-	-	-	-	-	-	-	-	-	-	0.011	0.0012	0.0061	<0.0002
SW11	Copper (Hardness dependent)	1	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.003	<0.003	<0.003	<0.003
SW11	Total Iron	1	-	-	-	-	-	-	-	-	-	-	-	-	-	0.032	0.012	0.043	0.11
SW11	Lead	0.0012	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0004	<0.0004	<0.0004	<0.0004
SW11	Mercury	0.00005	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00005	<0.0005	<0.0005	<0.0005
SW11	Nickel	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0014	0.0023	0.0013	0.002
SW11	Selenium	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0012	2.7	<0.0012	<0.0012
SW11	Vanadium	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11	Zinc (Hardness dependent)	0.0109	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0033	0.0022	0.0044	0.0059
SW11	Manganese	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.037	0.0022	0.043	0.81
SW12	Arsenic	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW12	Boron	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW12	Cadmium	0.00008	-	-	-	-	-	-	-	-	-	0.0006	<0.00003	<0.00003	-	-	-	-	-
SW12	Total Chromium	0.0047	-	-	-	-	-	-	-	-	-	0.0058	0.0005	<0.0002	-	-	-	-	-
SW12	Copper (Hardness dependent)	1	-	-	-	-	-	-	-	-	-	0.015	0.01	<0.003	-	-	-	-	-
SW12	Total Iron	1	-	-	-	-	-	-	-	-	-	0.33	1.1	1.5	-	-	-	-	-
SW12	Lead	0.0012	-	-	-	-	-	-	-	-	-	<0.0004	0.0019	<0.0004	-	-	-	-	-
SW12	Mercury	0.00005	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	-	-	-	-	-
SW12	Nickel	0.004	-	-	-	-	-	-	-	-	-	0.0048	0.0048	0.0032	-	-	-	-	-
SW12	Selenium	0.01	-	-	-	-	-	-	-	-	-	<0.0012	<0.0012	<0.0012	-	-	-	-	-
SW12	Vanadium	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW12	Zinc (Hardness dependent)	0.0109	-	-	-	-	-	-	-	-	-	0.47	0.098	0.0067	-	-	-	-	-
SW12	Manganese	0.03	-	-	-	-	-	-	-	-	-	0.18	0.17	0.52	-	-	-	-	-

Hatfield Road Quarry
Surface Water Quality Data - Metals

LOCATION	ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW14	Arsenic	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW14	Boron	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW14	Cadmium	0.00008	-	-	-	-	-	-	-	-	-	-	<0.00003	-	-	-	-	-	-
SW14	Total Chromium	0.0047	-	-	-	-	-	-	-	-	-	-	<0.0002	-	-	-	-	-	-
SW14	Copper (Hardness dependent)	1	-	-	-	-	-	-	-	-	-	-	<0.003	-	-	-	-	-	-
SW14	Total Iron	1	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-
SW14	Lead	0.0012	-	-	-	-	-	-	-	-	-	-	<0.0004	-	-	-	-	-	-
SW14	Mercury	0.00005	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	-	-	-
SW14	Nickel	0.004	-	-	-	-	-	-	-	-	-	-	0.0006	-	-	-	-	-	-
SW14	Selenium	0.01	-	-	-	-	-	-	-	-	-	-	<0.0012	-	-	-	-	-	-
SW14	Vanadium	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW14	Zinc (Hardness dependent)	0.0109	-	-	-	-	-	-	-	-	-	-	0.003	-	-	-	-	-	-
SW14	Manganese	0.03	-	-	-	-	-	-	-	-	-	-	0.12	-	-	-	-	-	-

Key	All results reported in mg/l.
–	Not sampled/analysed/no EQS available
EQS	UK EQS 2015
DWS	
888	Exceeds Detection Limit
888	Exceeds EQS/DWS

INORGANIC INDICATORS

Hatfield Road Quarry
Surface Water Quality Data - Major Ions Inorganics

LOCATION		ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW1	Major Ions	Sodium	-	-	-	9.0	12.0	-	-	-	-	-	11	11	-	-	-	-	-	-
SW1		Potassium	-	-	-	6.4	4.9	-	-	-	-	-	5.3	4.6	-	-	-	-	-	-
SW1		Calcium	-	-	-	80	92	-	-	-	-	-	79	80	-	-	-	-	-	-
SW1		Magnesium	-	-	-	5.7	5	-	-	-	-	-	4.5	4.1	-	-	-	-	-	-
SW1		Chloride	250	-	-	12	19	-	-	-	-	-	19	23	-	-	-	-	-	-
SW1		Carbonate Alkalinity as CaCO3	-	-	-	<1.0	<1.0	-	-	-	-	-			-	-	-	-	-	-
SW1		Bicarbonate Alkalinity as CaCO3	-	-	-	260	230	-	-	-	-	-	200	200	-	-	-	-	-	-
SW1		Sulphate	400	-	-	20	13	-	-	-	-	-	34	44	-	-	-	-	-	-
SW1	Inorganics and Others	Nitrate as NO3	50	-	-	2.3	<0.2	-	-	-	-	-	<0.2	0.7	-	-	-	-	-	-
SW1		Nitrite as NO_2	-	-	-	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-
SW1		Fluoride	1	-	-	-	-	-	-	-	-	-	<0.3	<0.3	-	-	-	-	-	-
SW1		Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	-	-	-	-	-	-
SW1		Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
SW1		Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
SW1		Complex Cyanide	-	-	-	<0.01	<0.01	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
SW1		Ammoniacal Nitrogen as NH4	0.3	-	-	2.5	0.33	-	-	-	-	-	0.15	0.13	-	-	-	-	-	-
SW1		Total Alkalinity as CaCO3	-	-	-	260	230	-	-	-	-	-	200	200	-	-	-	-	-	-
SW1		Total Organic Carbon	-	-	-	9.4	10	-	-	-	-	-	5	4	-	-	-	-	-	-
SW1		Total Suspended Solids	-	-	-	<10	18	-	-	-	-	-	-	-	-	-	-	-	-	-
SW1		Organic Nitrogen	-	-	-	4.5	3.5	-	-	-	-	-	-	-	-	-	-	-	-	-
SW1		Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	8	7	-	-	-	-	-	-
SW1		Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	24	41	-	-	-	-	-	-
SW1		Electrical Conductivity	-	-	-	-	-	-	-	-	-	-	460	460	-	-	-	-	-	-
SW1		pH	-	-	-	-	-	-	-	-	-	-	7	7.2	-	-	-	-	-	-
SW2	Major Ions	Sodium	-	-	8.7	3.5	5	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Potassium	-	-	5.1	4.3	4.8	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Calcium	-	-	59	34	51	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Magnesium	-	-	4.7	1.9	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Chloride	250	-	11	6.2	7.7	-	-	-	-	7.8	-	-	-	-	-	-	-	-
SW2		Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Bicarbonate Alkalinity as CaCO3	-	-	150	110	130	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Sulphate	400	-	25	0.22	9.2	-	-	-	-	37	-	-	-	-	-	-	-	-
SW2	Inorganics and Others	Nitrate as NO3	50	-	<0.2	0.58	<0.2	-	-	-	-	<0.2	-	-	-	-	-	-	-	-
SW2		Nitrite as NO_2	-	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Fluoride	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Complex Cyanide	-	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Ammoniacal Nitrogen as NH4	0.3	-	0.033	0.062	0.09	-	-	-	-	0.16	-	-	-	-	-	-	-	-
SW2		Total Alkalinity as CaCO3	-	-	150	110	130	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Total Organic Carbon	-	-	11	12	10	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Total Suspended Solids	-	-	<10	31	<10	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Organic Nitrogen	-	-	15	4.6	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Biological Oxygen Demand	-	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Chemical Oxygen Demand	-	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		Electrical Conductivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2		pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LOCATION		ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW3	Major Ions	Sodium	-	-	16	16	34	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Potassium	-	-	4.9	2.9	3.4	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Calcium	-	-	120	65	92	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Magnesium	-	-	6.9	3.1	7.3	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Chloride	250	-	29	24	62	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Bicarbonate Alkalinity as CaCO3	-	-	230	140	210	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Sulphate	400	-	92	34	43	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Inorganics and Others	Nitrate as NO3	50	-	5.3	12	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Nitrite as NO_2	-	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Fluoride	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Complex Cyanide	-	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Ammoniacal Nitrogen as NH4	0.3	-	0.049	0.057	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Total Alkalinity as CaCO3	-	-	230	140	210	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Total Organic Carbon	-	-	11	10	13	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Total Suspended Solids	-	-	<10	15	10	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Organic Nitrogen	-	-	3.1	3.1	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Biological Oxygen Demand	-	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Chemical Oxygen Demand	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Electrical Conductivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3		pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4	Major Ions	Sodium	-	-	34	43	29	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Potassium	-	-	2.8	2.3	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Calcium	-	-	35	38	31	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Magnesium	-	-	2.1	1.3	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Chloride	250	-	96	62	38	-	-	-	-	34	-	-	-	-	-	-	-	-
SW4		Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Bicarbonate Alkalinity as CaCO3	-	-	87	87	89	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Sulphate	400	-	19	25	13	-	-	-	-	13	-	-	-	-	-	-	-	-
SW4	Inorganics and Others	Nitrate as NO3	50	-	0.49	4.4	1.2	-	-	-	-	1.1	-	-	-	-	-	-	-	-
SW4		Nitrite as NO_2	-	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Fluoride	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Complex Cyanide	-	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Ammoniacal Nitrogen as NH4	0.3	-	0.35	0.11	0.37	-	-	-	-	0.33	-	-	-	-	-	-	-	-
SW4		Total Alkalinity as CaCO3	-	-	87	87	89	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Total Organic Carbon	-	-	2.1	20	4.8	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Total Suspended Solids	-	-	14	16	39	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Organic Nitrogen	-	-	7.9	2.0	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Biological Oxygen Demand	-	-	2.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Chemical Oxygen Demand	-	-	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		Electrical Conductivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4		pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LOCATION		ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW5	Major Ions	Sodium	-	-	32	27	31	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Potassium	-	-	2.7	2.9	2.1	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Calcium	-	-	36	53	32	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Magnesium	-	-	1.5	2.5	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Chloride	250	-	26	40	38	-	-	-	-	34	-	-	-	-	-	-	-	-
SW5		Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Bicarbonate Alkalinity as CaCO3	-	-	99	120	89	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Sulphate	400	-	82	32	14	-	-	-	-	12	-	-	-	-	-	-	-	-
SW5	Inorganics and Others	Nitrate as NO3	50	-	0.75	9.3	1.2	-	-	-	-	1.2	-	-	-	-	-	-	-	-
SW5		Nitrite as NO_2	-	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Fluoride	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Complex Cyanide	-	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Ammoniacal Nitrogen as NH4	0.3	-	0.29	0.076	0.31	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Total Alkalinity as CaCO3	-	-	99	120	89	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Total Organic Carbon	-	-	<2	7.1	5.1	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Total Suspended Solids	-	-	<10	16	16	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Organic Nitrogen	-	-	9.0	2.8	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Biological Oxygen Demand	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Chemical Oxygen Demand	-	-	<7.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		Electrical Conductivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5		pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Major Ions	Sodium	-	-	29	20	30	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Potassium	-	-	2.6	4.3	2.1	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Calcium	-	-	34	67	32	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Magnesium	-	-	1.5	3.3	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Chloride	250	-	41	27	38	-	-	-	-	33	-	-	-	-	-	-	-	-
SW6		Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Bicarbonate Alkalinity as CaCO3	-	-	87	170	82	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Sulphate	400	-	20	40	13	-	-	-	-	12	-	-	-	-	-	-	-	-
SW6	Inorganics and Others	Nitrate as NO3	50	-	1.6	6.2	1.6	-	-	-	-	2.5	-	-	-	-	-	-	-	-
SW6		Nitrite as NO_2	-	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Fluoride	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Complex Cyanide	-	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Ammoniacal Nitrogen as NH4	0.3	-	0.069	0.16	0.23	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Total Alkalinity as CaCO3	-	-	87	170	82	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Total Organic Carbon	-	-	5.8	8.0	5.1	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Total Suspended Solids	-	-	10	19	<10	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Organic Nitrogen	-	-	1.3	2.6	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Biological Oxygen Demand	-	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Chemical Oxygen Demand	-	-	<7.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		Electrical Conductivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6		pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LOCATION		ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW7A	Major Ions	Sodium	-	-	-	11	-	-	-	-	-	-	9.5	9.7	-	-	-	-	-	-
SW7A		Potassium	-	-	-	5.1	-	-	-	-	-	-	3.1	2.4	-	-	-	-	-	-
SW7A		Calcium	-	-	-	75	-	-	-	-	-	-	110	110	-	-	-	-	-	-
SW7A		Magnesium	-	-	-	3.7	-	-	-	-	-	-	5	4.8	-	-	-	-	-	-
SW7A		Chloride	250	-	-	17	-	-	-	-	-	-	14	16	-	-	-	-	-	-
SW7A		Carbonate Alkalinity as CaCO3	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW7A		Bicarbonate Alkalinity as CaCO3	-	-	-	180	-	-	-	-	-	-	250	220	-	-	-	-	-	-
SW7A		Sulphate	400	-	-	41	-	-	-	-	-	-	66	63	-	-	-	-	-	-
SW7A	Inorganics and Others	Nitrate as NO3	50	-	-	5.3	-	-	-	-	-	-	2.7	2.7	-	-	-	-	-	-
SW7A		Nitrite as NO_2	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW7A		Fluoride	1	-	-	-	-	-	-	-	-	-	<0.3	<0.3	-	-	-	-	-	-
SW7A		Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	0.6	0.6	-	-	-	-	-	-
SW7A		Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
SW7A		Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
SW7A		Complex Cyanide	-	-	-	<0.01	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
SW7A		Ammoniacal Nitrogen as NH4	0.3	-	-	0.19	-	-	-	-	-	-	0.09	0.06	-	-	-	-	-	-
SW7A		Total Alkalinity as CaCO3	-	-	-	180	-	-	-	-	-	-	250	220	-	-	-	-	-	-
SW7A		Total Organic Carbon	-	-	-	8.0	-	-	-	-	-	-	6	<2	-	-	-	-	-	-
SW7A		Total Suspended Solids	-	-	-	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW7A		Organic Nitrogen	-	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW7A		Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	1	<1	-	-	-	-	-	-
SW7A		Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	20	19	-	-	-	-	-	-
SW7A		Electrical Conductivity	-	-	-	-	-	-	-	-	-	-	580	560	-	-	-	-	-	-
SW7A		pH	-	-	-	-	-	-	-	-	-	-	7.6	7.7	-	-	-	-	-	-
SW8	Major Ions	Sodium	-	-	4.7	4.9	5.4	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Potassium	-	-	15	11	9.2	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Calcium	-	-	25	20	19	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Magnesium	-	-	3.0	2.3	2.1	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Chloride	250	-	8.9	9.5	9.6	-	-	-	-	9.6	-	-	-	-	-	-	-	-
SW8		Carbonate Alkalinity as CaCO3	-	-	<1.0	<1.0	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Bicarbonate Alkalinity as CaCO3	-	-	97	87	66	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Sulphate	400	-	<0.05	<0.05	<0.05	-	-	-	-	<0.05	-	-	-	-	-	-	-	-
SW8	Inorganics and Others	Nitrate as NO3	50	-	<0.2	1.3	<0.2	-	-	-	-	<0.2	-	-	-	-	-	-	-	-
SW8		Nitrite as NO_2	-	-	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Fluoride	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Complex Cyanide	-	-	0.011	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Ammoniacal Nitrogen as NH4	0.3	-	3.4	4.3	1.16	-	-	-	-	3.4	-	-	-	-	-	-	-	-
SW8		Total Alkalinity as CaCO3	-	-	97	87	66	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Total Organic Carbon	-	-	17	18	23	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Total Suspended Solids	-	-	26	30	32	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Organic Nitrogen	-	-	12	5.4	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Biological Oxygen Demand	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Chemical Oxygen Demand	-	-	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		Electrical Conductivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8		pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LOCATION		ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW9	Major Ions	Sodium	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Potassium	-	-	-	5.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Calcium	-	-	-	64	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Magnesium	-	-	-	3.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Chloride	250	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Carbonate Alkalinity as CaCO3	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Bicarbonate Alkalinity as CaCO3	-	-	-	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Sulphate	400	-	-	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Inorganics and Others	Nitrate as NO3	50	-	-	4.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Nitrite as NO_2	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Fluoride	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Complex Cyanide	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Ammoniacal Nitrogen as NH4	0.3	-	-	0.21	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Total Alkalinity as CaCO3	-	-	-	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Total Organic Carbon	-	-	-	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Total Suspended Solids	-	-	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Organic Nitrogen	-	-	-	2.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		Electrical Conductivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9		pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Major Ions	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Chloride	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Sulphate	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Inorganics and Others	Nitrate as NO3	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Fluoride	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Complex Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Ammoniacal Nitrogen as NH4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		Electrical Conductivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10		pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LOCATION		ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW11	Major Ions	Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	30	24	22
SW11		Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.3	2.7	3.2	4.7
SW11		Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	64	81	79	96
SW11		Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.3	4.3
SW11		Metaldehyde	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-
SW11		Chloride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	53	46
SW11		Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-
SW11		Bicarbonate Alkalinity as CaCO3	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11		Sulphate	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42	68
SW11	Inorganics and Others	Nitrate as NO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5	<0.2
SW11		Nitrite as NO_2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11		Fluoride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	<0.3
SW11		Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6	<0.2
SW11		Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11		Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11		Complex Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11		Ammoniacal Nitrogen as NH4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	0.21
SW11		Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	140	160	190	190
SW11		Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	6	8	8
SW11		Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10	-
SW11		Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW11		Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	1	<1	<1
SW11		Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	28	220	26
SW11		Electrical Conductivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	550	590	500	580
SW11		Total Cations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.34	6.22
SW11		Total Anions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.21	6.51
SW11		% Cation Excess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-7.53	-2.28
SW11		pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.3	6.8	7.6	7.7
SW12	Major Ions	Sodium	-	-	-	-	-	-	-	-	-	-	9.4	8.5	8	-	-	-	-	-
SW12		Potassium	-	-	-	-	-	-	-	-	-	-	11	9.5	13	-	-	-	-	-
SW12		Calcium	-	-	-	-	-	-	-	-	-	-	25	25	24	-	-	-	-	-
SW12		Magnesium	-	-	-	-	-	-	-	-	-	-	2.9	2.4	2.2	-	-	-	-	-
SW12		Chloride	250	-	-	-	-	-	-	-	-	-	20	18	17	-	-	-	-	-
SW12		Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-
SW12		Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	41	53	-	-	-	-	-	-
SW12		Sulphate	400	-	-	-	-	-	-	-	-	-	53	24	1.8	-	-	-	-	-
SW12	Inorganics and Others	Nitrate as NO3	50	-	-	-	-	-	-	-	-	-	6.6	<0.2	<0.2	-	-	-	-	-
SW12		Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW12		Fluoride	1	-	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	-	-	-	-	-
SW12		Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	1.6	<0.2	<0.2	-	-	-	-	-
SW12		Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
SW12		Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
SW12		Complex Cyanide	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-
SW12		Ammoniacal Nitrogen as NH4	0.3	-	-	-	-	-	-	-	-	-	0.09	0.13	0.59	-	-	-	-	-
SW12		Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	41	53	76	-	-	-	-	-
SW12		Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	16	26	25	-	-	-	-	-
SW12		Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW12		Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW12		Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	2	3	4	-	-	-	-	-
SW12		Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	54	74	79	-	-	-	-	-
SW12		Electrical Conductivity	-	-	-	-	-	-	-	-	-	-	240	220	210	-	-	-	-	-
SW12		pH	-	-	-	-	-	-	-	-	-	-	6.8	7	6.8	-	-	-	-	-

LOCATION		ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW14	Major Ions	Sodium	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-
SW14		Potassium	-	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-	-	-	-
SW14		Calcium	-	-	-	-	-	-	-	-	-	-	-	45	-	-	-	-	-	-
SW14		Magnesium	-	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	-
SW14		Chloride	250	-	-	-	-	-	-	-	-	-	-	9.7	-	-	-	-	-	-
SW14		Carbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW14		Bicarbonate Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	91	-	-	-	-	-	-
SW14		Sulphate	400	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-	-
SW14	Inorganics and Others	Nitrate as NO3	50	-	-	-	-	-	-	-	-	-	-	9.3	-	-	-	-	-	-
SW14		Nitrite as NO_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW14		Fluoride	1	-	-	-	-	-	-	-	-	-	-	<0.3	-	-	-	-	-	-
SW14		Total Oxidised Nitrogen as N	-	-	-	-	-	-	-	-	-	-	-	2.1	-	-	-	-	-	-
SW14		Free Cyanide	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW14		Total Cyanide	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW14		Complex Cyanide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW14		Ammoniacal Nitrogen as NH4	0.3	-	-	-	-	-	-	-	-	-	-	0.12	-	-	-	-	-	-
SW14		Total Alkalinity as CaCO3	-	-	-	-	-	-	-	-	-	-	-	91	-	-	-	-	-	-
SW14		Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-	-	-	-
SW14		Total Suspended Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW14		Organic Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW14		Biological Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
SW14		Chemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	49	-	-	-	-	-	-
SW14		Electrical Conductivity	-	-	-	-	-	-	-	-	-	-	-	270	-	-	-	-	-	-
SW14		pH	-	-	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-	-

Key	
	All results reported in mg/l.
–	Not sampled/analysed/no EQS available
EQS	UK EQS 2015
DWS	
888	Exceeds Detection Limit
888	Exceeds EQS/DWS

VOCs

SVOCs

PAHs

Pesticides

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW1	VOCs	Dichlorodifluoromethane	-	<0.002	-	<0.002
SW1		Methyl Tertiary Butyl Ether	0.0015	<0.0001	-	<0.0001
SW1		Chloromethane	-	<0.003	-	<0.003
SW1		Vinyl Chloride	0.0005	<0.0001	-	<0.0001
SW1		Bromomethane	-	<0.001	-	<0.001
SW1		Chloroethane	-	<0.003	-	<0.003
SW1		Trichlorofluoromethane	-	<0.003	-	<0.003
SW1		1,1-Dichloroethene	0.03	<0.003	-	<0.003
SW1		Dichloromethane	0.02	<0.003	-	<0.003
SW1		trans-1-2-Dichloroethene	0.05	<0.003	-	<0.003
SW1		1,1-Dichloroethane	-	<0.003	-	<0.003
SW1		cis-1-2-Dichloroethene	0.05	<0.003	-	<0.003
SW1		2,2-Dichloropropane	-	<0.001	-	<0.001
SW1		Bromochloromethane	-	<0.002	-	<0.002
SW1		Chloroform	0.0025	<0.002	-	<0.002
SW1		1,1,1-Trichloroethane	0.1	<0.002	-	<0.002
SW1		1,1-Dichloropropene	-	<0.003	-	<0.003
SW1		Carbon tetrachloride	0.012	<0.002	-	<0.002
SW1		1,2-Dichloroethane	0.01	<0.002	-	<0.002
SW1		Benzene	0.01	<0.0005	-	<0.0005
SW1		Trichloroethene	0.01	<0.003	-	<0.003
SW1		1,2-Dichloropropane	0.04	<0.002	-	<0.002
SW1		Dibromomethane	-	<0.003	-	<0.003
SW1		Bromodichloromethane	0.06	<0.002	-	<0.002
SW1		cis-1-3-Dichloropropene	-	<0.002	-	<0.002
SW1		Toluene	0.074	<0.0005	-	<0.005
SW1		trans-1-3-Dichloropropene	-	<0.002	-	<0.002
SW1		1,1,2-Trichloroethane	0.4	<0.002	-	<0.002
SW1		Tetrachloroethene	0.01	<0.003	-	<0.003
SW1		1,3-Dichloropropane	-	<0.002	-	<0.002
SW1		Dibromochloromethane	0.1	<0.002	-	<0.002
SW1		1,2-Dibromoethane	0.0004	<0.002	-	<0.002
SW1		Chlorobenzene	-	<0.002	-	<0.002
SW1		1,1,1,2-Tetrachloroethane	-	<0.002	-	<0.002
SW1		Ethylbenzene	0.02	<0.0005	-	<0.0005
SW1		p/m-Xylene	0.03	<0.001	-	<0.001
SW1		o-Xylene	0.03	<0.0005	-	<0.0005
SW1		Styrene	0.05	<0.002	-	<0.002
SW1		Bromoform	0.1	<0.002	-	<0.002
SW1		Isopropylbenzene	-	<0.003	-	<0.003
SW1		1,1,2,2-Tetrachloroethane	-	<0.004	-	<0.004
SW1		Bromobenzene	-	<0.002	-	<0.002
SW1		1,2,3-Trichloropropane	-	<0.003	-	<0.003
SW1		Propylbenzene	-	<0.003	-	<0.003
SW1		2-Chlorotoluene	-	<0.003	-	<0.003
SW1		1,3,5-Trimethylbenzene	-	<0.003	-	<0.003
SW1		4-Chlorotoluene	-	<0.003	-	<0.003
SW1		tert-Butylbenzene	-	<0.003	-	<0.003
SW1		1,2,4-Trimethylbenzene	-	<0.003	-	<0.003
SW1		sec-Butylbenzene	-	<0.003	-	<0.003
SW1		4-Isopropyltoluene	-	<0.003	-	<0.003
SW1		1,3-Dichlorobenzene	-	<0.003	-	<0.003
SW1		1,4-Dichlorobenzene	0.3	<0.003	-	<0.003
SW1		n-Butylbenzene	-	<0.003	-	<0.003
SW1		1,2-Dichlorobenzene	1	<0.003	-	<0.003
SW1		1,2-Dibromo-3-chloropropane	0.001	<0.002	-	<0.002
SW1		1,2,4-Trichlorobenzene	-	<0.003	-	<0.003
SW1		Hexachlorobutadiene	0.0001	<0.003	-	<0.003
SW1		Naphthalene	0.002	<0.002	-	<0.002
SW1		1,2,3-Trichlorobenzene	-	<0.003	-	<0.003

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW7A	VOCs	Dichlorodifluoromethane	-	<0.002	-	<0.002
SW7A		Methyl Tertiary Butyl Ether	0.0015	<0.0001	-	<0.0001
SW7A		Chloromethane	-	<0.003	-	<0.003
SW7A		Vinyl Chloride	0.0005	<0.0001	-	<0.0001
SW7A		Bromomethane	-	<0.001	-	<0.001
SW7A		Chloroethane	-	<0.003	-	<0.003
SW7A		Trichlorofluoromethane	-	<0.003	-	<0.003
SW7A		1,1-Dichloroethene	0.03	<0.003	-	<0.003
SW7A		Dichloromethane	0.02	0.006	-	<0.003
SW7A		trans-1-2-Dichloroethene	0.05	<0.003	-	<0.003
SW7A		1,1-Dichloroethane	-	<0.003	-	<0.003
SW7A		cis-1-2-Dichloroethene	0.05	<0.003	-	<0.003
SW7A		2,2-Dichloropropane	-	<0.001	-	<0.001
SW7A		Bromochloromethane	-	<0.002	-	<0.002
SW7A		Chloroform	0.0025	<0.002	-	<0.002
SW7A		1,1,1-Trichloroethane	0.1	<0.002	-	<0.002
SW7A		1,1-Dichloropropene	-	<0.003	-	<0.003
SW7A		Carbon tetrachloride	0.012	<0.002	-	<0.002
SW7A		1,2-Dichloroethane	0.01	<0.002	-	<0.002
SW7A		Benzene	0.01	<0.0005	-	<0.0005
SW7A		Trichloroethene	0.01	<0.003	-	<0.003
SW7A		1,2-Dichloropropane	0.04	<0.002	-	<0.002
SW7A		Dibromomethane	-	<0.003	-	<0.003
SW7A		Bromodichloromethane	0.06	<0.002	-	<0.002
SW7A		cis-1-3-Dichloropropene	-	<0.002	-	<0.002
SW7A		Toluene	0.074	<0.0005	-	<0.005
SW7A		trans-1-3-Dichloropropene	-	<0.002	-	<0.002
SW7A		1,1,2-Trichloroethane	0.4	<0.002	-	<0.002
SW7A		Tetrachloroethene	0.01	<0.003	-	<0.003
SW7A		1,3-Dichloropropane	-	<0.002	-	<0.002
SW7A		Dibromochloromethane	0.1	<0.002	-	<0.002
SW7A		1,2-Dibromoethane	0.0004	<0.002	-	<0.002
SW7A		Chlorobenzene	-	<0.002	-	<0.002
SW7A		1,1,1,2-Tetrachloroethane	-	<0.002	-	<0.002
SW7A		Ethylbenzene	0.02	<0.0005	-	<0.0005
SW7A		p/m-Xylene	0.03	<0.001	-	<0.001
SW7A		o-Xylene	0.03	<0.0005	-	<0.0005
SW7A		Styrene	0.05	<0.002	-	<0.002
SW7A		Bromoform	0.1	<0.002	-	<0.002
SW7A		Isopropylbenzene	-	<0.003	-	<0.003
SW7A		1,1,2,2-Tetrachloroethane	-	<0.004	-	<0.004
SW7A		Bromobenzene	-	<0.002	-	<0.002
SW7A		1,2,3-Trichloropropane	-	<0.003	-	<0.003
SW7A		Propylbenzene	-	<0.003	-	<0.003
SW7A		2-Chlorotoluene	-	<0.003	-	<0.003
SW7A		1,3,5-Trimethylbenzene	-	<0.003	-	<0.003
SW7A		4-Chlorotoluene	-	<0.003	-	<0.003
SW7A		tert-Butylbenzene	-	<0.003	-	<0.003
SW7A		1,2,4-Trimethylbenzene	-	<0.003	-	<0.003
SW7A		sec-Butylbenzene	-	<0.003	-	<0.003
SW7A		4-Isopropyltoluene	-	<0.003	-	<0.003
SW7A		1,3-Dichlorobenzene	-	<0.003	-	<0.003
SW7A		1,4-Dichlorobenzene	0.3	<0.003	-	<0.003
SW7A		n-Butylbenzene	-	<0.003	-	<0.003
SW7A		1,2-Dichlorobenzene	1	<0.003	-	<0.003
SW7A		1,2-Dibromo-3-chloropropane	0.001	<0.002	-	<0.002
SW7A		1,2,4-Trichlorobenzene	-	<0.003	-	<0.003
SW7A		Hexachlorobutadiene	0.0001	<0.003	-	<0.003
SW7A		Naphthalene	0.002	<0.002	-	<0.002
SW7A		1,2,3-Trichlorobenzene	-	<0.003	-	<0.003

Hatfield Road Quarry

Surface Water Quality Data - VOCs/SVOCc/Pesticides

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW1	Phenols	2-Chlorophenol	-	<0.001	-	
SW1		2-Methylphenol	-	<0.0005	-	
SW1		2-Nitrophenol	-	<0.0005	-	
SW1		2,4-Dichlorophenol	0.02	<0.0005	-	
SW1		2,4-Dimethylphenol	-	<0.001	-	
SW1		2,4,5-Trichlorophenol	-	<0.0005	-	
SW1		2,4,6-Trichlorophenol	-	<0.001	-	
SW1		4-Chloro-3-methylphenol	-	<0.0005	-	
SW1		4-Methylphenol	-	<0.001	-	
SW1		4-Nitrophenol	-	<0.01	-	
SW1		Pentachlorophenol	0.0004	<0.001	-	
SW1		Phenol	0.008	<0.001	-	
SW1	PAHs	2-Chloronaphthalene	-	<0.001	-	
SW1		2-Methylnaphthalene	-	<0.001	-	
SW1		Naphthalene	0.002	<0.001	-	
SW1		Acenaphthylene	-	<0.0005	-	
SW1		Acenaphthene	-	<0.001	-	
SW1		Fluorene	-	<0.0005	-	
SW1		Phenanthrene	-	<0.0005	-	
SW1		Anthracene	0.0001	<0.0005	-	
SW1		Fluoranthene	0.0000063	<0.0005	-	
SW1		Pyrene	-	<0.0005	-	
SW1		Benzo(a)anthracene	-	<0.0005	-	
SW1		Chrysene	-	<0.0005	-	
SW1		Benzo(bk)fluoranthene	0.00003	<0.001	-	
SW1		Benzo(a)pyrene	0.00017	<0.001	-	
SW1		Indeno(123cd)pyrene	0.000002	<0.001	-	
SW1		Dibenzo(ah)anthracene	-	<0.0005	-	
SW1		Benzo(ghi)perylene	0.000002	<0.0005	-	
SW1	Phthalates	Bis(2-ethylhexyl) phthalate	0.0013	<0.005	-	
SW1		Butylbenzyl phthalate	0.02	<0.001	-	
SW1		Di-n-butyl phthalate	0.008	<0.0015	-	
SW1		Di-n-Octyl phthalate	0.02	<0.001	-	
SW1		Diethyl phthalate	0.2	<0.001	-	
SW1		Dimethyl phthalate	0.8	<0.001	-	
SW1	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	
SW1		1,2,4-Trichlorobenzene	-	<0.001	-	
SW1		1,3-Dichlorobenzene	-	<0.001	-	
SW1		1,4-Dichlorobenzene	0.3	<0.001	-	
SW1		2-Nitroaniline	-	<0.001	-	
SW1		2,4-Dinitrotoluene	-	<0.0005	-	
SW1		2,6-Dinitrotoluene	-	<0.001	-	
SW1		3-Nitroaniline	-	<0.001	-	
SW1		4-Bromophenylphenylether	0.00014	<0.001	-	
SW1		4-Chloroaniline	-	<0.001	-	
SW1		4-Chlorophenylphenylether	-	<0.001	-	
SW1		4-Nitroaniline	-	<0.0005	-	
SW1		Azobenzene	-	<0.0005	-	
SW1		Bis(2-chloroethoxy)methane	-	<0.0005	-	
SW1		Bis(2-chloroethyl)ether	-	<0.001	-	
SW1		Carbazole	-	<0.0005	-	
SW1		Dibenzofuran	-	<0.0005	-	
SW1		Hexachlorobenzene	0.00001	<0.001	-	
SW1		Hexachlorobutadiene	0.0001	<0.001	-	
SW1		Hexachlorocyclopentadiene	-	<0.001	-	
SW1		Hexachloroethane	-	<0.001	-	
SW1		Isophorone	-	<0.0005	-	
SW1		N-nitrosodi-n-propylamine	-	<0.0005	-	
SW1		Nitrobenzene	-	<0.001	-	

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW7A	Phenols	2-Chlorophenol	-	<0.001	-	-
SW7A		2-Methylphenol	-	<0.0005	-	-
SW7A		2-Nitrophenol	-	<0.0005	-	-
SW7A		2,4-Dichlorophenol	0.02	<0.0005	-	-
SW7A		2,4-Dimethylphenol	-	<0.001	-	-
SW7A		2,4,5-Trichlorophenol	-	<0.0005	-	-
SW7A		2,4,6-Trichlorophenol	-	<0.001	-	-
SW7A		4-Chloro-3-methylphenol	-	<0.0005	-	-
SW7A		4-Methylphenol	-	<0.001	-	-
SW7A		4-Nitrophenol	-	<0.01	-	-
SW7A		Pentachlorophenol	0.0004	<0.001	-	-
SW7A		Phenol	0.008	<0.001	-	-
SW7A	PAHs	2-Chloronaphthalene	-	<0.001	-	-
SW7A		2-Methylnaphthalene	-	<0.001	-	-
SW7A		Naphthalene	0.002	<0.001	-	-
SW7A		Acenaphthylene	-	<0.0005	-	-
SW7A		Acenaphthene	-	<0.001	-	-
SW7A		Fluorene	-	<0.0005	-	-
SW7A		Phenanthrene	-	<0.0005	-	-
SW7A		Anthracene	0.0001	<0.0005	-	-
SW7A		Fluoranthene	0.0000063	<0.0005	-	-
SW7A		Pyrene	-	<0.0005	-	-
SW7A		Benzo(a)anthracene	-	<0.0005	-	-
SW7A		Chrysene	-	<0.0005	-	-
SW7A		Benzo(bk)fluoranthene	0.00003	<0.001	-	-
SW7A		Benzo(a)pyrene	0.00017	<0.001	-	-
SW7A		Indeno(123cd)pyrene	0.000002	<0.001	-	-
SW7A		Dibenzo(ah)anthracene	-	<0.0005	-	-
SW7A		Benzo(ghi)perylene	0.000002	<0.0005	-	-
SW7A	Phthalates	Bis(2-ethylhexyl) phthalate	0.0013	<0.005	-	-
SW7A		Butylbenzyl phthalate	0.02	<0.001	-	-
SW7A		Di-n-butyl phthalate	0.008	<0.0015	-	-
SW7A		Di-n-Octyl phthalate	0.02	<0.001	-	-
SW7A		Diethyl phthalate	0.2	<0.001	-	-
SW7A		Dimethyl phthalate	0.8	<0.001	-	-
SW7A	Other SVOCs	1,2-Dichlorobenzene	1	<0.001	-	-
SW7A		1,2,4-Trichlorobenzene	-	<0.001	-	-
SW7A		1,3-Dichlorobenzene	-	<0.001	-	-
SW7A		1,4-Dichlorobenzene	0.3	<0.001	-	-
SW7A		2-Nitroaniline	-	<0.001	-	-
SW7A		2,4-Dinitrotoluene	-	<0.0005	-	-
SW7A		2,6-Dinitrotoluene	-	<0.001	-	-
SW7A		3-Nitroaniline	-	<0.001	-	-
SW7A		4-Bromophenylphenylether	0.00014	<0.001	-	-
SW7A		4-Chloroaniline	-	<0.001	-	-
SW7A		4-Chlorophenylphenylether	-	<0.001	-	-
SW7A		4-Nitroaniline	-	<0.0005	-	-
SW7A		Azobenzene	-	<0.0005	-	-
SW7A		Bis(2-chloroethoxy)methane	-	<0.0005	-	-
SW7A		Bis(2-chloroethyl)ether	-	<0.001	-	-
SW7A		Carbazole	-	<0.0005	-	-
SW7A		Dibenzofuran	-	<0.0005	-	-
SW7A		Hexachlorobenzene	0.00001	<0.001	-	-
SW7A		Hexachlorobutadiene	0.0001	<0.001	-	-
SW7A		Hexachlorocyclopentadiene	-	<0.001	-	-
SW7A		Hexachloroethane	-	<0.001	-	-
SW7A		Isophorone	-	<0.0005	-	-
SW7A		N-nitrosodi-n-propylamine	-	<0.0005	-	-
SW7A		Nitrobenzene	-	<0.001	-	-

Hatfield Road Quarry

Surface Water Quality Data - VOCs/SVOCc/Pesticides

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW1	Organophosphorus Pesticides	Azinphos ethyl	-	<0.00010	-	
SW1		Azinphos methyl	-	<0.00050	-	
SW1		Carbophenothion	-	<0.00010	-	
SW1		Chlorfenvinphos	0.0001	<0.00010	-	
SW1		Chlorpyrifos	0.00003	<0.00010	-	
SW1		Chlorpyrifos-methyl	-	<0.00010	-	
SW1		Diazinon	0.00001	<0.00010	-	
SW1		Dichlorvos	-	<0.00010	-	
SW1		Disulfoton	-	<0.01000	-	
SW1		Dimethoate	0.00048	<0.00050	-	
SW1		Ethion	-	<0.00010	-	
SW1		Ethyl Parathion (Parathion)	-	<0.00010	-	
SW1		Etrimphos	-	<0.00010	-	
SW1		Fenitrothion	-	<0.00010	-	
SW1		Fenthion	-	<0.01000	-	
SW1		Malathion	-	<0.00010	-	
SW1		Methyl Parathion	-	<0.00010	-	
SW1		Mevinphos	-	<0.00010	-	
SW1		Phosalone	-	<0.00010	-	
SW1		Pirimiphos Methyl	0.000015	<0.00050	-	
SW1		Propetamphos	0.00003	<0.01000	-	
SW1		Triazophos	-	<0.00010	-	
SW1	Organochlorine Pesticides	Aldrin	0.00001	<0.00010	-	
SW1		Alpha-BHC	0.00002	<0.00010	-	
SW1		Beta-BHC	0.00002	<0.00010	-	
SW1		Chlorothalonil	0.0001	<0.00100	-	
SW1		cis-Chlordane	0.0002	<0.00010	-	
SW1		Delta-HCH (BHC)	-	<0.00010	-	
SW1		Dieldrin	0.00001	<0.00010	-	
SW1		Endosulphan I	0.000005	<0.00010	-	
SW1		Endosulphan II	0.000005	<0.00010	-	
SW1		Endosulphan sulphate	0.000005	<0.00010	-	
SW1		Endrin	0.00001	<0.00010	-	
SW1		Gamma-BHC	0.00002	<0.00010	-	
SW1		Heptachlor	0.00003	<0.00010	-	
SW1		Heptachlor Epoxide	0.00003	<0.00010	-	
SW1		Hexachlorobenzene	0.00001	<0.00010	-	
SW1		Isodrin	0.00001	<0.00010	-	
SW1		o,p'-DDE	0.000025	<0.00010	-	
SW1		o,p'-DDT	0.000025	<0.00010	-	
SW1		o,p'-Methoxychlor	-	<0.00010	-	
SW1		o,p'-TDE	0.000025	<0.00010	-	
SW1		p,p'-DDE	0.000025	<0.00010	-	
SW1		p,p'-DDT	0.000025	<0.00010	-	
SW1		p,p'-Methoxychlor	-	<0.00010	-	
SW1		p,p'-TDE	0.000025	<0.00010	-	
SW1		Pendimethalin	0.0015	<0.00010	-	
SW1		Permethrin I	-	<0.00010	-	
SW1		Permethrin II	-	<0.00010	-	
SW1		Quintozene	-	<0.00010	-	
SW1		Tecnazene	0.001	<0.00010	-	
SW1		Telodrin	-	<0.00010	-	
SW1		trans-Chlordane	0.0002	<0.00010	-	
SW1		Triadimefon	-	<0.00010	-	
SW1		Triallate	-	<0.00010	-	
SW1		Trifluralin	0.00003	<0.00010	-	

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW7A	Organophosphorus Pesticides	Azinphos ethyl	-	<0.00001	-	-
SW7A		Azinphos methyl	-	<0.00005	-	-
SW7A		Carbophenothion	-	<0.00001	-	-
SW7A		Chlorfenvinphos	0.0001	<0.00001	-	-
SW7A		Chlorpyrifos	0.00003	<0.00001	-	-
SW7A		Chlorpyrifos-methyl	-	<0.00001	-	-
SW7A		Diazinon	0.00001	<0.00001	-	-
SW7A		Dichlorvos	-	<0.00001	-	-
SW7A		Disulfoton	-	<0.00100	-	-
SW7A		Dimethoate	0.00048	<0.00005	-	-
SW7A		Ethion	-	<0.00001	-	-
SW7A		Ethyl Parathion (Parathion)	-	<0.00001	-	-
SW7A		Etrimphos	-	<0.00001	-	-
SW7A		Fenitrothion	-	<0.00001	-	-
SW7A		Fenthion	-	<0.00100	-	-
SW7A		Malathion	-	<0.00001	-	-
SW7A		Methyl Parathion	-	<0.00001	-	-
SW7A		Mevinphos	-	<0.00001	-	-
SW7A		Phosalone	-	<0.00001	-	-
SW7A		Pirimiphos Methyl	0.000015	<0.00005	-	-
SW7A		Propetamphos	0.00003	<0.00100	-	-
SW7A		Triazophos	-	<0.00001	-	-
SW7A	Organochlorine Pesticides	Aldrin	0.00001	<0.00001	-	-
SW7A		Alpha-BHC	0.00002	<0.00001	-	-
SW7A		Beta-BHC	0.00002	<0.00001	-	-
SW7A		Chlorothalonil	0.0001	<0.00010	-	-
SW7A		cis-Chlordane	0.0002	<0.00001	-	-
SW7A		Delta-HCH (BHC)	-	<0.00001	-	-
SW7A		Dieldrin	0.00001	<0.00001	-	-
SW7A		Endosulphan I	0.000005	<0.00001	-	-
SW7A		Endosulphan II	0.000005	<0.00001	-	-
SW7A		Endosulphan sulphate	0.000005	<0.00001	-	-
SW7A		Endrin	0.00001	<0.00001	-	-
SW7A		Gamma-BHC	0.00002	<0.00001	-	-
SW7A		Heptachlor	0.00003	<0.00001	-	-
SW7A		Heptachlor Epoxide	0.00003	<0.00001	-	-
SW7A		Hexachlorobenzene	0.00001	<0.00001	-	-
SW7A		Isodrin	0.00001	<0.00001	-	-
SW7A		o,p'-DDE	0.000025	<0.00001	-	-
SW7A		o,p'-DDT	0.000025	<0.00001	-	-
SW7A		o,p'-Methoxychlor	-	<0.00001	-	-
SW7A		o,p'-TDE	0.000025	<0.00001	-	-
SW7A		p,p'-DDE	0.000025	<0.00001	-	-
SW7A		p,p'-DDT	0.000025	<0.00001	-	-
SW7A		p,p'-Methoxychlor	-	<0.00001	-	-
SW7A		p,p'-TDE	0.000025	<0.00001	-	-
SW7A		Pendimethalin	0.0015	<0.00001	-	-
SW7A		Permethrin I	-	<0.00001	-	-
SW7A		Permethrin II	-	<0.00001	-	-
SW7A		Quintozene	-	<0.00001	-	-
SW7A		Tecnazene	0.001	<0.00001	-	-
SW7A		Telodrin	-	<0.00001	-	-
SW7A		trans-Chlordane	0.0002	<0.00001	-	-
SW7A		Triadimefon	-	<0.00001	-	-
SW7A		Triallate	-	<0.00001	-	-
SW7A		Trifluralin	0.00003	<0.00001	-	-

Hatfield Road Quarry

Surface Water Quality Data - VOCs/SVOCc/Pesticides

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW1	TDT	Dibutyltin	-	<0.0001	-	
SW1		Tributyltin	-	<0.0001	-	
SW1		Triphenyltin	-	<0.0001	-	
SW1		Total cyclodiene pesticides*	-	<0.00010	-	
SW1		Total DDT compounds**	-	<0.00010	-	
SW12	VOCs	Dichlorodifluoromethane	-	-	<0.002	-
SW12		Methyl Tertiary Butyl Ether	0.0015	-	<0.0001	-
SW12		Chloromethane	-	-	<0.003	-
SW12		Vinyl Chloride	0.0005	-	<0.0001	-
SW12		Bromomethane	-	-	<0.001	-
SW12		Chloroethane	-	-	<0.003	-
SW12		Trichlorofluoromethane	-	-	<0.003	-
SW12		1,1-Dichloroethene	0.03	-	<0.003	-
SW12		Dichloromethane	0.02	-	<0.003	-
SW12		trans-1-2-Dichloroethene	0.05	-	<0.003	-
SW12		1,1-Dichloroethane	-	-	<0.003	-
SW12		cis-1-2-Dichloroethene	0.05	-	<0.003	-
SW12		2,2-Dichloropropane	-	-	<0.001	-
SW12		Bromochloromethane	-	-	<0.002	-
SW12		Chloroform	0.0025	-	<0.002	-
SW12		1,1,1-Trichloroethane	0.1	-	<0.002	-
SW12		1,1-Dichloropropene	-	-	<0.003	-
SW12		Carbon tetrachloride	0.012	-	<0.002	-
SW12		1,2-Dichloroethane	0.01	-	<0.002	-
SW12		Benzene	0.01	-	<0.0005	-
SW12		Trichloroethene	0.01	-	<0.003	-
SW12		1,2-Dichloropropane	0.04	-	<0.002	-
SW12		Dibromomethane	-	-	<0.003	-
SW12		Bromodichloromethane	0.06	-	<0.002	-
SW12		cis-1-3-Dichloropropene	-	-	<0.002	-
SW12		Toluene	0.074	-	<0.0005	-
SW12		trans-1-3-Dichloropropene	-	-	<0.002	-
SW12		1,1,2-Trichloroethane	0.4	-	<0.002	-
SW12		Tetrachloroethene	0.01	-	<0.003	-
SW12		1,3-Dichloropropane	-	-	<0.002	-
SW12		Dibromochloromethane	0.1	-	<0.002	-
SW12		1,2-Dibromoethane	0.0004	-	<0.002	-
SW12		Chlorobenzene	-	-	<0.002	-
SW12		1,1,1,2-Tetrachloroethane	-	-	<0.002	-
SW12		Ethylbenzene	0.02	-	<0.0005	-
SW12		p/m-Xylene	0.03	-	<0.001	-
SW12		o-Xylene	0.03	-	<0.0005	-
SW12		Styrene	0.05	-	<0.002	-
SW12		Bromoform	0.1	-	<0.002	-
SW12		Isopropylbenzene	-	-	<0.003	-
SW12		1,1,2,2-Tetrachloroethane	-	-	<0.004	-
SW12		Bromobenzene	-	-	<0.002	-
SW12		1,2,3-Trichloropropane	-	-	<0.003	-
SW12		Propylbenzene	-	-	<0.003	-
SW12		2-Chlorotoluene	-	-	<0.003	-
SW12		1,3,5-Trimethylbenzene	-	-	<0.003	-
SW12		4-Chlorotoluene	-	-	<0.003	-
SW12		tert-Butylbenzene	-	-	<0.003	-
SW12		1,2,4-Trimethylbenzene	-	-	<0.003	-
SW12		sec-Butylbenzene	-	-	<0.003	-
SW12		4-Isopropyltoluene	-	-	<0.003	-
SW12		1,3-Dichlorobenzene	-	-	<0.003	-
SW12		1,4-Dichlorobenzene	0.3	-	<0.003	-
SW12		n-Butylbenzene	-	-	<0.003	-
SW12		1,2-Dichlorobenzene	1	-	<0.003	-
SW12		1,2-Dibromo-3-chloropropane	0.001	-	<0.002	-
SW12		1,2,4-Trichlorobenzene	-	-	<0.003	-
SW12		Hexachlorobutadiene	0.0001	-	<0.003	-

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW7A	TDT	Dibutyltin	-	<0.0001	-	-
SW7A		Tributyltin	-	<0.0001	-	-
SW7A		Triphenyltin	-	<0.0001	-	-
SW7A		Total cyclodiene pesticides*	-	<0.00001	-	-
SW7A		Total DDT compounds**	-	<0.00001	-	-
SW14	VOCs	Dichlorodifluoromethane	-	-	-	<0.002
SW14		Methyl Tertiary Butyl Ether	0.0015	-	-	<0.0001
SW14		Chloromethane	-	-	-	<0.003
SW14		Vinyl Chloride	0.0005	-	-	<0.0001
SW14		Bromomethane	-	-	-	<0.001
SW14		Chloroethane	-	-	-	<0.003
SW14		Trichlorofluoromethane	-	-	-	<0.003
SW14		1,1-Dichloroethene	0.03	-	-	<0.003
SW14		Dichloromethane	0.02	-	-	<0.003
SW14		trans-1-2-Dichloroethene	0.05	-	-	<0.003
SW14		1,1-Dichloroethane	-	-	-	<0.003
SW14		cis-1-2-Dichloroethene	0.05	-	-	<0.003
SW14		2,2-Dichloropropane	-	-	-	<0.001
SW14		Bromochloromethane	-	-	-	<0.002
SW14		Chloroform	0.0025	-	-	<0.002
SW14		1,1,1-Trichloroethane	0.1	-	-	<0.002
SW14		1,1-Dichloropropene	-	-	-	<0.003
SW14		Carbon tetrachloride	0.012	-	-	<0.002
SW14		1,2-Dichloroethane	0.01	-	-	<0.002
SW14		Benzene	0.01	-	-	<0.0005
SW14		Trichloroethene	0.01	-	-	<0.003
SW14		1,2-Dichloropropane	0.04	-	-	<0.002
SW14		Dibromomethane	-	-	-	<0.003
SW14		Bromodichloromethane	0.06	-	-	<0.002
SW14		cis-1-3-Dichloropropene	-	-	-	<0.002
SW14		Toluene	0.074	-	-	<0.005
SW14		trans-1-3-Dichloropropene	-	-	-	<0.002
SW14		1,1,2-Trichloroethane	0.4	-	-	<0.002
SW14		Tetrachloroethene	0.01	-	-	<0.003
SW14		1,3-Dichloropropane	-	-	-	<0.002
SW14		Dibromochloromethane	0.1	-	-	<0.002
SW14		1,2-Dibromoethane	0.0004	-	-	<0.002
SW14		Chlorobenzene	-	-	-	<0.002
SW14		1,1,1,2-Tetrachloroethane	-	-	-	<0.002
SW14		Ethylbenzene	0.02	-	-	<0.0005
SW14		p/m-Xylene	0.03	-	-	<0.001
SW14		o-Xylene	0.03	-	-	<0.0005
SW14		Styrene	0.05	-	-	<0.002
SW14		Bromoform	0.1	-	-	<0.002
SW14		Isopropylbenzene	-	-	-	<0.003
SW14		1,1,2,2-Tetrachloroethane	-	-	-	<0.004
SW14		Bromobenzene	-	-	-	<0.002
SW14		1,2,3-Trichloropropane	-	-	-	<0.003
SW14		Propylbenzene	-	-	-	<0.003
SW14		2-Chlorotoluene	-	-	-	<0.003
SW14		1,3,5-Trimethylbenzene	-	-	-	<0.003
SW14		4-Chlorotoluene	-	-	-	<0.003
SW14		tert-Butylbenzene	-	-	-	<0.003
SW14		1,2,4-Trimethylbenzene	-	-	-	<0.003
SW14		sec-Butylbenzene	-	-	-	<0.003
SW14		4-Isopropyltoluene	-	-	-	<0.003
SW14		1,3-Dichlorobenzene	-	-	-	<0.003
SW14		1,4-Dichlorobenzene	0.3	-	-	<0.003
SW14		n-Butylbenzene	-	-	-	<0.003
SW14		1,2-Dichlorobenzene	1	-	-	<0.003
SW14		1,2-Dibromo-3-chloropropane	0.001	-	-	<0.002
SW14		1,2,4-Trichlorobenzene	-	-	-	<0.003
SW14		Hexachlorobutadiene	0.0001	-	-	<0.003

Hatfield Road Quarry

Surface Water Quality Data - VOCs/SVOCc/Pesticides

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW12		Naphthalene	0.002	-	<0.002	-
SW12		1,2,3-Trichlorobenzene	-	-	<0.003	-
SW12	Phenols	2-Chlorophenol	-	-	<0.001	-
SW12		2-Methylphenol	-	-	<0.0005	-
SW12		2-Nitrophenol	-	-	<0.0005	-
SW12		2,4-Dichlorophenol	0.02	-	<0.0005	-
SW12		2,4-Dimethylphenol	-	-	<0.001	-
SW12		2,4,5-Trichlorophenol	-	-	<0.0005	-
SW12		2,4,6-Trichlorophenol	-	-	<0.001	-
SW12		4-Chloro-3-methylphenol	-	-	<0.0005	-
SW12		4-Methylphenol	-	-	<0.001	-
SW12		4-Nitrophenol	-	-	<0.01	-
SW12		Pentachlorophenol	0.0004	-	<0.001	-
SW12		Phenol	0.008	-	<0.001	-
SW12	PAHs	2-Chloronaphthalene	-	-	<0.001	-
SW12		2-Methylnaphthalene	-	-	<0.001	-
SW12		Naphthalene	0.002	-	<0.001	-
SW12		Acenaphthylene	-	-	<0.0005	-
SW12		Acenaphthene	-	-	<0.001	-
SW12		Fluorene	-	-	<0.0005	-
SW12		Phenanthrene	-	-	<0.0005	-
SW12		Anthracene	0.0001	-	<0.0005	-
SW12		Fluoranthene	0.0000063	-	<0.0005	-
SW12		Pyrene	-	-	<0.0005	-
SW12		Benzo(a)anthracene	-	-	<0.0005	-
SW12		Chrysene	-	-	<0.0005	-
SW12		Benzo(bk)fluoranthene	0.00003	-	<0.001	-
SW12		Benzo(a)pyrene	0.00017	-	<0.001	-
SW12		Indeno(123cd)pyrene	0.000002	-	<0.001	-
SW12		Dibenzo(ah)anthracene	-	-	<0.0005	-
SW12		Benzo(ghi)perylene	0.000002	-	<0.0005	-
SW12	Phthalates	Bis(2-ethylhexyl) phthalate	0.0013	-	<0.005	-
SW12		Butylbenzyl phthalate	0.02	-	<0.001	-
SW12		Di-n-butyl phthalate	0.008	-	<0.0015	-
SW12		Di-n-Octyl phthalate	0.02	-	<0.001	-
SW12		Diethyl phthalate	0.2	-	<0.001	-
SW12		Dimethyl phthalate	0.8	-	<0.001	-
SW12	Other SVOCs	1,2-Dichlorobenzene	1	-	<0.001	-
SW12		1,2,4-Trichlorobenzene	-	-	<0.001	-
SW12		1,3-Dichlorobenzene	-	-	<0.001	-
SW12		1,4-Dichlorobenzene	0.3	-	<0.001	-
SW12		2-Nitroaniline	-	-	<0.001	-
SW12		2,4-Dinitrotoluene	-	-	<0.0005	-
SW12		2,6-Dinitrotoluene	-	-	<0.001	-
SW12		3-Nitroaniline	-	-	<0.001	-
SW12		4-Bromophenylphenylether	0.00014	-	<0.001	-
SW12		4-Chloroaniline	-	-	<0.001	-
SW12		4-Chlorophenylphenylether	-	-	<0.001	-
SW12		4-Nitroaniline	-	-	<0.0005	-
SW12		Azobenzene	-	-	<0.0005	-
SW12		Bis(2-chloroethoxy)methane	-	-	<0.0005	-
SW12		Bis(2-chloroethyl)ether	-	-	<0.001	-
SW12		Carbazole	-	-	<0.0005	-
SW12		Dibenzofuran	-	-	<0.0005	-
SW12		Hexachlorobenzene	0.00001	-	<0.001	-
SW12		Hexachlorobutadiene	0.0001	-	<0.001	-
SW12		Hexachlorocyclopentadiene	-	-	<0.001	-
SW12		Hexachloroethane	-	-	<0.001	-
SW12		Isophorone	-	-	<0.0005	-
SW12		N-nitrosodi-n-propylamine	-	-	<0.0005	-
SW12		Nitrobenzene	-	-	<0.001	-

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW14		Naphthalene	0.002	-	-	<0.002
SW14		1,2,3-Trichlorobenzene	-	-	-	<0.003
SW14	Phenols	2-Chlorophenol	-	-	-	-
SW14		2-Methylphenol	-	-	-	-
SW14		2-Nitrophenol	-	-	-	-
SW14		2,4-Dichlorophenol	0.02	-	-	-
SW14		2,4-Dimethylphenol	-	-	-	-
SW14		2,4,5-Trichlorophenol	-	-	-	-
SW14		2,4,6-Trichlorophenol	-	-	-	-
SW14		4-Chloro-3-methylphenol	-	-	-	-
SW14		4-Methylphenol	-	-	-	-
SW14		4-Nitrophenol	-	-	-	-
SW14		Pentachlorophenol	0.0004	-	-	-
SW14		Phenol	0.008	-	-	-
SW14	PAHs	2-Chloronaphthalene	-	-	-	-
SW14		2-Methylnaphthalene	-	-	-	-
SW14		Naphthalene	0.002	-	-	-
SW14		Acenaphthylene	-	-	-	-
SW14		Acenaphthene	-	-	-	-
SW14		Fluorene	-	-	-	-
SW14		Phenanthrene	-	-	-	-
SW14		Anthracene	0.0001	-	-	-
SW14		Fluoranthene	0.0000063	-	-	-
SW14		Pyrene	-	-	-	-
SW14		Benzo(a)anthracene	-	-	-	-
SW14		Chrysene	-	-	-	-
SW14		Benzo(bk)fluoranthene	0.00003	-	-	-
SW14		Benzo(a)pyrene	0.00017	-	-	-
SW14		Indeno(123cd)pyrene	0.000002	-	-	-
SW14		Dibenzo(ah)anthracene	-	-	-	-
SW14		Benzo(ghi)perylene	0.000002	-	-	-
SW14	Phthalates	Bis(2-ethylhexyl) phthalate	0.0013	-	-	-
SW14		Butylbenzyl phthalate	0.02	-	-	-
SW14		Di-n-butyl phthalate	0.008	-	-	-
SW14		Di-n-Octyl phthalate	0.02	-	-	-
SW14		Diethyl phthalate	0.2	-	-	-
SW14		Dimethyl phthalate	0.8	-	-	-
SW14	Other SVOCs	1,2-Dichlorobenzene	1	-	-	-
SW14		1,2,4-Trichlorobenzene	-	-	-	-
SW14		1,3-Dichlorobenzene	-	-	-	-
SW14		1,4-Dichlorobenzene	0.3	-	-	-
SW14		2-Nitroaniline	-	-	-	-
SW14		2,4-Dinitrotoluene	-	-	-	-
SW14		2,6-Dinitrotoluene	-	-	-	-
SW14		3-Nitroaniline	-	-	-	-
SW14		4-Bromophenylphenylether	0.00014	-	-	-
SW14		4-Chloroaniline	-	-	-	-
SW14		4-Chlorophenylphenylether	-	-	-	-
SW14		4-Nitroaniline	-	-	-	-
SW14		Azobenzene	-	-	-	-
SW14		Bis(2-chloroethoxy)methane	-	-	-	-
SW14		Bis(2-chloroethyl)ether	-	-	-	-
SW14		Carbazole	-	-	-	-
SW14		Dibenzofuran	-	-	-	-
SW14		Hexachlorobenzene	0.00001	-	-	-
SW14		Hexachlorobutadiene	0.0001	-	-	-
SW14		Hexachlorocyclopentadiene	-	-	-	-
SW14		Hexachloroethane	-	-	-	-
SW14		Isophorone	-	-	-	-
SW14		N-nitrosodi-n-propylamine	-	-	-	-
SW14		Nitrobenzene	-	-	-	-

Hatfield Road Quarry

Surface Water Quality Data - VOCs/SVOCc/Pesticides

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW12	Organophosphorus Pesticides	Azinphos ethyl	-	-	<0.00005	-
SW12		Azinphos methyl	-	-	<0.00001	-
SW12		Carbophenothion	-	-	<0.00001	-
SW12		Chlorfenvinphos	0.0001	-	<0.00001	-
SW12		Chlorpyrifos	0.00003	-	<0.00001	-
SW12		Chlorpyrifos-methyl	-	-	<0.00001	-
SW12		Diazinon	0.00001	-	<0.00002	-
SW12		Dichlorvos	-	-	<0.00001	-
SW12		Disulfoton	-	-	<0.00100	-
SW12		Dimethoate	0.00048	-	<0.00005	-
SW12		Ethion	-	-	<0.00001	-
SW12		Ethyl Parathion (Parathion)	-	-	<0.00002	-
SW12		Etrimphos	-	-	<0.00001	-
SW12		Fenitrothion	-	-	<0.00001	-
SW12		Fenthion	-	-	<0.00100	-
SW12		Malathion	-	-	<0.00001	-
SW12		Methyl Parathion	-	-	<0.00001	-
SW12		Mevinphos	-	-	<0.00001	-
SW12		Phosalone	-	-	<0.00001	-
SW12		Pirimiphos Methyl	0.000015	-	<0.00002	-
SW12		Propetamphos	0.00003	-	<0.00100	-
SW12		Triazophos	-	-	<0.00001	-
SW12	Organochlorine Pesticides	Aldrin	0.00001	-	<0.00001	-
SW12		Alpha-BHC	0.00002	-	<0.00001	-
SW12		Beta-BHC	0.00002	-	<0.00001	-
SW12		Chlorothalonil	0.0001	-	<0.00050	-
SW12		cis-Chlordane	0.0002	-	<0.00001	-
SW12		Delta-HCH (BHC)	-	-	<0.00001	-
SW12		Dieldrin	0.00001	-	<0.00001	-
SW12		Endosulphan I	0.000005	-	<0.00001	-
SW12		Endosulphan II	0.000005	-	<0.00001	-
SW12		Endosulphan sulphate	0.000005	-	<0.00001	-
SW12		Endrin	0.00001	-	<0.00001	-
SW12		Gamma-BHC	0.00002	-	<0.00001	-
SW12		Heptachlor	0.00003	-	<0.00001	-
SW12		Heptachlor Epoxide	0.00003	-	<0.00001	-
SW12		Hexachlorobenzene	0.00001	-	<0.00001	-
SW12		Isodrin	0.00001	-	<0.00001	-
SW12		o,p'-DDE	0.000025	-	<0.00001	-
SW12		o,p'-DDT	0.000025	-	<0.00001	-
SW12		o,p'-Methoxychlor	-	-	<0.00001	-
SW12		o,p'-TDE	0.000025	-	<0.00001	-
SW12		p,p'-DDE	0.000025	-	<0.00001	-
SW12		p,p'-DDT	0.000025	-	<0.00001	-
SW12		p,p'-Methoxychlor	-	-	<0.00001	-
SW12		p,p'-TDE	0.000025	-	<0.00001	-
SW12		Pendimethalin	0.0015	-	<0.00001	-
SW12		Permethrin I	-	-	<0.00001	-
SW12		Permethrin II	-	-	<0.00001	-
SW12		Quintozene	-	-	<0.00001	-
SW12		Tecnazene	0.001	-	<0.00001	-
SW12		Telodrin	-	-	<0.00001	-
SW12		trans-Chlordane	0.0002	-	<0.00001	-
SW12		Triadimefon	-	-	<0.00001	-
SW12		Triallate	-	-	<0.00001	-
SW12		Trifluralin	0.00003	-	<0.00001	-

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW14	Organophosphorus Pesticides	Azinphos ethyl	-	-	-	-
SW14		Azinphos methyl	-	-	-	-
SW14		Carbophenothion	-	-	-	-
SW14		Chlorfenvinphos	0.0001	-	-	-
SW14		Chlorpyrifos	0.00003	-	-	-
SW14		Chlorpyrifos-methyl	-	-	-	-
SW14		Diazinon	0.00001	-	-	-
SW14		Dichlorvos	-	-	-	-
SW14		Disulfoton	-	-	-	-
SW14		Dimethoate	0.00048	-	-	-
SW14		Ethion	-	-	-	-
SW14		Ethyl Parathion (Parathion)	-	-	-	-
SW14		Etrimphos	-	-	-	-
SW14		Fenitrothion	-	-	-	-
SW14		Fenthion	-	-	-	-
SW14		Malathion	-	-	-	-
SW14		Methyl Parathion	-	-	-	-
SW14		Mevinphos	-	-	-	-
SW14		Phosalone	-	-	-	-
SW14		Pirimiphos Methyl	0.000015	-	-	-
SW14		Propetamphos	0.00003	-	-	-
SW14		Triazophos	-	-	-	-
SW14	Organochlorine Pesticides	Aldrin	0.00001	-	-	-
SW14		Alpha-BHC	0.00002	-	-	-
SW14		Beta-BHC	0.00002	-	-	-
SW14		Chlorothalonil	0.0001	-	-	-
SW14		cis-Chlordane	0.0002	-	-	-
SW14		Delta-HCH (BHC)	-	-	-	-
SW14		Dieldrin	0.00001	-	-	-
SW14		Endosulphan I	0.000005	-	-	-
SW14		Endosulphan II	0.000005	-	-	-
SW14		Endosulphan sulphate	0.000005	-	-	-
SW14		Endrin	0.00001	-	-	-
SW14		Gamma-BHC	0.00002	-	-	-
SW14		Heptachlor	0.00003	-	-	-
SW14		Heptachlor Epoxide	0.00003	-	-	-
SW14		Hexachlorobenzene	0.00001	-	-	-
SW14		Isodrin	0.00001	-	-	-
SW14		o,p'-DDE	0.000025	-	-	-
SW14		o,p'-DDT	0.000025	-	-	-
SW14		o,p'-Methoxychlor	-	-	-	-
SW14		o,p'-TDE	0.000025	-	-	-
SW14		p,p'-DDE	0.000025	-	-	-
SW14		p,p'-DDT	0.000025	-	-	-
SW14		p,p'-Methoxychlor	-	-	-	-
SW14		p,p'-TDE	0.000025	-	-	-
SW14		Pendimethalin	0.0015	-	-	-
SW14		Permethrin I	-	-	-	-
SW14		Permethrin II	-	-	-	-
SW14		Quintozene	-	-	-	-
SW14		Tecnazene	0.001	-	-	-
SW14		Telodrin	-	-	-	-
SW14		trans-Chlordane	0.0002	-	-	-
SW14		Triadimefon	-	-	-	-
SW14		Triallate	-	-	-	-
SW14		Trifluralin	0.00003	-	-	-

Hatfield Road Quarry

Surface Water Quality Data - VOCs/SVOCc/Pesticides

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW12	TDT	Dibutyltin	-	-	<0.0001	-
SW12		Tributyltin	-	-	<0.0001	-
SW12		Triphenyltin	-	-	<0.0001	-
SW12		Total cyclodiene pesticides*	-	-	<0.00001	-
SW12		Total DDT compounds**	-	-	<0.00001	-

Location		Analysis	EQS	Jan-16	Feb-16	Apr-16
SW14	TDT	Dibutyltin	-	-	-	-
SW14		Tributyltin	-	-	-	-
SW14		Triphenyltin	-	-	-	-
SW14		Total cyclodiene pesticides*	-	-	-	-
SW14		Total DDT compounds**	-	-	-	-

Key	All results reported in mg/l.
–	Not sampled/analysed/no EQS available
EQS	UK EQS 2015
DWS	
888	Exceeds Detection Limit
888	Exceeds EQS/DWS

Surface Water Quality Data - PAHs / EPHRO

LOCATION		ANALYSIS	EQS	Mar-19	May-19
SW11	PAHs	Naphthalene#	0.002	<0.0001	<0.0001
SW11		Acenaphthylene#	-	<0.000013	<0.000013
SW11		Acenaphthene#	-	<0.000013	<0.000013
SW11		Fluorene#	-	<0.000014	<0.000014
SW11		Phenanthrene#	-	<0.000011	<0.000011
SW11		Anthracene#	0.0001	<0.000013	<0.000013
SW11		Fluoranthene#	0.0000063	<0.000012	0.000015
SW11		Pyrene#	-	<0.000013	0.000013
SW11		Benzo(a)anthracene#	-	<0.000015	<0.000015
SW11		Chrysene#	-	<0.000011	<0.000011
SW11		Benzo(bk)fluoranthene#	0.00003	<0.000018	<0.000018
SW11		Benzo(a)pyrene#	0.00017	<0.000016	<0.000016
SW11		Indeno(123cd)pyrene#	0.000002	<0.000011	<0.000011
SW11		Dibenzo(ah)anthracene#	-	<0.00001	<0.00001
SW11		Benzo(ghi)perylene#	0.000002	<0.000011	<0.000011
SW11		PAH 16 Total#	-	<0.000195	<0.000195
SW11		Benzo(b)fluoranthene	0.00003	<0.00001	<0.00001
SW11		Benzo(k)fluoranthene	0.00003	<0.00001	<0.00001
SW11		PAH Surrogate % Recovery	-	83	84
SW11	EPH/GRO	GRO (>C4-C8)#	No Visible Film	<0.01	<0.01
SW11		GRO (>C8-C12)#	No Visible Film	<0.01	<0.01
SW11		GRO (>C4-C12)#	No Visible Film	<0.01	<0.01
SW11		EPH (C8-C40)#	No Visible Film	<0.01	<0.01

Key	All results reported in mg/l.
–	Not sampled/analysed/no EQS available
EQS	UK EQS 2015
888	Exceeds Detection Limit
888	Exceeds EQS

PHENOLS

LOCATION	ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW1	Resorcinol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW1	Catechol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW1	Phenol	0.0077	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW1	m/p-cresol	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	-	-	-	-	-	-
SW1	o-cresol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW1	Total cresols	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	-	-	-	-	-	-
SW1	Xylenols	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	-	-	-	-	-	-
SW1	1-naphthol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW1	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW1	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW1	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	-	-	-	-	-	-
SW2	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW2	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW3	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW4	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW5	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LOCATION	ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW6	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW6	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW7A	Resorcinol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW7A	Catechol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW7A	Phenol	0.0077	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW7A	m/p-cresol	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	-	-	-	-	-	-
SW7A	o-cresol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW7A	Total cresols	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	-	-	-	-	-	-
SW7A	Xylenols	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	-	-	-	-	-	-
SW7A	1-naphthol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW7A	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW7A	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-
SW7A	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	-	-	-	-	-	-
SW8	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW8	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW9	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW10	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LOCATION	ANALYSIS	EQS	Aug-13	Nov-13	Feb-14	May-14	Oct-14	Jan-15	May-15	Jul-15	Oct-15	Jan-16	Apr-16	Jul-16	Nov-16	Feb-17	Feb-18	Feb-19	May-19
SW11	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	-
SW11	Catechol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	-
SW11	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	<0.01
SW11	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.0005	-
SW11	o-cresol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	-
SW11	Total cresols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.0005	-
SW11	Xylenols	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	<0.0005	-
SW11	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	-
SW11	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	-
SW11	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.0005	-
SW11	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.005	-
SW12	Resorcinol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	-	-	-	-	-
SW12	Catechol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	-	-	-	-	-
SW12	Phenol	0.0077	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	-	-	-	-	-
SW12	m/p-cresol	-	-	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	-	-	-	-	-
SW12	o-cresol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	-	-	-	-	-
SW12	Total cresols	-	-	-	-	-	-	-	-	-	-	<0.03	<0.03	<0.03	-	-	-	-	-
SW12	Xylenols	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06	<0.06	-	-	-	-	-
SW12	1-naphthol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	-	-	-	-	-
SW12	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	-	-	-	-	-
SW12	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	-	-	-	-	-
SW12	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	-	-	-	-	-
SW14	Resorcinol	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-
SW14	Catechol	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-
SW14	Phenol	0.0077	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-
SW14	m/p-cresol	-	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	-	-	-
SW14	o-cresol	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-
SW14	Total cresols	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	-	-	-	-
SW14	Xylenols	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	-	-	-	-
SW14	1-naphthol	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-
SW14	2,3,5-trimethyl phenol	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-
SW14	2-isopropylphenol	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-
SW14	Total Speciated Phenols HPLC	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-

Key	All results reported in mg/l.
–	Not sampled/analysed/no EQS available
EQS	UK EQS 2015
888	Exceeds Detection Limit
888	Exceeds EQS

HATFIELD QUARRY

APPENDIX 6-9:

FLOOD RISK ASSESSMENT AND SURFACE WATER MANAGEMENT PLAN

Former Hatfield Aerodrome

Prepared for: Brett Aggregates Limited

SLR Ref: 403.09885.00024
Version No: Draft V1
September 2021

BASIS OF REPORT

This document has been prepared by SLR with reasonable skill, care and diligence, and taking account of the manpower, timescales and resources devoted to it by agreement with Brett Aggregates Limited (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

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Drawing 01: Site Location Plan
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Drawing 03: Extract of Environment Agency Surface Water Flood Map
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ACRONYMS

UMH: Upper Mineral Horizon
LMH: Lower Mineral Horizon

1.0 Introduction

1.1 Terms of Reference

SLR Consulting Limited (SLR) was appointed by Brett Aggregates Limited to prepare a Flood Risk Assessment (FRA) as part of a planning application for a proposed sand and gravel quarry, including new access onto the A1057, an aggregate processing plant, concrete batching plant and other ancillary facilities on land at the former Hatfield Aerodrome, Hertfordshire (the application site).

The application site is located at National Grid Reference (NGR) TL 704 077 as illustrated by Drawing No. 001.

Consultation was held with the Environment Agency (EA) and Lead Local Flood Authority (LLFA) after the submission of the original application. The EA and LLFA initial objected to the application until further clarification and information were provided. This information was provided in July 2016 and the objections removed; copies of the response are given in Appendices 01 and 02.

1.2 Background and Aims

This report has been prepared to consider the risk of flooding to the application site and to recommend, where appropriate, mitigation measures. In addition, the impact of the proposed restoration on the risk of flooding elsewhere has been considered.

The provisions of National Planning Policy Framework[2] (NPPF) and the Planning Practice Guidance[3] (PPG) have been considered in preparing the FRA.

The indicative flood maps published on the Environment Agency's website show that the application site lies partially within an area of flooding. Therefore, with reference to footnote 20 of the NPPF any planning application for the application site must be accompanied by a FRA. An extract of the Environment Agency's indicative flood map is reproduced as Drawing No. 002.

1.3 Best Practice

This report has been prepared in accordance with the advice provided by current best practice guidance relating to management of flood risk in development published by the Construction Industry Research and Information Association (CIRIA)[4], the British Standards Institution (BSI) BS8533[5] and the Environment Agency's National Standing Advice on Development and Flood Risk[6].

---

[2] National Planning Policy Framework, Department for Communities and Local Government (Last Updated July 2021)
[3] Planning Practice Guidance, Ministry of Housing, Communities & Local Government, http://planningguidance.planningportal.gov.uk/blog/guidance/ (Last Updated June 2021)
[4] CIRIA Report C624, Development and flood risk – guidance for the construction industry
[5] BS8533:2011, Assessing and managing flood risk in development – Code of Practice (1st Edition, October 2011)
[6] Environment Agency, Review individual flood risk assessments: standing advice for local planning authorities (Last Updated February 2021)

2.0 Development Description and Location

2.1 Site Description

The application site is located within an area bounded by the A1057 (Hatfield Road/St Albans Road) to the south, Oaklands Lane to the west, Coopers Green Lane to the north and the western fringe of Hatfield to the east.

2.2 Topography

A topographic survey of the existing application site was completed in November 2014, a copy of which is enclosed in Appendix 03. The survey shows ground levels across the application site falling in a general south easterly direction from approximately 78.00m to 74.00m Above Ordnance Datum (AOD).

2.3 Hydrological Features

Details of the baseline conditions can be found in the environmental statement submitted in support of the planning application. In general, the application site is located within the hydrological catchment of the River Colne.

With reference to the 1:25,000 scale Ordnance Survey mapping, a tributary of the Ellenbrook flows in a southerly direction some 200m to the east of the application site. This water feature is believe to be principally fed by surface water originating from developments east of the tributary via a network of balancing lagoons designed to control flow.

With reference to the 'Water Framework Directive - 2015 River Basin Management Plans – Rivers' published on the gov.uk website[7], approximately 600m to the east of the application site, the Ellenbrook is shown to flow within a culvert in a south westerly direction to the junction of the A1057 (Hatfield Road/St Albans Road) and Albatross Way. SLR understands the Ellenbrook tributary described above joins the Ellenbrook culvert at this approximate location and then continues south within a culvert 170m parallel with Ellenbrook Lane until it joins the Nast at the junction of Ellenbrook Lane and Ellenbrook Crescent (discussed further below).

The Nast, an ephemeral groundwater fed watercourse, flows as an open channel in a general south easterly direction through the northern part of the application site. When groundwater levels are near their seasonal high the Nast flows and combines with surface water flow fed from the adjacent Hatfield Quarry lagoons located just beyond the northwest boundary of the site at Home Covert, which is then transferred by culvert beneath the application site and adjacent sports playing fields to the southeast of the site. The culvert daylights and then continues beneath and parallel with the A1057 (Hatfield Road/St Albans Road) before joining an open concrete box channel alongside Ellenbrook Lane. The Nast then combines with the Ellenbrook approximately 170m along Ellenbrook Lane as referred to above.

2.4 Geological and Hydrogeological Features

Published geological mapping[8] indicates the geology comprises a superficial deposit of *Lowestoft Formation - Diamicton* overlain along the Nast by *Alluvium - Clay, Silt, Sand and Gravel*. A bedrock

[7] Environment Agency Website (Accessed on 18 August 2021) https://www.gov.uk/government/collections/river-basin-management-plans-2015
[8] BGS Website (Accessed on 18 August 2021) https://www.bgs.ac.uk/map-viewers/geoindex-onshore/

geology comprising the *Lewes Nodular Chalk Formation and Seaford Chalk Formation (undifferentiated) - Chalk* extends beneath the application site.

The Environment Agency[9] classifies the Lowestoft Formation as a '*Secondary (undifferentiated)*' aquifer which '*has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type'*. The Alluvium however, is classified as a '*Secondary A*' aquifer which is defined as '*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers*'.

The Lewes Nodular Chalk Formation And Seaford Chalk Formation are classified as a '*Principal*' aquifer with '*layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer*.'

The Environment Agency has identified the application site to lie partly within the Zone 2 (Outer Zone) and Zone 3c (Total Catchment – subsurface activity only) of a Groundwater Source Protection Zone (SPZ). Groundwater SPZs have been developed by the Environment Agency to map the catchment areas to springs and boreholes that are used for public drinking water supply.

[9] Defra Magic Map Website (Accessed on 18 August 2021) https://magic.defra.gov.uk/MagicMap.aspx

3.0 Development Proposal

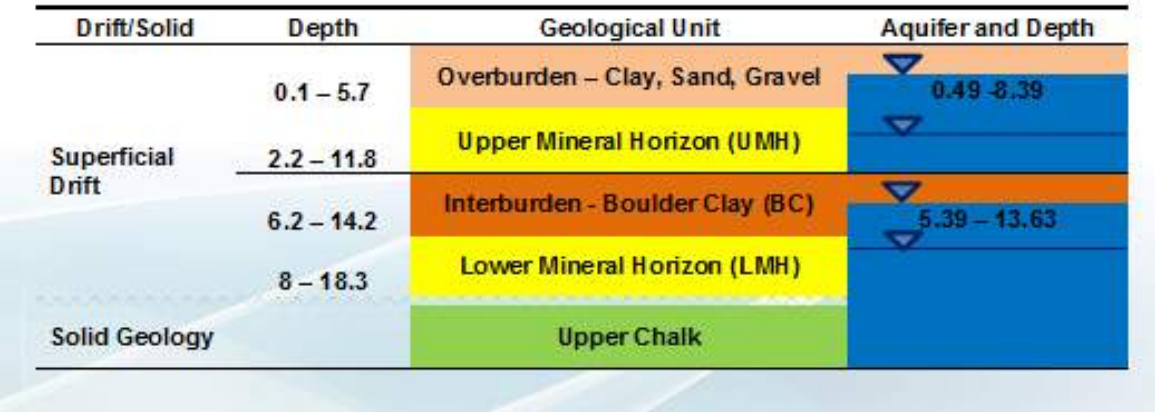
3.1 Description

The proposals would involve the winning and working, together with processing for sale, of approximately 8Mt of sand and gravel over a period of around 30 years (based on an annual output of around 250,000tpa). In parallel with the extraction of minerals would be the importation of low permeability inert material to infill the mineral workings to facilitate the restoration of the application site to a beneficial after use, combining recreation and nature consideration. The imported material would typically comprise excavation wastes from construction and engineering projects (soils, overburden, clays etc.) within the region.

The quarry would be worked on a phased basis to allow for progressive restoration from the east. Details of the proposed phased mineral extraction are in shown in Appendix 04 and Drawings HQ 3/5 to 3/10 of the ES.

The sand and gravel will be extracted from an UMH and a LMH as conceptualised ion Figure 3-1.

Figure 3-1
Geological and Hydrogeological Site Conditions



3.2 Planning Context

The Local Plan is currently under preparation. Current policies are therefore provided within the following documents:

a. Saved policies of the Welwyn Hatfield District Plan[10] adopted in 2005

Since its adoption some changes have been made to the Local Plan as a result of the 'saving' of policies in April 2008. These have been saved until it is replaced by a Local Development Framework.

Policy R8 *Floodplains and Flood Prevention* has not been saved and therefore planning policies pertaining to flood risk at the application site is currently being provided solely by the NPPF which states:

> *'Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary,*

[10] Welwyn Hatfield Borough Council (2005). Welwyn Hatfield District Plan

making it safe without increasing flood risk elsewhere. Local Plans should be supported by Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by:

- *applying the Sequential Test;*
- *if necessary, applying the Exception Test;*
- *safeguarding land from development that is required for current and future flood management;*
- *using opportunities offered by new development to reduce the causes and impacts of flooding; and*
- *where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to facilitate the relocation of development, including housing, to more sustainable locations.'*

b. Hertfordshire Waste Local Plan[11] adopted 2012

Policy 16: *Soil, Air and Water* states:

'Waste management proposals will be permitted where it can be demonstrated that they meet the following criteria:

i) Will not have a negative impact on the soil or water environment, including main rivers, floodplains, ordinary water courses, other water bodies such as lakes and ponds, and groundwater resources unless appropriate measures can be imposed to mitigate harmful effects;

iv) Where possible avoid floodplain areas as demonstrated with a Sequential Test and if this cannot be achieved, reduce the risk of flooding or not have a negative impact on storage or flow capacity of the floodplain, in line with the exceptions Test where required.'

c. Hertfordshire Minerals Local Plan Review 2002-2016[12] adopted in 2007

Although the Hertfordshire Minerals Local Plan Review 2002-2016 is currently under review, it provides current planning policy pertaining to flood risk at the application site.

Minerals Policy 17: *Criteria For The Control Of Mineral Development To Protect Critical Capital And Other Environmental Assets* states:

'All proposals for mineral extraction and related development (including after uses):

v) shall not be permitted if the development would increase the risk of flooding or have a material negative impact on the storage or flow capacity of the floodplain, unless the risk or impact can be obviated;'

[11] Hertfordshire County Council (2012). Hertfordshire Waste Development Framework: Waste Core Strategy & Development Management Policies Development Plan Document 2011-2026

[12] Hertfordshire County Council (2007). Hertfordshire Minerals Local Plan Review 2002-2016

The measures set out Sections 8.0 and 9.0 of this assessment will demonstrate that the proposed development is consistent with the local and national planning policies.

4.0 Potential Sources of Flooding

4.1 Screening Study

There are a number of potential sources of flooding, including:

- Flooding from rivers or fluvial flooding;
- Flooding from the sea or tidal flooding;
- Flooding from land;
- Flooding from groundwater;
- Flooding from sewers; and
- Flooding from reservoirs, canals, and other artificial sources.

The flood risk from each of these potential sources is discussed below.

4.1.1 Flooding from Rivers or Fluvial Flooding

With reference to the Environment Agency Flood Map for Planning[13], the south eastern corner of the application site is shown to lie within an area at risk of fluvial flooding from the Nast.

Flooding from this source has therefore been considered further in Section 5.0.

4.1.2 Flooding from the Sea or Tidal Flooding

As the application site is remote from the coast, the risk of tidal flooding is not considered significant.

Flooding from this source has not therefore been considered further.

4.1.3 Flooding from Land

Local topography indicates higher ground to the west and northwest which could have the potential to direct overland flows towards the application site.

Flooding from this source has been considered further in Section 5.0.

4.1.4 Flooding from Groundwater

With reference to Map 1b contained within Appendix 2 of the Hertfordshire County Council Level 1 Strategic Flood Risk Assessment[14] (SFRA), the application site lies outside the '*Areas Susceptible to Groundwater Flooding*'. Moreover, in preparing the Welwyn Hatfield Council SFRA[15], groundwater flooding incidents have been collated from the database maintained by the Environment Agency. With reference to Section 4.6 of the aforementioned Welwyn Hatfield Council SFRA, no flooding incidents have been recorded near the application site. The closest record of groundwater flooding is at NGR TL 21281 08856, some 800m to the east of the application site, beyond the Ellenbrook. The SFRA indicates this flooding of indoor tennis courts was mostly likely from a local building.

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[13] Gov.uk website (accessed 19/08/21) Flood map for planning - GOV.UK (flood-map-for-planning.service.gov.uk)

[14] Hertfordshire County Council (2018). Hertfordshire Minerals Local Plan Review: Level 1 Strategic Flood Risk Assessment (SFRA)

[15] JBA Consulting (2016). Welwyn Hatfield Council Level 1 and 2 Strategic Flood Risk Assessment, Final Report

Therefore, the risk of groundwater flooding is not significant and has not been considered further.

4.1.5 Flooding from Sewers

Floodwater from surcharging foul and surface water sewers in the vicinity of the application site is likely to follow the general topography and drain towards the Ellenbrook. Therefore, any flows would be conveyed in a south easterly direction by the natural slope of the land and would not accumulate to a sufficient depth in the vicinity of the proposed development to give rise to a flood risk.

Therefore, the risk of sewer flooding is not significant and has not been considered further.

4.1.6 Flooding from Reservoirs, Canals and Other Artificial Sources

With reference to the 1:25,000 scale Ordnance Survey mapping, there are a number of silt lagoons to the north of the application site that are related to former and active mineral gravel extraction workings. These lagoons do not retain water above the natural ground level so do not pose a significant flood risk to the application site

Environment Agency mapping confirms that the application site is not located in an area identified at risk of flooding from a reservoir.

Flooding from these sources has not therefore been considered further.

4.2 Summary of Sources of Flooding

A summary of the potential sources of flooding is presented in Table 4-1.

Table 4-1
Potential Sources of Flooding

Potential Source of flooding	Potential Flood Risk at the Site
Rivers or Fluvial Flooding	**Yes**
Sea or Tidal Flooding	No
Land or Pluvial Flooding	**Yes**
Groundwater	No
Sewers	No
Reservoirs, Canals and other Artificial Sources	No

5.0 Assessment of flood risk

5.1 Potential Sources of Flood Risk

The flood screening assessment reported in Section 4.0 suggested that the application site could be at risk of flooding from land i.e. pluvial flooding and/or fluvial flooding and this is considered further below.

5.2 Data Sources

In considering the flood risk to the application site, the following data sources have been considered:

- The flood maps published on the UK Government's website[16]; and

5.3 Historical Flooding

Emapsite has provided a map of historic flood events, a copy of which is enclosed in Appendix 05. With reference to the '*3. Environment Agency Historic Flooding Events Map*', localised flooding along the Nast within the south eastern corner of the application site is shown to have occurred during the December 2002/January 2003 flood event.

5.4 Environment Agency Surface Water Flood Maps

An extract of the Environment Agency's flood map published on their website is reproduced as Drawing No. 003. Based upon the mapping, the majority of the application site is designated as being at 'very low' risk of surface water flooding, whilst some localised areas of 'low' to 'high' risk of surface water flooding are located along the alignment of the Nast and at relatively low-lying areas across the application site.

5.5 Probability of the Site Flooding

5.5.1 Fluvial Flooding

As mentioned at Section 4.1.1, the indicative flood maps published on the Gov.uk website show a strip of land along the south eastern reach of the Nast which correlates with the historical flood extent described in Section 5.3. This area has been assessed by the Environment Agency to have been 1% and 0.1% Annual Exceedance Probability (AEP) of flooding from rivers.

With reference to the proposed phased mineral extraction and restoration (Appendix 04 and Drawings HQ 3/5 to 3/10 of the ES), no works are proposed within the aforementioned area.

It is therefore not deemed appropriate to assess this source of flooding further nor construct a hydraulic model to explicitly represent the flood risk at the application site from this source.

[16] UK Government Website (Accessed on 19 August 2021) https://flood-warning-information.service.gov.uk/long-term-flood-risk/ & https://flood-map-for-planning.service.gov.uk/

5.5.2 Pluvial Flooding

The EA maps that show the potential extent of pluvial flooding, reproduced as Drawing No. 003, take little or no account of existing drainage and infiltration potential of the underlying ground; therefore, they very much represent an overly onerous depiction of surface water flood risk.

Given the above and based upon the low vulnerability of the proposed development land use any localised and shallow ponding of surface water from rainfall poses minimal impact upon the function of the application site.

Flooding from this source is not considered to be significant at the application site. It is therefore not deemed appropriate to construct a hydraulic model to explicitly represent the flood risk at the application site from this source.

5.6 Flood Zone

The definition of flood zones is provided by *Table 1: Flood zones* in NPPF Paragraph 065 and is summarised below:

- *Zone 1 - low probability* (Flood Zone 1). Land having a less than 1 in 1,000 annual probability of river or sea flooding.
- *Zone 2 - medium probability* (Flood Zone 2) Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
- *Zone 3a - high probability* (Flood Zone 3a) Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
- *Zone 3b - the functional floodplain* (Flood Zone 3b) This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

With reference to the assessment of the flood risk discussed above, while the south eastern corner of the application site is located in Flood Zone 2, the mineral workings, processing facility and restoration works will all be outside this area. The proposed works therefore lie within **Flood Zone 1**.

6.0 Climate Change

The most recent advice on climate change is provided by the Environment Agency[17]. The guidance confirms that peak rainfall intensity, sea level, peak river flow, offshore wind speed and extreme wave heights are all expected to increase in the future. The guidance recommends that considerations for future climate change are included in Flood Risk Assessments for proposed developments.

An extract of peak rainfall intensity allowances from published EA guidance aforementioned is provided below as Table 6-1.

Table 6-1
Peak rainfall intensity allowance in small catchments (less than 5km2) or urban drainage catchments (based on a 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

The EA Guidance indicates that "*peak river flow allowances show the anticipated changes to peak flow by management catchment. Management catchments are sub-catchments of river basin districts*". The range of allowances is based on percentiles:

- The central allowance is based on the 50th percentile;
- The higher central allowance is based on the 70th percentile; and
- The upper end allowance is based on the 95th percentile.

Peak river flow climate change allowances for the Colne Management Area is provided below as Table 6-2.

Table 6-2
Peak River Flow Climate Change Allowances for Colne Management Catchment Area

Time Period	Peak River Flow Climate Change Allowances	
2020s	Central	10
	Higher Central	16
	Upper End	30
2050s	Central	8

[17] UK Government Guidance – Flood Risk Assessments: Climate Change Allowances (Updated July 2021) https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Time Period	Peak River Flow Climate Change Allowances	
	Higher Central	16
	Upper End	38
2080s	Central	21
	Higher Central	35
	Upper End	72

The application site is likely to be subject to increases in rainfall intensity of 40% over the lifetime of the development nominally taken to be 100 years.

It has been shown that the proposed works is outside of any identified floodplains or from areas that have been subject to flooding historically. It is not anticipated, therefore, that an increase in rainfall intensity attributable to the possible effects of climate change will increase flood risk at application site during the proposed life of the development.

7.0 Policy Status for Proposed development

7.1 Vulnerability

With reference to NPPF *Table 2: Flood risk vulnerability classification*, sites used for sand and gravel working and general industry are considered as a '*Water compatible development*' and '*Less vulnerable*' use respectively.

7.2 Appropriateness Classification

As discussed at Section 5.3, the proposed works lie entirely within Flood Zone 1. *Table 3: Flood risk vulnerability and flood zone 'compatibility'* at PPG Paragraph 067 (reproduced as Table 7-1) advises that a '*Water compatible development*' and '*Less vulnerable*' uses in Flood Zone 1 are considered an appropriate form of development.

Table 7-1
Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification (PPG Table 2)		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (PPG Table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	x	Exception Test Required	✓
	Zone 3b (functional floodplain)	Exception Test Required	✓	x	x	x

Key: ✓ Development is appropriate

x Development should not be permitted

7.3 Sequential Test and Exception Test

7.3.1 Sequential Test

The NPPF requires that at all stages of planning; a Sequential Test is completed with the aim of steering new development to areas at the lowest probability of flooding (Flood Zone 1). The Sequential Test would normally be completed by the Local Planning Authority (LPA) to inform the preparation of the Local Development Framework (LDF), where one exists. However, where this process has not yet been completed the onus for the provision of evidence demonstrating

successful application of the Sequential Test falls to the developer, or promoter of the application site.

However, as the application site falls into Flood Zone 1 the Sequential Test can be deemed to be passed for the application site.

7.3.2 Exception Test

With reference to PPG *Table 3: Flood risk vulnerability and flood zone 'compatibility'* the Exception Test does not have to be applied.

7.4 Sequential Test within Site layout

The NPPF also requires the layout of the application site to be sequentially tested; however, the application site is located entirely within Flood Zone 1. It is not therefore necessary to sequentially test the development layout, however, key operational plant and facilities will generally be situated away from the lowest lying areas of the application site thereby adopting the sequential approach to land use management advocated by the NPPF.

8.0 Flood Risk Management Measures

8.1 Flood Risk Management Measures

Given the low risk of flooding across the entire application site, it is not deemed appropriate to develop a Flood Evacuation Plan to address public safety issues, nor is flood resilient construction methods deemed necessary.

9.0 Management of Off Site Impacts

9.1 Groundwater Management

9.1.1 Operational Phase

The mineral site will be developed and restored in 7 sequential phases (A through G). Each phase will be worked for approximately 4 years from start to restoration and activities will be consistent for each phase.

Each phase will be initially surrounded by a perimeter clay bund, a process that will require localised pumping and disposal of groundwater into a recharge lagoon in the UMH. The perimeter bund will be installed with a back-drain to control groundwater levels behind the bund which will drain to the recharge lagoon in the UMH with any overflow discharging into Nast at the south east boundary of the application site at greenfield runoff rate. The back-drain design will be different for each phase; some will be controlled through gravity and some by pumping from sumps.

Once the perimeter bund is installed, excavation of the UMH within each phase will require localised dewatering but since the perimeter bund will be in place the pumping rate will decline over time until the only pumping requirement is equal to rainfall recharge and to remove groundwater in storage within the phase. Maintenance pumping will involve discharging water to the UMH lagoon and/or the LMH lagoon.

The LMH will be worked wet and therefore no groundwater management will be required for this phase of development.

9.1.2 Restoration phase

The highest groundwater elevation monitored within the UMH between August 2013 and July 2021 occurred in February 2014 and April 2021 when groundwater reached a peak elevation of 77.28m AOD at BH102U located as shown on Drawing No. 004. At this location ground level will be restored to approximately 78.00m AOD.

The clay bund will be retained along the outer perimeter of extraction works which will impede groundwater flow within the UMH. It is therefore proposed to retain the back-drain to phases E and G as a 500mm deep open channel to intercept groundwater levels exceeding that monitored in February 2014 and April 2021 and extended as shown on Drawing No. HQ 3/10 enclosed in Appendix 04.

The infiltration lagoon will comprise the infilling of the LMHL with the interburden thereby limiting infiltration to the LMH. The UMH and LMH infiltration lagoons will then be combined into one large UMH lagoon by removing the clay bund separating the two. It is therefore proposed that any intercepted groundwater will drain to the UMH lagoon as shown on Drawing No. HQ 3/10.

9.2 Surface Water Management

9.2.1 Operational Phase Dewatering

Management of rainfall within each phase during the LMH excavation period will be as described above through maintenance pumping and discharging water to the UMHL and/or the LMHL.

9.2.2 Restoration phase

Following extraction works, the application site will be infilled to approximately 76.0m AOD with a slope in a general north-easterly direction towards the infiltration lagoon.

It is therefore proposed to discharge surface water runoff offsite using a 2-tiered approach. Surface Water runoff will be intercepted by a network of lined swales and ponds before discharging to the infiltration lagoon.

9.3 Infiltration Lagoons

The infiltration rate for the UMHL and LMHL are expected to be suitable for the control of groundwater and surface water by infiltration, see Appendix 6/10 of the ES.

Notwithstanding the above, during operational phase, a secondary outfall will be provided into the Nast at the south east boundary of the application site to allow for management of groundwater and surface water during an exceedance event or in the case of failure of the infiltration lagoons. It is of note that flow into the Nast will be attenuated to the 100% AEP greenfield runoff rate of 1.37l/s/ha for the application site.

9.4 Diversion of the Nast

During the operational phase, to enable the construction of the proposed processing facility, the open reach of the Nast to the north of the quarry workings will be diverted along the northern perimeter of the working areas. The culverted reach of the Nast, that passes through the excavation phases of the site, will also need to be diverted to allow the mineral workings and infilling to take place. As such, it is proposed that the culvert be diverted to the east of the proposed infiltration lagoons.

Upon restoration of the application site, the Nast to the north of the excavation phases will be reinstated along its pre-quarry alignment within the northern part of the application site. The remaining, diverted part of the Nast, will be retained as a culverted watercourse around north eastern boundary of the site.

10.0 Residual Risks

Extreme fluvial events are generally predictable but by their nature predictions are based on probability and thus subject to uncertainty. A residual risk remains that events exceeding those predicted may occur.

However, as discussed in Section 5.3, the proposed works lie entirely in Flood Zone 1 and as such the residual flood risk is not considered to be significant.

11.0 Conclusions

11.1 Background

This report has been commissioned to consider the flood risk to land at the former Hatfield aerodrome, Hertfordshire where a planning application is being made for a proposed sand and gravel quarry to include new access (onto A1057), aggregate processing plant, concrete batching plant and other ancillary facilities.

With reference to the flood maps and site specific flood information provided by the Environment Agency, the proposed works are considered to lie in Flood Zone 1 as defined by PPG *Table 1: Flood zones*.

11.2 Vulnerability and Appropriateness Classification

With reference to PPG *Table 2: Flood risk vulnerability classification*, sites used for sand and gravel working and general industry are considered as a '*Water compatible development*' and '*Less vulnerable*' use respectively.

Therefore, with reference to PPG *Table 3: Flood risk vulnerability and flood zone 'compatibility'*, the proposed development would be considered '*appropriate*'.

11.3 Sequential and Exception Tests

As the proposed works falls into Flood Zone 1 the Sequential Test can be deemed to be passed for the application site. Moreover, with reference to PPG *Table 3: Flood risk vulnerability and flood zone 'compatibility'* the Exception Test does not have to be applied.

11.4 Flood Risk Management

Given the relatively low risk of flooding across the entire application site, it is not deemed appropriate to develop a Flood Evacuation Plan to address public safety issues, nor are flood resilient construction methods deemed necessary.

Notwithstanding the above, a network of swales and ponds will be provided within the design of the restoration scheme to provide surface water quality benefits.

Without mitigation, the proposed works have the potential to increase the risk of flooding elsewhere due to obstruction groundwater flow by the perimeter bund and increasing surface water runoff resulting from the proposed capping of the waste.

It is therefore proposed that groundwater be controlled using a back-drain behind the proposed perimeter bund and drain to the UMH lagoon with any overflow discharging to the LMH lagoon or into Nast at the south east boundary of the application site at greenfield runoff rate.

Management of rainfall within each phase during the LMH excavation period will be managed as part of the groundwater management, through maintenance pumping and discharging water to the UMHL and/or the LMHL.

Upon restoration, surface water runoff will be intercepted by a network of lined swales and ponds before discharging to the infiltration lagoon.

11.5 Residual Risks

As the proposed works lie entirely in Flood Zone 1 and as such the residual flood risk is not considered to be significant. Moreover, as discussed at Section 9.2.2, an overflow arrangement to the Nast, at the south east boundary of the application, will be provided to manage any excess flow during an exceedance event or in case of failure of the infiltration lagoon. 11.6 Consultation on Original Applciaiton

APPENDICES

APPENDIX 01: RESPONSE TO ENVIRONMENT AGENCY CONSULTATION

7 July 2016

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Herts, AL10 9EX
via email: SPHatfield@environment-agency.gov.uk

Our Ref: 403.01009.00132

Dear Kai

RE: HATFIELD QUARRY, FORMER HATFIELD AERODROME, HERTFORDSHIRE: RESPONSE TO ENVIRONMENT AGENCY OBJECTION

1.0 INTRODUCTION

This letter has been prepared to address comments received from the Environment Agency contained in a letter received by email from Hertfordshire County Council on 21 April 2016. The comments refer to the Flood Risk Assessment (FRA) for the proposed sand and gravel quarry, including new access onto the A1057, an aggregate processing plant, concrete batching plant and other ancillary facilities on land at the former Hatfield Aerodrome, Hertfordshire (the application site).

We understand from the aforementioned correspondence that the Environment Agency would object to the grant of planning permission for the proposed development as:

> *'The FRA submitted with this application does not comply with the requirements set out in paragraph 9 the Technical Guide to the National Planning Policy Framework. The submitted FRA does not therefore provide a suitable basis for assessment to be made of the flood risks arising from the proposed development.*
>
> *In particular, the submitted FRA fails to:*
>
> 1. *Ensure that any off-site flood risk from the development site does not increase the risk of flooding to downstream properties in extreme flood events.*
> 2. *Demonstrate that the diversion proposals for the River Nast will not increase the risk of flooding on the development site in extreme flood events.*
> 3. *Consider the temporary diversion of the River Nast in an open channel.*
> 4. *Consider an open channel watercourse on the proposed permanent line of the River Nast after restoration.'*

Following discussions with your colleague Trevor Brawn, we understand that the information provided within the Environmental Statement (ES) and Water Framework Directive Compliance Assessment (WFDCA) is sufficient to satisfy items 1 to 4 of your objection. However, to assist in your assessment we have collated the relevant information provided further clarification details of the proposals.

2.0 ASSESSMENT OF FLOOD RISK

The proposed works lie within Flood Zone 1. The focus of the FRA was therefore to development a Surface Water Management Strategy to manage groundwater and surface water at the application site during the operational and restoration phases.

2.1 Groundwater Management

2.1.1 Operational Phase

The quarry would be worked in phases to allow for progressive restoration as illustrated on Drawings HQ 3/6 to 3/12 (Appendix A). Sand and gravel would be worked from the two discrete horizons described above; the Upper Mineral Horizon (UMH) and the Lower Mineral Horizon (LMH).

The UMH is overlain by a clayey material (referred to as '*overburden*'), above which is the soil horizon. The two mineral horizons are separated by a laterally continuous layer of boulder clay (referred to as '*interburden*'). The overburden and interburden would be used to control groundwater ingress and to infill the base of the workings to provide a suitable low permeability geological barrier on which the imported material would be placed.

Two infiltration lagoons will be constructed; one into the UMH and a second into the LMH. These would be used to manage the groundwater and surface water discharge generated during the operation of the application site. Groundwater from the LMH would be discharged only to the LMH lagoon. UMH groundwater will be discharged to the UMH and/or the LMH lagoon if additional capacity is required.

Prior to the excavation of each phase it will be isolated from the adjacent aquifer by the construction of a clay barrier or perimeter bund. This will be installed into a trench excavated into the UMH, and keyed into the underlying interburden clays. This will require localised pumping to install the bund in a dry excavation. Groundwater from this dewatering will discharged into UMH Lagoon.

The perimeter bund will be installed with a back-drain to control groundwater levels behind the bund which will drain to the recharge UMH Lagoon. The back-drain design will be different for each phase; some will be controlled through gravity and some by pumping from sumps.

Once the perimeter bund is installed the mineral in the phase will be dewatered and the mineral excavated in the dry. The pumping rate will decline over time until the only pumping requirement is equal to rainfall recharge and to remove groundwater in storage within the phase. Groundwater from this dewatering will discharged into UMH Lagoon.

Limited dewatering may be required to excavate the interburden in the dry, although this will not be needed for all phases. Groundwater from this dewatering will discharged into LMH Lagoon. Once the interburden has been removed the LMH will be worked wet, i.e. it will not be dewatered.

2.1.2 Restoration Phase

The clay bund along the outer perimeter of extraction works will be retained after restoration. This will impede groundwater flow within the UMH. It is therefore proposed to retain the back-drain to phases E and G as a 500mm deep open channel to intercept groundwater levels to ensure that historic high water table elevations are not exceeded.

At restoration the two recharge lagoons will be connected and backfilled to allow recharge only into the UMH. Groundwater in the Phase E and G back drain will be directed to this lagoon as shown on Drawing No. HQ 3/10 (Appendix A).

2.2 Surface Water Management

2.2.1 Operational Phase Dewatering

Management of rainfall within each phase during the LMH excavation period will be through pumping and the discharge water to the UMH Lagoon.

2.2.2 Restoration Phase

Following extraction works, the application site will be infilled to an elevation ranging between approximately 76mAOD and 78.0m AOD with a slope in a general east-north-east direction towards the single UMH lagoon. Surface water runoff will be intercepted by a network of lined swales and ponds before discharging to the infiltration lagoon.

2.3 Groundwater and Surface Water Management Infiltration Capacity

An assessment was made in the ES to demonstrate that the recharge lagoons had the capacity to manage the predicted surface water and groundwater volumes.

Estimates of the water volumes that may need to be managed and the capacity of the recharge lagoons are presented in Appendix 6/10 of the ES (a copy of which is enclosed with this report for ease of reference) and summarised in Table 2-1 (Superscript references refer to the relevant sections of Appendix 6/10).

Table 2-1
Estimated Volume of Water to be Managed and Lagoon Capacity

Line	Source of Water	Estimated Volume (m^3/day)	Discharge Location & Capacity
1	Dewater for bund construction	59 – 299 [1(b)]	UMH lagoon (LMH if required)
2	Backflow Drain	28 – 133 [1(c)]	
3	Groundwater and rainfall within each phase	125 – 147 [2]	
4	LMH groundwater if above interburden base	155 – 811 [3(b)]	LMH lagoon
5	Back-drain discharge from restored site (Phase E & G only)	134 – 269 [7]	UMH lagoon (LMH if required)
6	Restored site runoff	41,000 [8]	UMH Lagoon (enlarged)
7	UMH Lagoon Infiltration Capacity LMH Lagoon Infiltration Capacity		289 – 579 [5(a)] 1,158 – 2,316 [5(b)]

An explanation of each line in Table 2-1 is given below:

- Line 1 is the range in groundwater abstraction required to dewater the UMH during construction of the perimeter bund to each Phase.
- Line 2 is the volume of groundwater collected in back drains installed around each Phase during operation.
- Line 3 is the volume of groundwater and surface water pumping required from each Phase to dewater the UMH.
- Line 4 is the volume of dewatering required from the LMH to enable excavation of the interburden.
- Line 5 is the estimated groundwater flow into the back drain, post restoration, at the western perimeter of the application site.
- Line 6 is the 1% Annual Exceedance Probability (AEP) surface water runoff from the restored phase inclusive of an allowance for climate change.
- Line 7 is the estimated infiltration capacity of the UMH and the LMH Lagoons. The variation is due to the range in aquifer properties and the variation in rest water level in the lagoon.

Note, for Line 6, the greatest increase in surface water runoff from the proposed development will be during the restored phase which will comprise the largest area of impermeable surface due to the underlying fill and capping. While the FRA allowed for a 30% uplift in rainfall intensity for the restored phase, under new guidance published by the Environment Agency[1], a 40% uplift in rainfall intensity should be considered. With reference to the Flood Estimation Handbook Depth Duration Frequency model data, a 1% AEP 1 hour storm duration results in a rainfall intensity of 48.89mm/hr, or 68.45mm/hr inclusive of climate change. A conservative approach has been adopted that assumes all rainfall onto the proposed extraction works will result in surface water runoff. Over the proposed extraction works area of 53.4ha, 36,550m^3 of surface water runoff would result from the restored phase.

As well as the stated infiltration capacity, the combined UMH lagoon has a storage range of between 93,000m^3 and 167,000m^3 (depending on UMH static groundwater elevation at the time of storm event), which is more than double the surface water runoff volume from the restored phase. Therefore, in the event of a second 1% AEP rainfall event at the application site within a 24 hour period, the combined UMH lagoon will have ample capacity to store the runoff.

A comparison of the groundwater and surface water being produced and the infiltration capacity of the lagoons indicate that the discharge capacity is sufficient for its purpose. A secondary outfall will be provided into the Nast at the south east boundary of the application site to allow for management of groundwater and surface water during an extreme event. It is of note that flow into the Nast will be attenuated to the 100% AEP greenfield runoff rate of 1.37l/s/ha for the application site.

[1] Environment Agency, February 2016. Flood risk assessments: climate change allowances (Accessed 17 June 2016 at https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances)

3.0 DIVERSION OF THE NAST

3.1 Operational Phase

During the operational phase the existing open reach of the Nast to the north of the quarry workings will be diverted south and along the northern perimeter of the working areas. This is required to enable the construction of the proposed processing facility. As there will remain significant activity above and/or adjacent to the Nast associated with both the proposed processing facility and the quarry workings it is proposed to culvert the existing open channel reach of the Nast during the operational phase.

The existing culverted reach of the Nast, that passes through the excavation phases of the application site, will also be diverted to allow the mineral workings and infilling to take place. It is proposed that the culvert be diverted to the east of the proposed infiltration lagoons. At this location ground levels during operational phase will be approximately 80m AOD (see Drawing HQ 3/6), and as, the existing open channel of the Nast has an invert level of 74m AOD (see topographic survey Appendix A of the FRA) at its downstream end, an open channel to the east of the infiltration lagoon would need to be 6m deep which is not deemed viable.

3.2 Restoration Phase

Upon restoration of the application site, the Nast to the north of the excavation phases will be reinstated along its pre-quarry alignment within the northern part of the application site.

The remaining culverted section to the east of the infiltration lagoons will be retained. It is not possible to reinstate the culvert along its former alignment as this will be in filled material which will settle and potential cause the culvert to collapse. With reference to Drawing HQ 3/11 enclosed in Appendix A, ground levels to the east of the infiltration lagoon will be lowered to approximately 76m AOD. The invert level of existing reach of the Nast at the south eastern boundary of the application site is 71.78m AOD, some 4m below restored ground levels. An open channel this deep is not deemed viable.

It is of note that the restoration works will comprise the construction of a network of open ditch/swale as shown Drawing HQ 3/11, thereby providing a net improvement across the application site.

A secondary outfall will be provided into the Nast at the south east boundary of the application site to allow for management of groundwater and surface water during an exceedance event, should one occur. However, as discussed at Section 3, this will be limited to the 100% AEP greenfield runoff rate of 1.37l/s/ha for the application site.

4.0 CONCLUSIONS

Technical information presented within this report on behalf of Brett Aggregates Limited seeks to demonstrate that a sustainable and integrated groundwater and surface water management scheme can be implemented for the application site during the operational and restoration phases. That is, groundwater and surface water will be managed on site without causing an increase of flood risk elsewhere.

It also seeks to demonstrate that the proposed diversion of the Nast will not cause an increase in flood risk elsewhere.

Finally, the opportunity for '*diversion of the River Nast in an open channel*' and providing *'an open channel watercourse on the proposed permanent line of the River Nast after restoration'* has been assessed but is considered unfeasible. However, the restoration works will comprise the construction of a network of open ditch/swale which will provide a net improvement across the application site.

Should you have any queries or wish to discuss any aspect of this letter report in greater detail please do not hesitate to contact me in our Bradford on Avon Office on 01225 309 400.

Yours sincerely
SLR Consulting Limited

pp. C. Jeanne

Caroline Jeanne
Associate Hydrologist

Enc.

Appendix A	**Drawings from ES**
Appendix 6/10[2]	**Groundwater, Surface Water and Drain Management**

[2] This is the reference used in the ES

Appendix A Drawings from ES

EPHEMERAL RIVER NAST TO BE DIVERTED AROUND LANDSCAPE AND ECOLOGICAL CORRIDOR AROUND SITE BOUNDARY

PLANT SITE, STOCKPILES AND LAGOONS

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND PLACED INTO TEMPORARY STORAGE AROUND PERIMETER. FORMATION LEVELS TO THEN BE BUILT UP TO EXISTING USING SUITABLE AS-DUG UMH FROM RECHARGE LAGOONS, AVERAGE 1.5m THICKNESS.

REFER TO DRAWING HQ 3/3 FOR PLANT SITE LAYOUT

PROPOSED ADVANCE HEDGEROW AND TREE PLANTING ALONG ECOLOGICAL CORRIDOR

NORTHERN PART OF PUBLIC RIGHT OF WAY DIVERTED AROUND SITE PERIMETER, ALONG ENHANCED LANDSCAPE AND ECOLOGICAL CORRIDOR

INTERNAL HAUL ROAD

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND PLACED INTO TEMPORARY STORAGE AROUND PERIMETER.

ROAD TO THEN BE BUILT UP TO EXISTING USING AS-DUG FROM UPPER MINERAL LAGOON.

CROSSING POINT FOR PERMISSIVE PATH

UPPER AND LOWER MINERAL RECHARGE LAGOON AND ADJACENT STRIP TO SOUTH

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND PLACED INTO TEMPORARY STORAGE AROUND PERIMETER.

THEN TO BE STRIPPED OF OVERBURDEN AND USED TO FORM PERIMETER SEALS AROUND LAGOONS, WITH SURPLUS PLACED INTO PERIMETER STORAGE MOUNDS ADJACENT.

IF SUITABLE, AS-DUG MINERAL TO BE USED TO BUILD FORMATION LEVELS IN PLANT SITE, STOCKING AREA AND INTERNAL ROADS.

INTERBURDEN TO BE STRIPPED FROM LMH LAGOON AND PLACED INTO PERIMETER STORAGE MOUNDS FOR LATER REUSE IN RESTORATION, EXPOSING LMH TO BE TAKEN TO PLANT SITE.

UMH RECHARGE LAGOON

LMH RECHARGE LAGOON

N:208500

N:208500

NAST TO BE DIVERTED TO STANDOFF TO EAST, TO CONNECT TO EXISTING CULVERT AT EDGE OF SITE

EXTRA PLANTING ON BUND

EXISTING NAST CULVERT. INVERT AT MONITORING POINT ALONG THE SIDE OF THE ROAD AT 71.78m AOD.

PERMISSIVE ROUTE TO CONNECT TO ROADSIDE PATH

N:208000

NEW INTERNAL ROAD TO BE CONSTRUCTED AT 10m STANDOFF TO GAS PIPE, AND TO INCORPORATE NEW DRAINAGE CHANNEL TO INTERCEPT SURFACE WATER AND STOCK-PROOF FENCE ON BOUNDARY.

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND PLACED INTO TEMPORARY STORAGE AROUND PERIMETER.

SUBJECT TO SUITABILITY, FORMATION LEVELS TO THEN BE BUILT UP TO EXISTING USING AS-DUG UMH FROM RECHARGE LAGOONS, AVERAGE 1.5m THICKNESS.

SUBSEQUENT WEARING COURSE TO BE DETERMINED.

ACOUSTIC FENCE TO BE CONSTRUCTED ALONG PART OF WESTERN SITE BOUNDARY, AS REQUIRED, TO INCLUDE CLIMBING PLANTS ON OUTSIDE FACE. ALIGNMENT TO BE AT 10m STANDOFF TO GAS PIPE

ROAD ACCESS

ACCESS POINT OVER BUND FOR PERMISSIVE PATH LEADING FROM ROADSIDE PATH

PROPOSED PERIMETER BUND

BUNDS TO INCLUDE SOILS FROM RECHARGE LAGOONS, ROADS AND PLANT SITE, WITH OVERBURDEN AND INTERBURDEN TO BE PLACED ALONGSIDE RECHARGE LAGOONS FOR BACKFILLING UMH LAGOON AS PART OF FINAL RESTORATION.

3m HIGH ALONG HATFIELD ROAD, 4m HIGH ELSEWHERE. 1:3 OUTER SIDE SLOPES ALONG PROW TO NORTH, HATFIELD ROAD TO SOUTH AND PLAYING FIELD TO SOUTH-EAST AND 1:2 SLOPES ELSEWHERE. 5M STAND OFF FROM TOE OF BUND TO EXTRACTION AREA AND SITE BOUNDARY.

TOPSOIL TO BE STRIPPED FROM BENEATH INTERBURDEN, OVERBURDEN AND SUBSOIL STORAGE BUNDS IN ADVANCE AND PLACED OVER THE TOP AS FINAL COVER. ALL BUNDS TO BE GRASS SEEDED. CONTRASTING UNITS TO BE SEPARATED BY GEOTEXTILE

0 50 100 150 200m 300 400 500

Metres 1:5000

N

LEGEND

- SITE BOUNDARY
- PROPOSED CONTOURS (2m INTERVALS)
- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- MINERAL EXTRACTION AREA
- PUBLIC RIGHT OF WAY (INC DIVERTED SECTION)
- PERMISSIVE RIGHT OF WAY (INC DIVERTED SECTION)
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- PROPOSED AREA OF DISTURBANCE FROM SITE PREPARATION WORKS
- PROPOSED PERIMETER STORAGE BUNDS
- PROPOSED PERIMETER SEALS
- LANDSCAPE AND ECOLOGICAL CORRIDOR
- UNDISTURBED LAND WITHIN APPLICATION SITE
- ADVANCE HEDGEROW AND STANDARD TREE PLANTING
- EXISTING VEGETATION

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HATFIELD AERODROME

PLANNING APPLICATION

INITIAL SITE PREPARATION

HQ 3/6

Scale 1:5,000 @ A3

Date DEC 2015

160107_01009.00132.29.000_HQ3-6_SITEPREP1_SM.dwg

PHASE A

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND PLACED INTO TEMPORARY STORAGE AROUND PERIMETER.

TO BE STRIPPED OF OVERBURDEN AND USED TO FORM PERIMETER SEALS AROUND PHASE, WITH SURPLUS PLACED INTO WORKED OUT VOID. SUITABLE IMPORTED MATERIALS MAY BE USED TO FORM THE PERIMETER SEALS.

INTERBURDEN TO BE PROGRESSIVELY STRIPPED AND PLACED BACK INTO VOID AS 2m THICK GEOLOGICAL SEAL.

UMH AND LMH TO BE PROGRESSIVELY TAKEN TO PLANT SITE.

CROSSING POINT FOR PERMISSIVE PATH

PLANT SITE, STOCKPILES AND LAGOONS

NORTHERN PART OF PUBLIC RIGHT OF WAY DIVERTED AROUND SITE PERIMETER, ALONG ENHANCED LANDSCAPE AND ECOLOGICAL CORRIDOR

UMH RECHARGE LAGOON

LMH RECHARGE LAGOON

PHASE A - EXTRACTION AREA

PERMISSIVE ROUTE TO CONNECT TO ROADSIDE PATH

ROAD ACCESS

ACCESS POINT OVER BUND FOR PERMISSIVE PATH LEADING FROM ROADSIDE PATH

PROPOSED PERIMETER BUND

BUND EXTENDED ALONG HATFIELD ROAD AND AROUND POPEFIELD FARM.

3m HIGH ALONG HATFIELD ROAD AND 1:2 SLOPES. 5M STAND OFF FROM TOE OF BUND TO EXTRACTION AREA AND SITE BOUNDARY.

TOPSOIL TO BE STRIPPED FROM BENEATH SUBSOIL STORAGE IN ADVANCE AND PLACED OVER THE TOP AS FINAL COVER. ALL BUNDS TO BE GRASS SEEDED. CONTRASTING UNITS TO BE SEPARATED BY GEOTEXTILE

N:209000 N:208500 N:208000 E:519500

0 50 100 150 200m 300 400 500

Metres 1:5000

N

LEGEND

- SITE BOUNDARY
- 70 PROPOSED CONTOURS (2m INTERVALS)
- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- MINERAL EXTRACTION AREA
- PUBLIC RIGHT OF WAY (INC DIVERTED SECTION)
- PERMISSIVE RIGHT OF WAY
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- PROPOSED AREA OF DISTURBANCE FROM SITE
- PROPOSED PERIMETER STORAGE BUNDS
- PROPOSED PERIMETER SEALS
- LANDSCAPE AND ECOLOGICAL CORRIDOR
- UNDISTURBED LAND WITHIN APPLICATION SITE
- ADVANCE HEDGEROW AND STANDARD TREE PLANTING
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PHASE A - ILLUSTRATION

HQ 3/7

Scale 1:5,000 @ A3

Date DEC 2015

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CROSSING POINT FOR PERMISSIVE PATH

PHASE B

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND PLACED INTO TEMPORARY STORAGE TO PERIMETER / PHASE G.

TO BE STRIPPED OF OVERBURDEN AND USED TO FORM PERIMETER SEALS AROUND PHASE, WITH SURPLUS PLACED INTO WORKED OUT VOID IN PHASE A OR PHASE B. SUITABLE IMPORTED MATERIALS MAY BE USED TO FORM THE PERIMETER SEALS.

INTERBURDEN TO BE PROGRESSIVELY STRIPPED AND PLACED BACK INTO VOID AS 2m THICK GEOLOGICAL SEAL.

UMH AND LMH TO BE PROGRESSIVELY TAKEN TO PLANT SITE.

PLANT SITE, STOCKPILES AND LAGOONS

NORTHERN PART OF PUBLIC RIGHT OF WAY DIVERTED AROUND SITE PERIMETER, ALONG ENHANCED LANDSCAPE AND ECOLOGICAL CORRIDOR

UMH RECHARGE LAGOON

LMH RECHARGE LAGOON

PHASE B - EXTRACTION AREA

PHASE A - EXTRACTION AND INFILL AREA

TEMP DIVIDING BUND BETWEEN PHASE A AND B

TO BE REMOVED AND PLACED INTO ADJACENT VOID OR USED TO FORM SEAL ELSEWHERE

PERMISSIVE ROUTE TO CONNECT TO ROADSIDE PATH

PROPOSED PERIMETER BUND

BUND EXTENDED WITHIN FOOTPRINT OF MINERAL EXTRACTION PHASE G. BASED ON BEING 3m HIGH AND 1:2 SLOPES.

TOPSOIL TO BE STRIPPED FROM BENEATH SUBSOIL STORAGE IN ADVANCE. ALL BUNDS TO BE GRASS SEEDED. CONTRASTING UNITS TO BE SEPARATED BY GEOTEXTILE

ROAD ACCESS

ACCESS POINT OVER BUND FOR PERMISSIVE PATH LEADING FROM ROADSIDE PATH

N:208500

N:208000

E:519500

E:520500

0 50 100 150 200m 300 400 500

Metres 1:5000

N

LEGEND

- SITE BOUNDARY
- 70 — PROPOSED CONTOURS (2m INTERVALS)
- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- MINERAL EXTRACTION AREA
- PUBLIC RIGHT OF WAY (INC DIVERTED SECTION)
- PERMISSIVE RIGHT OF WAY
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- PROPOSED AREA OF DISTURBANCE FROM SITE
- PROPOSED PERIMETER STORAGE BUNDS
- PROPOSED PERIMETER SEALS
- LANDSCAPE AND ECOLOGICAL CORRIDOR
- UNDISTURBED LAND WITHIN APPLICATION SITE
- ADVANCE HEDGEROW AND STANDARD TREE PLANTING
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PHASE B - ILLUSTRATION

HQ 3/8

Scale 1:5,000 @ A3

Date DEC 2015

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PHASE C

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND DIRECT PLACED ONTO PREVIOUSLY PREPARED FORMATION LEVELS IN PHASE C, ACCORDING TO SPECIFICATION AND PROFILES TO MAXIMIZE HABITAT CREATION POTENTIAL.

OVERBURDEN TO BE USED TO FORM PERIMETER SEALS AROUND PHASE, WITH SURPLUS PLACED INTO PREVIOUSLY WORKED OUT VOIDS. SUITABLE IMPORTED MATERIALS MAY BE USED TO FORM THE PERIMETER SEALS.

INTERBURDEN TO BE PROGRESSIVELY STRIPPED AND PLACED BACK INTO VOID AS 2m THICK GEOLOGICAL SEAL.

UMH AND LMH TO BE PROGRESSIVELY TAKEN TO PLANT SITE.

PLANT SITE, STOCKPILES AND LAGOONS

NORTHERN PART OF PUBLIC RIGHT OF WAY DIVERTED AROUND SITE PERIMETER, ALONG ENHANCED LANDSCAPE AND ECOLOGICAL CORRIDOR

CROSSING POINT FOR PERMISSIVE PATH

UMH RECHARGE LAGOON

PHASE C - EXTRACTION AREA

PHASE B - EXTRACTION AND INFILL AREA

LMH RECHARGE LAGOON

TEMP DIVIDING BUND BETWEEN PHASE B AND C

TO BE REMOVED AND PLACED INTO ADJACENT VOID OR USED TO FORM SEAL ELSEWHERE

PHASE A - INFILL AND RESTORATION AREA

PERMISSIVE ROUTE TO CONNECT TO ROADSIDE PATH

ROAD ACCESS

ACCESS POINT OVER BUND FOR PERMISSIVE PATH LEADING FROM ROADSIDE PATH

N:208500

N:208000

E:519500

E:520500

0 50 100 150 200m 300 400 500

Metres 1:5000

N

LEGEND

- SITE BOUNDARY
- PROPOSED CONTOURS (2m INTERVALS)
- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- MINERAL EXTRACTION AREA
- PUBLIC RIGHT OF WAY (INC DIVERTED SECTION)
- PERMISSIVE RIGHT OF WAY
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- PROPOSED AREA OF DISTURBANCE FROM SITE
- PROPOSED PERIMETER STORAGE BUNDS
- PROPOSED PERIMETER SEALS
- LANDSCAPE AND ECOLOGICAL CORRIDOR
- UNDISTURBED LAND WITHIN APPLICATION SITE
- PROPOSED SEMI-NATURAL SPECIES-RICH GRASSLAND
- ADVANCE HEDGEROW AND STANDARD TREE PLANTING
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PLANNING APPLICATION

PHASE C - ILLUSTRATION

HQ 3/9

Scale 1:5,000 @ A3

Date DEC 2015

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PLANT SITE, STOCKPILES AND LAGOONS

NORTHERN PART OF PUBLIC RIGHT OF WAY DIVERTED AROUND SITE PERIMETER, ALONG ENHANCED LANDSCAPE AND ECOLOGICAL CORRIDOR

PHASE C - INFILL AND RESTORATION AREA

UMH RECHARGE LAGOON

LMH RECHARGE LAGOON

PHASES A & B - RESTORED AREA

PHASE E - EXTRACTION AREA

PHASE D - EXTRACTION AND INFILL AREA

PERMISSIVE ROUTE TO CONNECT TO ROADSIDE PATH

ROAD ACCESS

ACCESS POINT OVER BUND FOR PERMISSIVE PATH LEADING FROM ROADSIDE PATH

N:208500

N:208000

E:520500

N

0 50 100 150 200m 300 400 500

Metres 1:5000

PHASE E

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND DIRECT PLACED ONTO PREVIOUSLY PREPARED FORMATION LEVELS IN PHASE C, ACCORDING TO SPECIFICATION AND PROFILES TO MAXIMIZE HABITAT CREATION POTENTIAL

OVERBURDEN TO BE USED TO FORM PERIMETER SEALS AROUND PHASE, WITH SURPLUS PLACED INTO PREVIOUSLY WORKED OUT VOIDS. SUITABLE IMPORTED MATERIALS MAY BE USED TO FORM THE PERIMETER SEALS.

INTERBURDEN TO BE PROGRESSIVELY STRIPPED AND PLACED BACK INTO VOID AS 2m THICK GEOLOGICAL SEAL.

UMH AND LMH TO BE PROGRESSIVELY TAKEN TO PLANT SITE.

LEGEND

- SITE BOUNDARY
- 70 — PROPOSED CONTOURS (2m INTERVALS)
- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- MINERAL EXTRACTION AREA
- PUBLIC RIGHT OF WAY (INC DIVERTED SECTION)
- PERMISSIVE RIGHT OF WAY
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- PROPOSED AREA OF DISTURBANCE FROM SITE
- PROPOSED PERIMETER STORAGE BUNDS
- PROPOSED PERIMETER SEALS
- LANDSCAPE AND ECOLOGICAL CORRIDOR
- UNDISTURBED LAND WITHIN APPLICATION SITE
- PROPOSED SEMI-NATURAL SPECIES-RICH GRASSLAND
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PLANNING APPLICATION

PHASE E - ILLUSTRATION

HQ 3/10

Scale 1:5,000 @ A3

Date DEC 2015

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PLANT SITE AND STOCKING AREA TO BE RESTORED TO ACID GRASSLAND MOSAIC USING RESIDUAL MINERAL LEFT OVER AT END OF SITE CLEARANCE, WITH RIDGE AND FURROW, MICRO-TOPOGRAPHICAL VARIATION AND MANAGED AS TRANQUIL AREA FOR NATURE CONSERVATION.

DISCHARGE FROM BACK DRAIN TO SURFACE WATER SWALE

TWO EXISTING GREAT CRESTED NEWT PONDS ON MARGIN OF SITE RETAINED

FRESHWATER AND SILT LAGOONS RETAINED AS PERMANENT WATERBODIES AS PART OF RESTORATION

THE TWO RECHARGE LAGOONS TO BE RETAINED AS PERMANENT WATERBODIES, BUT PARTIALLY BACKFILLED TO TOP OF INTERBURDEN USING SITE DERIVED AND IMPORTED MATERIAL

AA

CAR PARKING AND SITE OFFICES TO BE RETAINED FOR RECREATIONAL USE

PUBLIC RIGHT OF WAY REINSTATED ALONG ORIGINAL ALIGNMENT

OVERFLOW/OUTFALL FROM RESTORED WATERBODY AS DITCH/PIPE AT 75.5m AOD TO DRAIN TO DIVERTED NAST CULVERT

NEW DRAINAGE CHANNEL TO INTERCEPT GROUND WATER

INVERT OF EXISTING NAST CULVERT ALONG THE SIDE OF THE ROAD AT 71.78m AOD.

SEMI-NATURAL SPECIES_RICH GRASSLAND TO INCLUDE RIDGE AND FURROW, MICROTOPOGRAPHICAL AND SUBSTRATE VARIATION TO MAXIMISE OVERALL POTENTIAL HABITAT VALUE AND INTEREST

SW7A (71.788) & SW7B (71.896)

PARTS OF PERIMETER SOIL BUND TO BE RETAINED AS A LOW BERM AROUND THE SITE FOR RECREATIONAL ACCESS AND VIEWS

DISCHARGE FROM BACK DRAIN TO SURFACE WATER SWALE

ACCESS ROAD RETAINED

N:208500

N:208000

E:519500

E:520000

E:520500

0 50 100 150 200m 300 400 500

Metres 1:5000

SCALE 1:5,000 @ A3

LEGEND

- SITE BOUNDARY
- PROPOSED CONTOURS (2m INTERVALS) — 70
- PROPOSED OPEN DITCH/SWALE
- ADVANCE HEDGEROW AND TREE PLANTING
- EXISTING TREES AND SHRUBS
- PROPOSED HEDGROW
- PROPOSED SCRUB
- PROPOSED SEMI-NATURAL SPECIES RICH GRASSLAND
- PROPOSED MARGINAL VEGETATION/REEDBED
- WATER BODY / PONDS
- UNIMPROVED NEUTRAL-ACIDIC GRASSLAND
- NEUTRAL-ACIDIC GRASSLAND
- CALCAREOUS GRASSLAND
- PROPOSED RIDGE AND FURROW
- CULVERTED REACH OF NAST

REFER TO DRAWING HQ 3/12 FOR SECTION ILLUSTRATIONS

LEGEND

- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- PUBLIC RIGHT OF WAY
- PERMISSIVE RIGHT OF WAY
- MINERAL EXTRACTION AREA
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- RETAINED ACCESS ROAD
- POTENTIAL INDICATIVE LOCATION OF BACK DRAIN

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PLANNING APPLICATION

ILLUSTRATIVE RESTORATION CONCEPT

HQ 3/11

Scale: AS SHOWN

Date: DEC 2015

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NEUTRAL-ACID GRASSLAND TO BE CREATED WITHIN FORMER PLANT SITE AREA USING RESIDUAL SAND AND GRAVEL MIXED WITH SUBSOIL

UNIMPROVED NEUTRAL / ACID GRASSLAND TO BE CREATED ON AREAS RESTORED USING SUBSOIL OR BOULDER CLAY

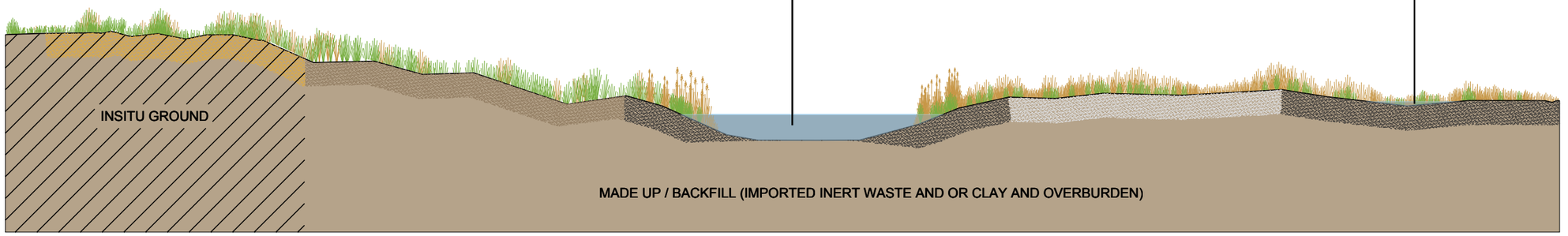
AREAS OF REED SWAMP FORMED ON LOWER LYING AREAS OF TOPSOIL AND SUBSOIL

CALCAREOUS GRASSLAND TO BE CREATED ON AREAS RESTORED USING CALCAREOUS CLAY AND/OR BROKEN CONCRETE SUBSTRATES AND SOILS

AREAS OF WETLAND GRASSLAND AND SCRUB USING TOPSOIL AND SUBSOIL

DEEPER WATER BODIES TO ATTRACT DIVING DUCKS

SEASONALLY WET SCRAPES IN DEPRESSIONS



INDICATIVE DETAIL SECTION OF RESTORATION SUBSTRATES AND MICRO-TOPOGRAPHY

NOT TO SCALE

FINAL RESTORATION LANDFORM CREATED USING SITE DERIVED AND IMPORTED MATERIAL

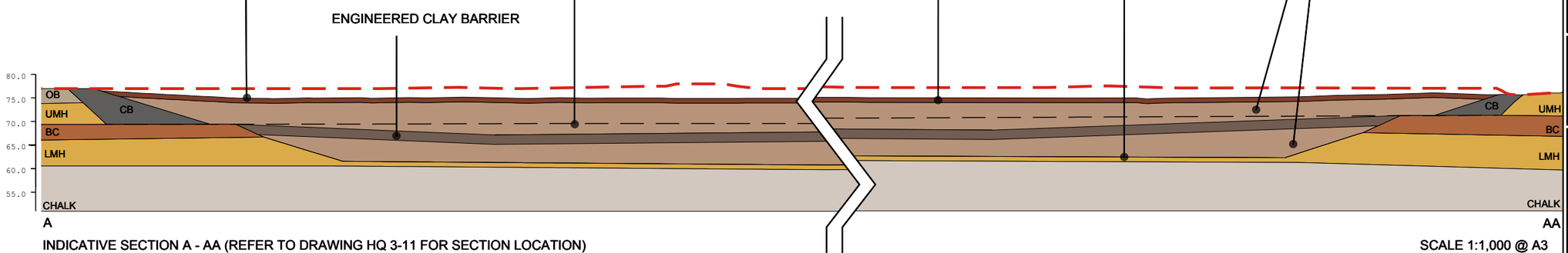
ORIGINAL TOP OF INTERBURDEN BOULDER CLAY

ENGINEERED CLAY BARRIER

1M RESTORATION PROFILE (SUBSTRATE VARIES ACCORDING TO DETAIL ABOVE)

BASE OF QUARRY 1m ABOVE IN SITU CHALK

IMPORTED INERT WASTE AND/OR SITE DERIVED CLAY AND OVERBURDEN INCLUDING ENGINEERED BARRIER



INDICATIVE SECTION A - AA (REFER TO DRAWING HQ 3-11 FOR SECTION LOCATION)

SCALE 1:1,000 @ A3

LEGEND

SECTION LEGEND

EXISTING LANDFORM

INSITU HORIZONS

OB — SOIL AND OVERBURDEN

BC — INTERBURDEN BOULDER CLAY

UMH / LMH — UPPER MINERAL HORIZON AND LOWER MINERAL HORIZON (INSITU)

CHALK — CHALK

SITE DERIVED AND IMPORTED MATERIALS AS BACKFILL

1M THICK RESTORATION PROFILE (SUBSTRATE VARIES ACCORDING TO DETAIL)

IMPORTED INERT WASTE AND SITE DERIVED MATERIAL

ENGINEERED CLAY CAP / BARRIER

CB — ENGINEERED CLAY PERIMETER SEAL/ EMBANKMENT

RESTORATION SUBSTRATES

RESIDUAL SAND AND GRAVEL MIXED WITH SUBSOIL

SUBSOIL OR BOULDER CLAY

TOPSOIL AND SUBSOIL

CALCAREOUS CLAY OR BROKEN CONCRETE AND SOILS

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PLANNING APPLICATION

ILLUSTRATIVE SECTIONS

HQ 3/12

Scale: AS SHOWN

Date: DEC 2015

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Appendix 6/10[3] **Groundwater, Surface Water and Drain Management**

[3] This is the reference used in the ES

<table>
<tr><th>Objective</th><th>Task</th><th>Description</th><th>Mineral Management</th><th>Water Management Control Process</th><th>Water Volume</th></tr>
<tr><td>Isolate UMH aquifer within each 4 Year Operational Phase (Phase A through G).</td><td>1(a)</td><td>Excavate overburden and UMH around the perimeter of the mineral excavation phase down to a depth equal to the water saturated mineral. The depth will vary by season and phase.</td><td rowspan="4">Segregate mineral from overburden and stockpile and/or process accordingly</td><td>None required</td><td></td></tr>
<tr><td rowspan="3">Install UMH Perimeter Bund Wall.</td><td>1(b)</td><td>Install well points and/or sumps along the perimeter of each phase to selectively dewater the UMH along the phase perimeter. Excavate UMH down to the upper surface of the Interburden in suitable section lengths (20m wide x 65m length) to allow for installation of the perimeter bund and back drain. Allow for a 1:4 grade haul road down to the upper surface of the interburden.</td><td>Actively dewater the UMH aquifer at a rate to allow placement of the perimeter bund keyed into the interburden. Depending on suspended load groundwater from the UMH will be discharged into a settlement lagoon followed by the UMH Recharge Lagoon, or directly to the UMH Recharge Lagoon.</td><td>
<table>
<tr><th>Confined m³/day</th><th>Unconfined[1] m³/day</th></tr>
<tr><td colspan="2">Ro=200</td></tr>
<tr><td>59 – 149</td><td>72 - 144</td></tr>
<tr><td colspan="2">Ro=100</td></tr>
<tr><td>149 - 299</td><td>92 - 288</td></tr>
</table>
</td></tr>
<tr><td>1(c)</td><td>Install UMH perimeter clay bund with a back drain, keying the bund into the overburden surface. Bund crest elevations will be as detailed below, which are above the highest UMH groundwater levels (AOD) recorded on the site (March 2014):
<table>
<tr><th>Phase</th><th>Bund Crest (AOD)</th><th>Bund Length (m)[2]</th></tr>
<tr><td>A</td><td>76m</td><td>770</td></tr>
<tr><td>B</td><td>76m</td><td>760</td></tr>
<tr><td>C</td><td>77m (west), 76m (east)</td><td>780</td></tr>
<tr><td>D</td><td>77m (west), 76m (east)</td><td>570</td></tr>
<tr><td>E</td><td>78m (west), 77m (east)</td><td>900</td></tr>
<tr><td>F</td><td>78m (west), 77m (east)</td><td>560</td></tr>
<tr><td>G</td><td>78m</td><td>620</td></tr>
</table>
</td><td>The back drain will control the maximum groundwater head outside of the Phase bund. Drain invert elevations (AOD, listed below) will vary for each Phase, but the intention is to manage the groundwater head at 1m below the maximum recorded water level for that Phase.
<table>
<tr><th>Phase</th><th>Back Drain IL (mAOD)</th><th>Groundwater Level in the UMH (mAOD)[3]</th></tr>
<tr><td>A</td><td>74m</td><td>75.5 – 74</td></tr>
<tr><td>B</td><td>74.5</td><td>75.5 – 74</td></tr>
<tr><td>C</td><td>76m</td><td>76.8 – 74.5</td></tr>
<tr><td>D</td><td>76m</td><td>76.7 – 75.5</td></tr>
<tr><td>E</td><td>76.5m</td><td>77.6 – 77.0</td></tr>
<tr><td>F</td><td>76.5m</td><td>77.0 – 76.0</td></tr>
<tr><td>G</td><td>76.5m</td><td>77.5 – 76.0</td></tr>
</table>
</td><td>
<table>
<tr><th colspan="3">Back Drain Flow (m³/day and L/sec)[4]</th></tr>
<tr><td>A</td><td>97-193[5]</td><td>1.1-2.2</td></tr>
<tr><td>B</td><td>59-118</td><td>0.7-1.4</td></tr>
<tr><td>C</td><td>64-128</td><td>0.7-1.5</td></tr>
<tr><td>D</td><td>38-75</td><td>0.4-0.9</td></tr>
<tr><td>E</td><td>85-169</td><td>1.0-2.0</td></tr>
<tr><td>F</td><td>28-55</td><td>0.3-0.6</td></tr>
<tr><td>G</td><td>66-133</td><td>0.8-1.5</td></tr>
</table>
</td></tr>
<tr><td>1(d)</td><td>Repeat Tasks 1(a-c) for the remaining perimeter sections of each phase until a continuous clay bund has been constructed around the perimeter of the site.

This scenario corresponds with the final reinstated site condition.</td><td>The perimeter back drains will control UMH groundwater levels during the site restoration stage to a maximum elevation of 76.5mAOD. The reinstatement back drain will be constructed in 2 halves with flow around the north and the south sides of the site to where ground levels will fall below 76.5mAOD. This approximates to the lateral extent of Phase E and G.
It should be recognised that for the period of monitoring UMH groundwater only exceeded 76.5mAOD during the months of January to mid-March in 2014 following an extremely wet winter period. Water levels did not reach this elevation in 2015, which means that the E and G back drains would not have captured groundwater.</td><td>
<table>
<tr><th colspan="3">Back Drain Flow (m³/day and L/sec)[6]</th></tr>
<tr><td>E</td><td>73-147</td><td>0.8-1.7</td></tr>
<tr><td>G</td><td>61-122[7]</td><td>0.7-1.4</td></tr>
<tr><td>E+G</td><td>134-269</td><td>1.6-3.1</td></tr>
</table>
</td></tr>
</table>

[1] Calculated using Tab12. Well Points (UC) in 'Assessing the impacts of dewatering on water resources', Tier 1 Analytical Tools, Version 1.6; Environment Agency
[2] Length excludes the shared internal bund if it is to be removed (See Task 6)
[3] Seasonal high water level (March 2014)
[4] Calculations are based upon highest recorded groundwater level using March 2014 data (worse case). For significant period of the year there will be very little to no flow from the back drain.
[5] Calculated using Tab 8. Trench with Flow One Side (UC) in 'Assessing the impacts of dewatering on water resources', Tier 1 Analytical Tools, Version 1.6; Environment Agency
[6] As footnote 5 above.
[7] As footnote 1 above

<table>
<tr><th>Objective</th><th>Task</th><th>Description</th><th>Mineral Management</th><th>Water Management Control Process</th><th colspan="4">Water Volume</th></tr>
<tr><td rowspan="3">Excavate Overburden and UMH for storage, blending and processing.</td><td rowspan="3">2</td><td rowspan="3">Overburden and UMH within the bunded area of each phase will be excavated down to the Interburden surface in areas equivalent to an annual operating period</td><td rowspan="3"></td><td rowspan="3">Reduce and maintain groundwater levels in the UMH inside the Phase using ditches, and sump pumps to control water levels.

Maintenance pumping will also be required to capture and discharge flow generated by precipitation.

Each Phase will be dewatered at a sustainable rate equal to recharge plus the volume held in storage. Discharge rates will be managed according to the available recharge lagoon infiltration capacity, supplemented by recharge into the LMH aquifer within the confines of each phase as its worked.</td><td>Phase</td><td>Water in Storage (m^3/day)</td><td>Precipitation Recharge (m^3/day)</td><td>Combined Discharge Requirement (m^3/day)</td></tr>
<tr><td>A
B
C
D
E
F
G</td><td>51
53
45
50
63
63
69</td><td>73
83
66
91
82
82
79</td><td>125
136
111
141
145
146
147</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td rowspan="2">Preparation for extraction of LMH mineral beneath the interburden.

It is advantageous if the interburden can be removed without a positive upward pressure from groundwater below.</td><td>3a</td><td>For site phases where the LMH groundwater levels are below the base of the Interburden for a significant seasonal period (unconfined aquifer conditions), then the interburden will be excavated from suitably sized working ‘cells’ with an approximate dimension of 75m x 75m.</td><td rowspan="2">Cohesive material from the interburden will be stockpiled for future bund construction, backfilling of the LMH excavation, or will be placed directly into previously excavated LMH ‘cells’.</td><td>Monitoring of groundwater levels indicates that no active groundwater pumping will be required from the LMH for Phase A and B (and possibly C, D and F, depending on seasonal conditions). This conclusion is drawn from Drawings B through K that illustrates geological cross sections for each Phase with the maximum and minimum seasonal water levels in both the UMH and the LMH aquifers). The maximum and minimum water levels are based upon the groundwater hydrographs in Appendix 6/3 of the Environmental Statement.</td><td colspan="4">No water generating activities required</td></tr>
<tr><td>3b</td><td>For site phases where the LMH groundwater levels are above the base of the Interburden for a significant seasonal period (confined aquifer conditions), then the interburden will be excavated from suitably sized working ‘cells’.</td><td>Monitoring of groundwater levels indicates that active groundwater pumping will be required from the LMH aquifer during extraction of the interburden in Phase E and G (Phase c, D and F may or may not require active lowering of the water table – this will be determined at the time of working). For these 2 phases the working ‘cells’ will be reduced to a size of approximately 30m x 100m (3,000m^2)to limit the volume of water being pumped and recharged into the LMH Recharge Lagoon. Once the interburden has been removed from each ‘cell’ then pumping will be stopped and LMH aquifer water levels will be allowed to recover and re-equilibrate.
The volume calculations are sensitive to a number of assumptions, e.g., permeability and hydraulic connection with the Chalk being important.</td><td colspan="2">Phase</td><td colspan="2">Pumping rate to lower water level to the base of the interburden[8]</td></tr>
<tr><td colspan="4"></td><td colspan="2">A
B
C
D
E
F
G</td><td colspan="2">Not required
Not required
155 – 310
215 – 431
278 – 558
472 – 945
405 – 811</td></tr>
<tr><td>Extraction of LMH mineral.</td><td>4</td><td>‘Wet excavation’ of the LMH will occur once the interburden has been removed from the working ‘cell’.</td><td>LMH mineral will be excavated ‘wet’ from the working ‘cell’ for stockpiling and processing using long reach excavators</td><td>No active groundwater management is anticipated during the LMH mineral extraction operation.</td><td colspan="4">No water generating activities required</td></tr>
</table>

[8] Calculated using Tab 1. Thiem (C) in ‘Assessing the impacts of dewatering on water resources’, Tier 1 Analytical Tools, Version 1.6; Environment Agency

Objective	Task	Description	Mineral Management	Water Management Control Process	Water Volume	
Recharge into UMH aquifer	5a	Water generated by the following tasks will be discharged to the UMH recharge lagoon: • Task 1 (b) Dewatering UMH during placement of perimeter bunds • Task 1 (c) Back drain discharge once UMH perimeter bunds are in place • Task 2 Maintenance water management (storage in UMH and precipitation) during all excavations	None required associated with this stage. Care will be taken to ensure both lagoons do not accumulate silt with the potential for decreasing infiltration rates	Lagoon recharge capacity is controlled by the physical properties of the aquifer, as well as with season due to changes in the water level at the time of discharge. A range of potential recharge values have been calculated using the Theim equation and the following assumptions: K = 4m to 8m/d (from piezometer test data) Ro = 200m, acting as a locally confined aquifer by the overburden Minimum head change in lagoon 2m (winter conditions) Maximum head change in lagoon 2.7m (summer conditions)	K = 4m/d 160 – 289m^3/day	K = 8m/d 322 – 579m^3/day
Recharge into LMH aquifer	5b	Water generated by the following task will be discharged to the LMH recharge lagoon. • Task 3 (b) Lowering of the piezometric surface of the LMH aquifer to the base of the interburden • Tasks 1(b), (c), 2, if required		The Theim equation has also been used to calculate the recharge capacity for the LMH lagoon with the following assumptions: K = 10m to 20m/d (from piezometer tests) Ro = 1000m Maximum available head change in the LMH lagoon is 6m	K = 10m/d 1,158m^3/day	K = 20m/d 2,316m^3/day
Removal of internal bund walls in neighbouring Phases.	6	Internal bund walls will be removed during construction of neighbouring phases that share a bund. Clay material won from the bund will be reused for subsequent bund preparation works.	Mineral will be excavated beneath the former bund for processing	Once the internal perimeter bund has been removed there may be groundwater seepage from the adjacent reinstated UMH in the adjacent phase.	Negligible quantity assumed	
Final Restoration	7	Perimeter bund drainage	None	The perimeter drain for Phase E and G will remain in place during the restoration stage and discharge into the interior of the restored site within shallow swales and hedgerow boundary ditches that will eventually discharge into the combined UMH recharge lagoon (see Task 8 below). Following a period of water level review, the perimeter drain around Phase A, B, C (part of), D and F will be removed.	136m^3/d – 269m3/d[9]	
Combined Lagoons	8	Create a pathway for surface water (comprising a) Rainfall runoff b) Groundwater fed runoff (Phase E and G) All to be recharged into the UMH and LMH lagoons (combined as a single UMH lagoon).	None	The LMH lagoon will be reinstated to the upper surface of the interburden. The bund between the the UMH and LMH lagoon will be removed so forming a single UMH lagoon. a) RW runoff for the reinstated site will be at the greenfield rate b) The Phase E & G drain will be set at 76.5mAOD and is designed to capture rising groundwater, if any c) Combined lagoon recharge capacity	The combined flow to the infiltration lagoon will comprise:	
					a) RW runoff b) E & G GW runoff	36 – 41,000m^3 134 – 269m^3/day
					Combined lagoon recharge capacity	
					K = 4m/d 370 – 666m^3/day	K = 8m/d 740 – 1,333m^3/day
				The combined lagoon will have a storage capacity equal to its area X the available rise in water head from the static water level up to the spill point at 75.5mAOD The static water level recorded at the lagoon area ranges seasonally from 72.8m to 74mAOD so a rise in available head of 2.7m to 1.5m.	167,000m^3 to 93,000m^3	

[9] Refer back to task 1(d)

Assumptions and Example Calculations

Task 1b Install well points to dewater UMH along the alignment of the perimeter bund for each phase.

Water volumes have been estimated using the analytical tool 'Assessing the impacts of dewatering on water resources', Tier 1 Analytical Tools, Version 1.6; Environment Agency, specifically Tab 12 solution Well Points (UC).

An example of the output is provided in the spreadsheet image below. Significant assumptions are:

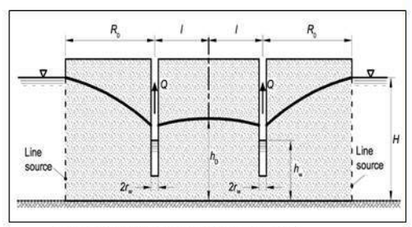
- Aquifer thickness is a maximum for each phase
- Hydraulic conductivity (K) = 4m/d and 8m/d
- Ro = 200m
- Drawdown requirements vary according to average aquifer thickness in each phase
- Length of trench= 65m along which dewatering is undertaken.

12) Partial penetration by a double row of wellpoints of an unconfined aquifer midway between two equidistant and parallel line sources

$$Q=\left[\left(0.73+0.27\frac{(H-h_w)}{H}\right)\frac{Kx}{R_0}(H^2-h_w^2)\right]$$

Essential input
Optional input
Calculated

		expected		min	max	
Head						
Height of water table at radius of influence	H	7.5	m	6	6	m
Height of water table at well	h_w	0.3	m	0.3	0.3	m
Conductivity						
Hydraulic conductivity of aquifer	K	4	m/d	10	10	m/d
Length of trench	x	65	m	65	65	m
Distance to line source, equal to radius of influence	R_0	200	m	100	400	m
Total discharge from wellpoints	Q	72.22	m^3/d	23.03	361.10	m^3/d
Height of WT at centre of dewatered area	$h_D=h\left[\frac{C_1C_2}{R_0}(H-h)+1\right]$					
Distance to centre of dewatered area	l	10	m			
	l/h	33.3333				
Coefficient 1	C_1	1.01				
Radius of each well	r_w	0.05	m			
	r_w/H	0.00667				
Coefficient 2	C_2	1.37				
Height of WT at centre of dewatered area	h_D	0.31	m			



(Figures adapted from Mansur & Kaufman, 1962)

The following assumptions apply to this equation
- the slot is infinite in length
- R_0/H greater than or equal to 3
- the aquifer is unconfined
- the aquifer is homogeneous, isotropic and of uniform thickness
- the Dupuit Forcheimer assumption is valid
- the aquifer has reached steady state conditions
- the initial water table is horizontal

(Mansur & Kaufman, 1962)

Task 1c Calculation of Back Drain Flow for each Phase

Water volumes have been estimated using the analytical tool 'Assessing the impacts of dewatering on water resources', Tier 1 Analytical Tools, Version 1.6; Environment Agency, specifically Tab 8 Trench with Flow One Side (UC).

An example of the output is provided in the spreadsheet image below. Significant assumptions are:

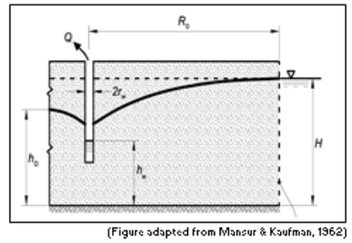
- Aquifer thickness is a maximum for each phase
- Drawdown is between 0.5m and 1.5m and varies for each phase
- Hydraulic conductivity (K) = 4m/d and 8m/d
- Ro = 200m
- The length of the active perimeter for each phase is different and varies between 570m and 900m in length along which a flow is generated. The example below is for Phase A.

8) Partial penetration by a single row of wellpoints of an unconfined aquifer fed from a single line source

$$Q=\left[\left(0.73+0.27\frac{(H-h_l)}{H}\right)\frac{Kx}{2R_0}(H^2-h_w^2)\right]$$

Essential input
Optional input
Calculated

		expected		min	max	
Head						
Height of water table at radius of influence	H	6	m	48	52	m
Height of water table at well	h_w	4.5	m	43	47	m
Conductivity						
Hydraulic conductivity of aquifer	K	4	m/d			m/d
Radius						
Length of trench	x	770	m			
Radius of influence	R_0	200	m	250	400	m
Is R_0/H greater than or equal to 3 ?		Yes		Yes	Yes	
Total discharge from wellpoints	Q	96.72	m^3/d	#######	#######	m^3/d
Height of WT downstream of slot	$h_D=h_w\left[\frac{1.48}{R_0}(H-h_w)+1\right]$					
Height of WT downstream of slot	h_D	4.55	m			



(Figure adapted from Mansur & Kaufman, 1962)

The following assumptions apply to this equation
- the slot is infinite in length
- R_0/H greater than or equal to 3
- the aquifer is unconfined
- the aquifer is homogeneous, isotropic and of uniform thickness
- the Dupuit Forcheimer assumption is valid
- the aquifer has reached steady state conditions
- the initial water table is horizontal

(Mansur & Kaufman, 1962)

Task 1d **Final Restoration Phase – Back Drain Flow**

It is proposed that an active back drain will remain upon completion of all mineral excavation works. The intention is to maintain a maximum UMH groundwater head below that recorded on site during the maximum water level recorded on site in March 2014.

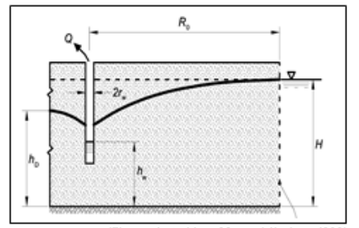
The invert elevation of the back drain will be set at 67.5mAOD and will surround the perimeter to a point where ground surface levels are also at 67.5mAOD. At this location the drain will 'daylight' at the surface and a flow will discharge to the interior of the restored site. Flow will occur approximately between January and March although whether a flow occurs will be dictated by groundwater levels in the aquifer which are controlled by seasonal rainfall events. Flow has been calculated using the same formula illustrated in Task 1c as shown below for the location of the back drain around Phase G.

8) Partial penetration by a single row of wellpoints of an unconfined aquifer fed from a single line source

$$Q=\left[\left(0.73+0.27\frac{(H-h_u)}{H}\right)\frac{Kx}{2R_0}(H^2-h_u^2)\right]$$

Essential input
Optional input
Calculated

			expected		min	max	
Head							
Height of water table at radius of influence	H	7.5	m		48	52	m
Height of water table at well	h_u	6.5	m		43	47	m
Conductivity							
Hydraulic conductivity of aquifer	K	4	m/d				m/d
Radius							
Length of trench	x	570	m				
Radius of influence	R_0	200	m		250	400	m
Is R_0/H greater than or equal to 3 ?		Yes			Yes	Yes	
Total discharge from wellpoints	**Q**	61.13	m^3/d		######	######	m^3/d



(Figure adopted from Mansur & Kaufman, 1962)

Height of WT downstream of slot

$$h_D=h_w\left[\frac{1.48}{R_0}(H-h_w)+1\right]$$

Height of WT downstream of slot h_D 6.5481 m

The following assumptions apply to this equation
- the slot is infinite in length
- R_0/H greater than or equal to 3
- the aquifer is unconfined
- the aquifer is homogeneous, isotropic and of uniform thickness
- the Dupuit Forcheimer assumption is valid
- the aquifer has reached steady state conditions
- the initial water table is horizontal

(Mansur & Kaufman, 1962)

Task 2 **Operational discharge estimates to dewater the UMH once the perimeter drain is installed plus an estimate of rainfall recharge**

Once the perimeter bund of each phase is constructed there will be a requirement to dewater the UMH within the phase. Each phase is approximately 4 years of operation so the total volume of water to be removed prior to mineral excavation will be the volume of water held in storage at the time of perimeter bund completion plus recharge. The table below presents the calculations:

- Precipitation (PPT) – 662mm/year

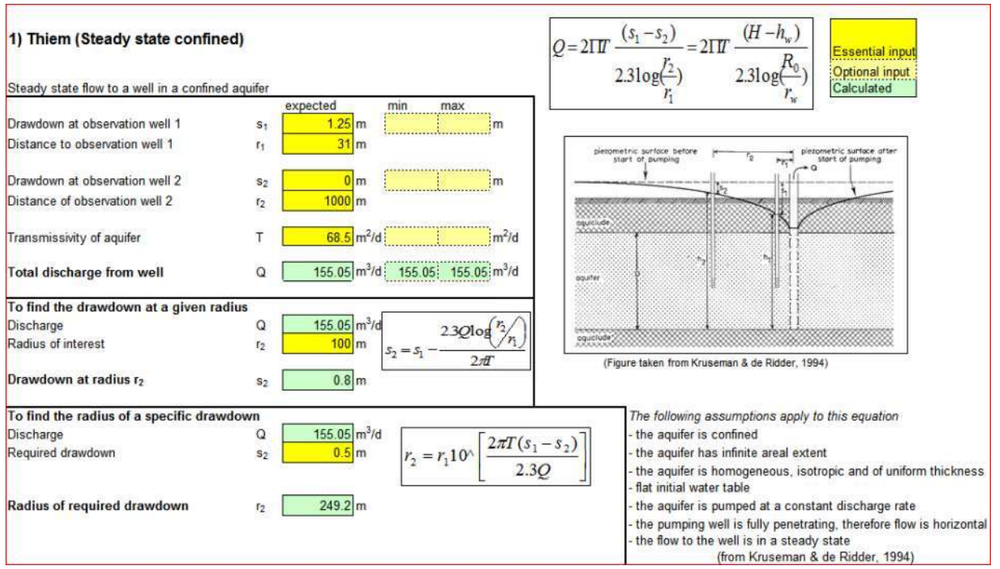
Phase Area		Groundwater in Storage					Recharge		Combined Flow to Discharge per day (Storage + Recharge) (m^3)
Phase	Area (m^2)	Saturated Thickness (m)	Porosity	Water Volume in Storage (m^3)	Annual Water Volume in Storage (m^3)	Daily Water Volume (m^3)	Ave Annual PPT (m^3)	Ave Daily PPT	
A	62274	6	0.2	74729	18682	51	26797	73	125
B	70505	5.5	0.2	77556	19389	53	30338	83	136
C	56335	5.8	0.2	65349	16337	45	24241	66	111
D	77532	4.7	0.2	72880	18220	50	33362	91	141
E	69380	6.6	0.2	91582	22895	63	29854	82	145
F	69239	6.8	0.2	94165	23541	64	29794	82	146
G	66805	7.5	0.2	100208	25052	69	28746	79	147

Note: Average annual PPT is calculated using an assumption that 65% of PPT is recharged.

Task 3b Lower Mineral Horizon (LMH) Groundwater Lowering

The example calculation illustrates the volume of water discharge generated to lower the confined aquifer water level to the base of the interburden. The need for pumping at all, and the amount of pumping required will vary according to the water level in the aquifer and the aquifers physical parameters. Water volumes have been estimated using the analytical tool 'Assessing the impacts of dewatering on water resources', Tier 1 Analytical Tools, Version 1.6; Environment Agency, specifically Tab 1 Theim (Steady State Confined). The important assumptions used in this calculation are that:

- The aquifer is assumed to be the LMH and not the Chalk + LMH (the chalk surface is characterised as a putty chalk with a relatively low hydraulic conductivity)
- Hydraulic conductivity (K) of the LMH has been assumed to be in the range of 10m/day and 20m/day
- The cell to be dewatered is equivalent to an area of 3,000m^2 (a circle with a radius of 31m)



(Figure taken from Kruseman & de Ridder, 1994)

Phase	Water Elev (high) = H	Top of Chalk (ave)	Base of Interburden (Ave) = h	Mineral Thickness	Sat Thickness	Required head change	K	T	r	Q (m3/d)
C	70	61.9	68.75	6.85	8.1	1.25	10	68.5	31	155
D	69	60.3	67.3	7	8.7	1.7	10	70	31	215
E	71.5	61.8	69.5	7.7	9.7	2	10	77	31	278
F	71	60.2	67.35	7.15	10.8	3.65	10	71.5	31	472
G	71	61.1	67.5	6.4	9.9	3.5	10	64	31	405

Phase	Water Elev (high) = H	Top of Chalk (ave)	Base of Interburden (Ave) = h	Mineral Thickness	Sat Thickness	Required head change	K	T	r	Q (m3/d)
C	70	61.9	68.75	6.85	8.1	1.25	20	137	31	310
D	69	60.3	67.3	7	8.7	1.7	20	140	31	431
E	71.5	61.8	69.5	7.7	9.7	2	20	154	31	558
F	71	60.2	67.35	7.15	10.8	3.65	20	143	31	945
G	71	61.1	67.5	6.4	9.9	3.5	20	128	31	811

Task 5a **Recharge into UMH Lagoon**

The Thiem equation has been used to calculate recharge for the UMH lagoon. The assumptions used in this calculation include:

- Transmissivity of the aquifer is K(hydraulic conductivity) x b (thickness) where b is take as the mineral thickness (3.5m) excluding overburden
- 2 values for K have been used, 4m/d and 8m/d
- Area of the LMH lagoon is 24,361m^2, equivalent to a circle with the radius of 88m
- Available +ve head change in the lagoon will be set by the bund height (elevation of 76mAOD) and spill point elevation (75.5mAOD) which will range between +2m and +2.7m above the static water level
- Ro = 200m

1) Thiem (Steady state confined)

$$Q = 2\pi T \frac{(s_1 - s_2)}{2.3\log(\frac{r_2}{r_1})} = 2\pi T \frac{(H - h_w)}{2.3\log(\frac{R_0}{r_w})}$$

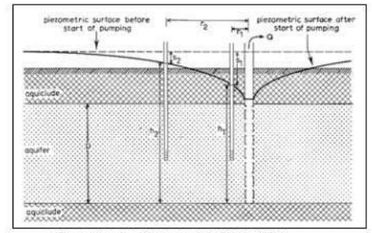
Essential input / Optional input / Calculated

Steady state flow to a well in a confined aquifer

		expected		min	max	
Drawdown at observation well 1	s_1	2.7	m			m
Distance to observation well 1	r_1	88	m			
Drawdown at observation well 2	s_2	0	m	0.2	0.8	m
Distance of observation well 2	r_2	200	m			
Transmissivity of aquifer	T	28	m^2/d			m^2/d
Total discharge from well	Q	579.24	m^3/d	407.61	579.24	m^3/d
To find the drawdown at a given radius						
Discharge	Q	579.24	m^3/d			
Radius of interest	r_2	100	m			
Drawdown at radius r_2	s_2	2.3	m			

$$s_2 = s_1 - \frac{2.3Q\log(r_2/r_1)}{2\pi T}$$

To find the radius of a specific drawdown				
Discharge	Q	579.24	m^3/d	
Required drawdown	s_2	1	m	$r_2 = r_1 10^{\wedge}\left[\frac{2\pi T(s_1 - s_2)}{2.3Q}\right]$
Radius of required drawdown	r_2	147.6	m	



(Figure taken from Kruseman & de Ridder, 1994)

The following assumptions apply to this equation
- the aquifer is confined
- the aquifer has infinite areal extent
- the aquifer is homogeneous, isotropic and of uniform thickness
- flat initial water table
- the aquifer is pumped at a constant discharge rate
- the pumping well is fully penetrating, therefore flow is horizontal
- the flow to the well is in a steady state

(from Kruseman & de Ridder, 1994)

Task 5b **Recharge into LMH Lagoon**

The Thiem equation has been used to calculate recharge for the LMH lagoon. The assumptions used in this calculation include:

- Transmissivity of the aquifer is K(hydraulic conductivity) x b (thickness) where b is take as the mineral thickness (6.8m)
- 2 values for K have been used, 10m/day and 20m/day
- Area of the LMH lagoon is 37,594m^2, equivalent to a circle with the radius of 109m
- Available +ve head change in the lagoon will be set by the bund height (elevation of 76mAOD) which will be approximately +6m above the LMH static water level
- Ro = 1000m

1) Thiem (Steady state confined)

$$Q = 2\pi T \frac{(s_1 - s_2)}{2.3\log(\frac{r_2}{r_1})} = 2\pi T \frac{(H - h_w)}{2.3\log(\frac{R_0}{r_w})}$$

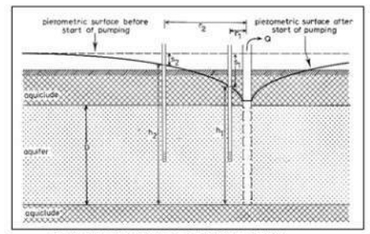
Essential input / Optional input / Calculated

Steady state flow to a well in a confined aquifer

		expected		min	max	
Drawdown at observation well 1	s_1	-6	m			m
Distance to observation well 1	r_1	109	m			
Drawdown at observation well 2	s_2	0	m			m
Distance of observation well 2	r_2	1000	m			
Transmissivity of aquifer	T	136	m^2/d			m^2/d
Total discharge from well	Q	-2315.84	m^3/d	-2315.84	#######	m^3/d
To find the drawdown at a given radius						
Discharge	Q	-2315.84	m^3/d			
Radius of interest	r_2	209	m			
Drawdown at radius r_2	s_2	-4.2	m			

$$s_2 = s_1 - \frac{2.3Q\log(r_2/r_1)}{2\pi T}$$

To find the radius of a specific drawdown				
Discharge	Q	-2315.84	m^3/d	
Required drawdown	s_2	-3.2	m	$r_2 = r_1 10^{\wedge}\left[\frac{2\pi T(s_1 - s_2)}{2.3Q}\right]$
Radius of required drawdown	r_2	306.6	m	



(Figure taken from Kruseman & de Ridder, 1994)

The following assumptions apply to this equation
- the aquifer is confined
- the aquifer has infinite areal extent
- the aquifer is homogeneous, isotropic and of uniform thickness
- flat initial water table
- the aquifer is pumped at a constant discharge rate
- the pumping well is fully penetrating, therefore flow is horizontal
- the flow to the well is in a steady state

(from Kruseman & de Ridder, 1994)

Task 7 **Restoration Phase, Back Drain Flow (see Task 1d)**

Task 8e Restoration Phase – Combined Lagoon Discharge Capacity

The Thiem equation has been used to calculate recharge for the combined UMH and LMH lagoon areas. The assumptions used in this calculation include:

- Transmissivity of the aquifer is K(hydraulic conductivity) x b (thickness) where b is take as the mineral thickness (3.5m) excluding overburden
- 2 values for K have been used, 4m/day and 8m/day
- Area of the LMH lagoon is 61,955m^2 (24,361+37,594) equivalent to a circle with the radius of 140m
- Available +ve head change in the lagoon will be set by the bund height (elevation of 76mAOD) and spill point elevation (75.5mAOD) which will range between +2m and +2.7m above the static water level
- Ro = 200m

1) Thiem (Steady state confined)

$$Q = 2\pi T \frac{(s_1 - s_2)}{2.3\log(\frac{r_2}{r_1})} = 2\pi T \frac{(H - h_w)}{2.3\log(\frac{R_0}{r_w})}$$

Essential input
Optional input
Calculated

Steady state flow to a well in a confined aquifer

		expected	min	max	
Drawdown at observation well 1	s_1	2.7 m			m
Distance to observation well 1	r_1	140 m			
Drawdown at observation well 2	s_2	0 m	0.2	0.8	m
Distance of observation well 2	r_2	200 m			
Transmissivity of aquifer	T	28 m^2/d			m^2/d
Total discharge from well	Q	1333.27 m^3/d	938.22	1333.27	m^3/d

To find the drawdown at a given radius

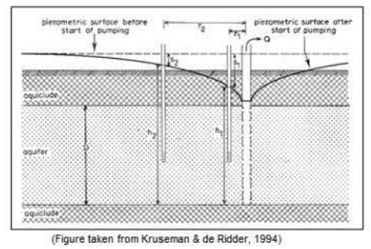
Discharge	Q	1333.27 m^3/d
Radius of interest	r_2	100 m
Drawdown at radius r_2	s_2	5.2 m

$$s_2 = s_1 - \frac{2.3Q\log(r_2/r_1)}{2\pi T}$$

To find the radius of a specific drawdown

Discharge	Q	1333.27 m^3/d
Required drawdown	s_2	1 m
Radius of required drawdown	r_2	175.3 m

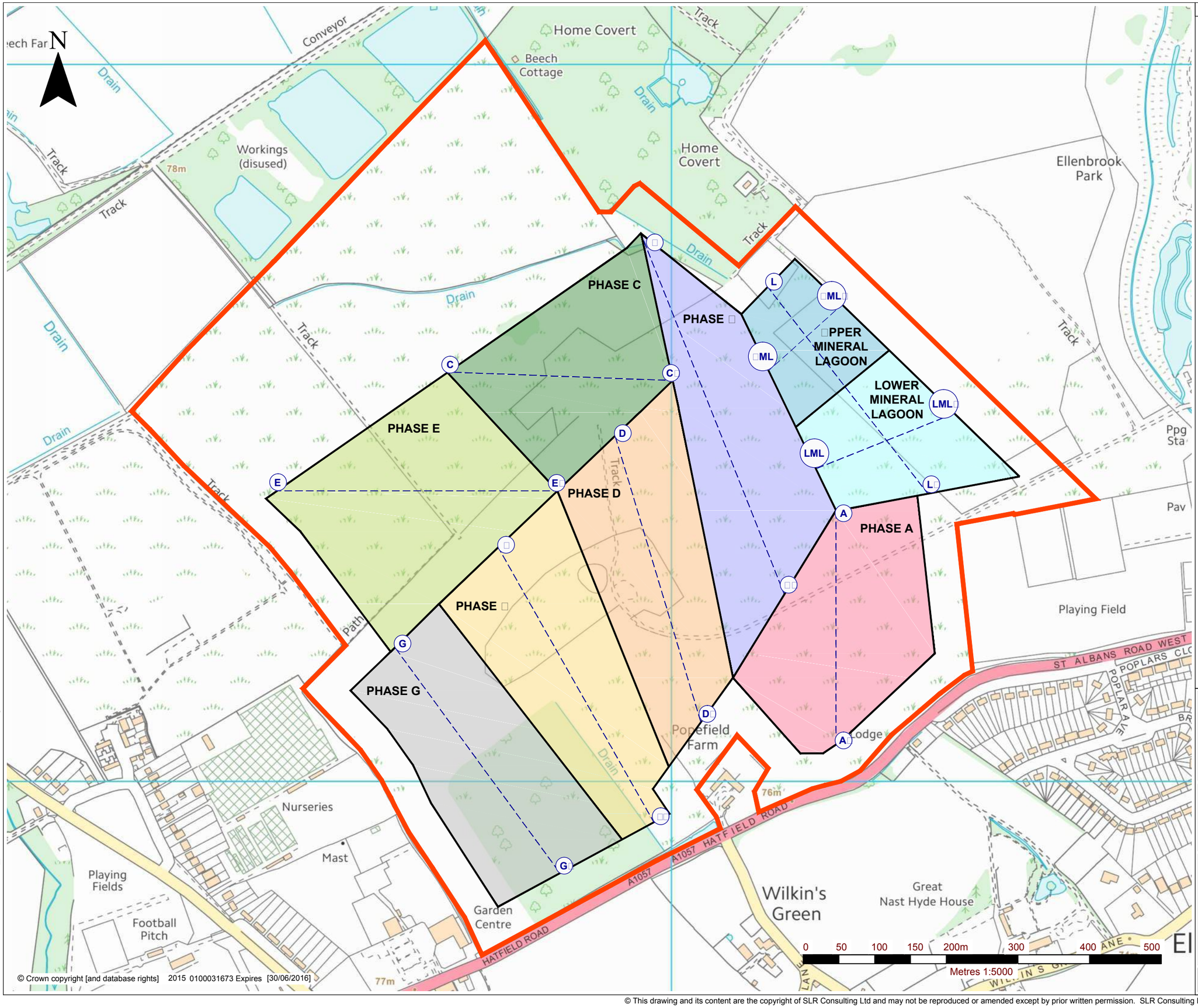
$$r_2 = r_1 10^{\wedge}\left[\frac{2\pi T(s_1 - s_2)}{2.3Q}\right]$$



(Figure taken from Kruseman & de Ridder, 1994)

The following assumptions apply to this equation
- the aquifer is confined
- the aquifer has infinite areal extent
- the aquifer is homogeneous, isotropic and of uniform thickness
- flat initial water table
- the aquifer is pumped at a constant discharge rate
- the pumping well is fully penetrating, therefore flow is horizontal
- the flow to the well is in a steady state

(from Kruseman & de Ridder, 1994)



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LEGEND

- SITE BOUNDARY
- PHASE BOUNDARY
- SECTION LINE

PHASES

- PHASE A
- PHASE B
- PHASE C
- PHASE D
- PHASE E
- PHASE F
- PHASE G
- PHASE UPPER MINERAL LAGOON
- PHASE LOWER MINERAL LAGOON

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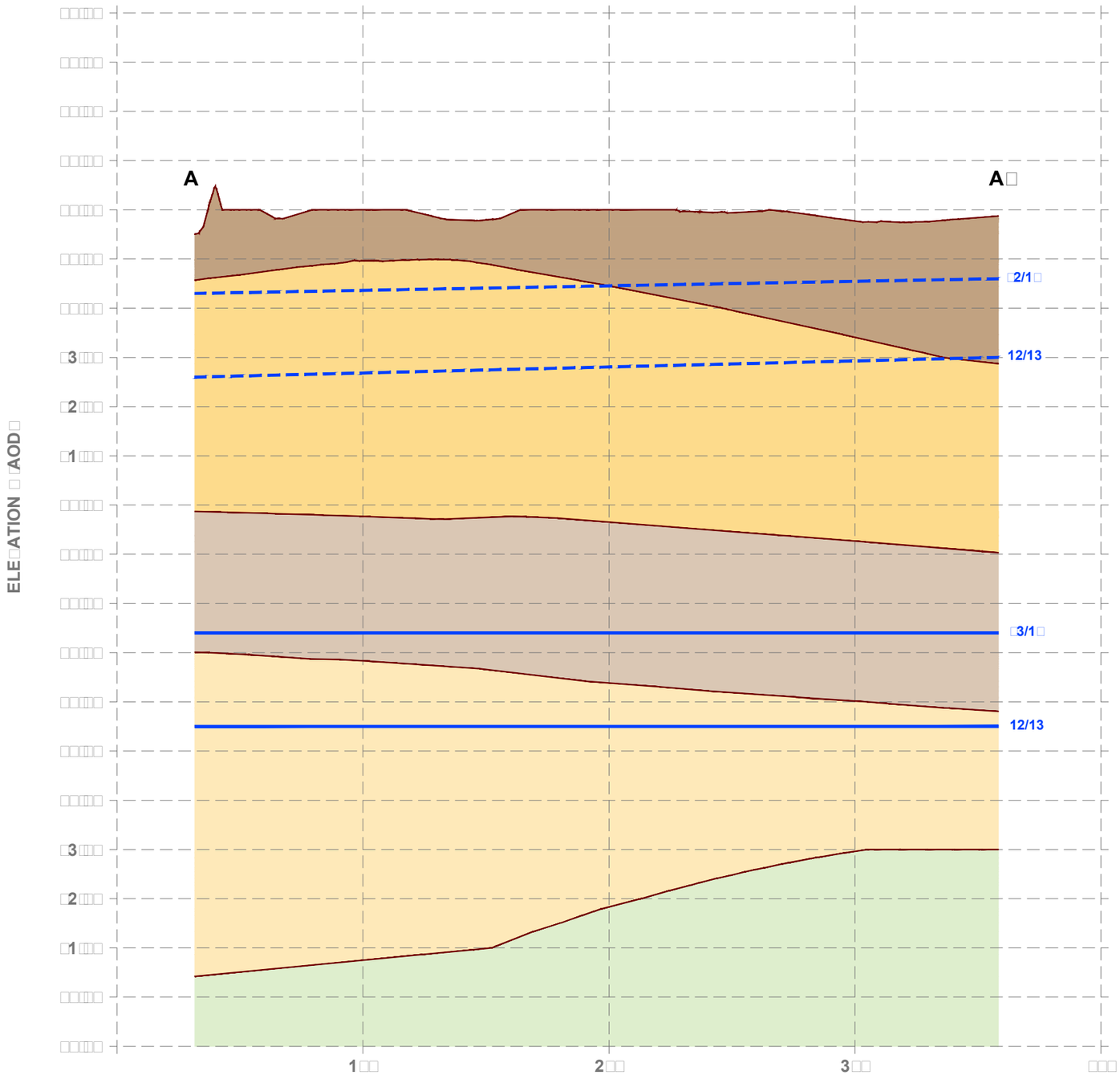
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PHASE A
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- LMA PIEZOMETRIC SURFACE
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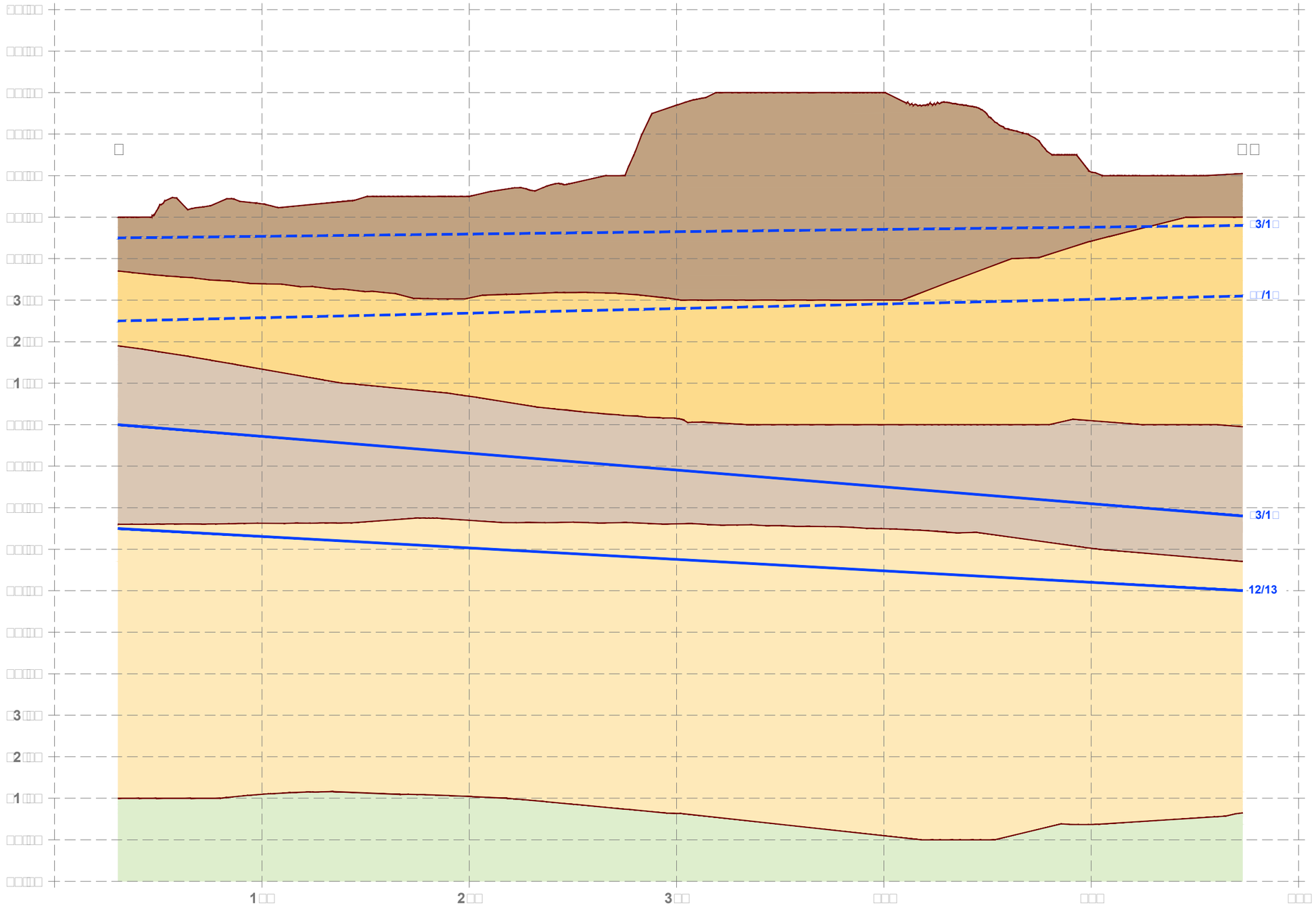
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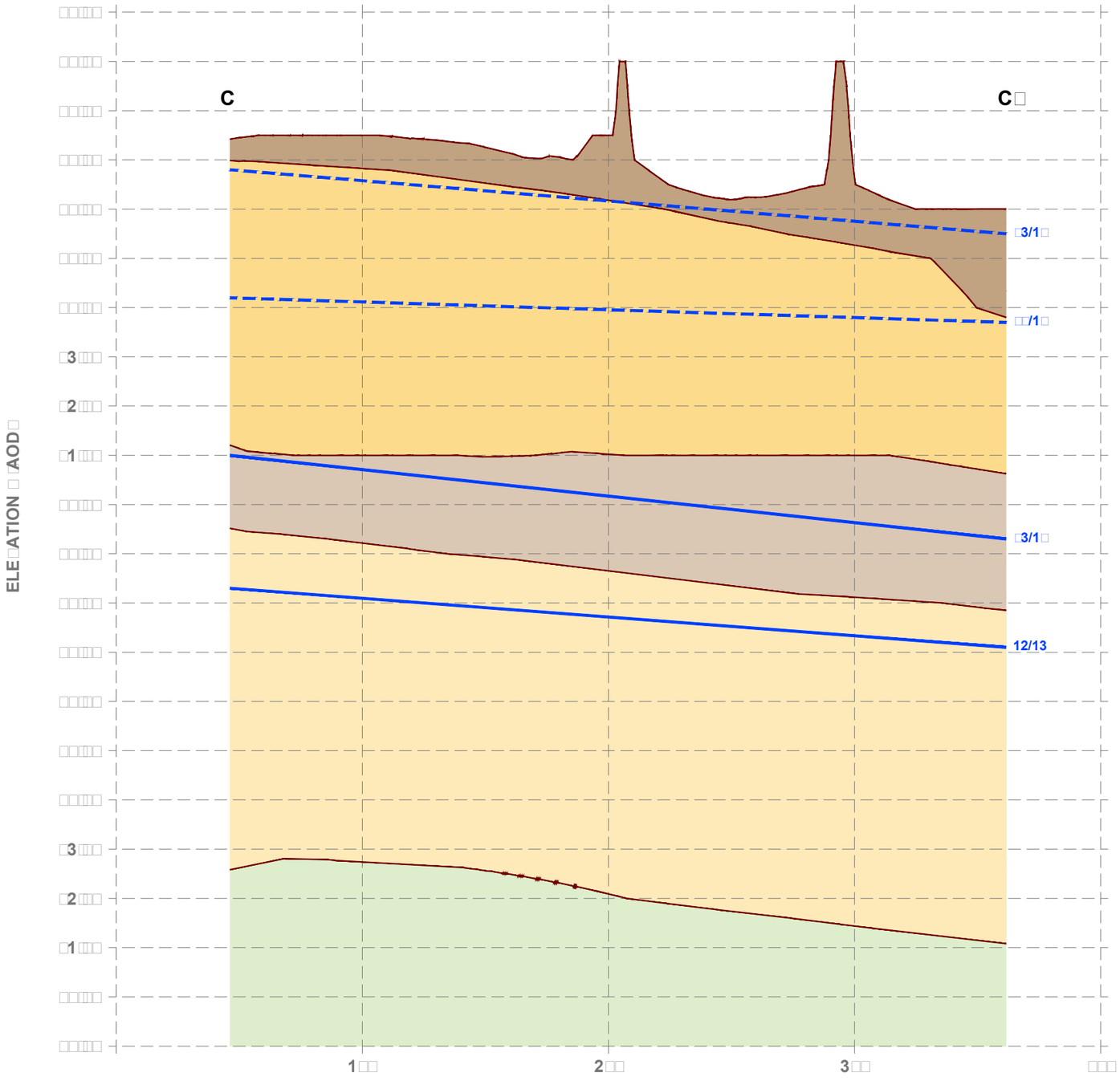
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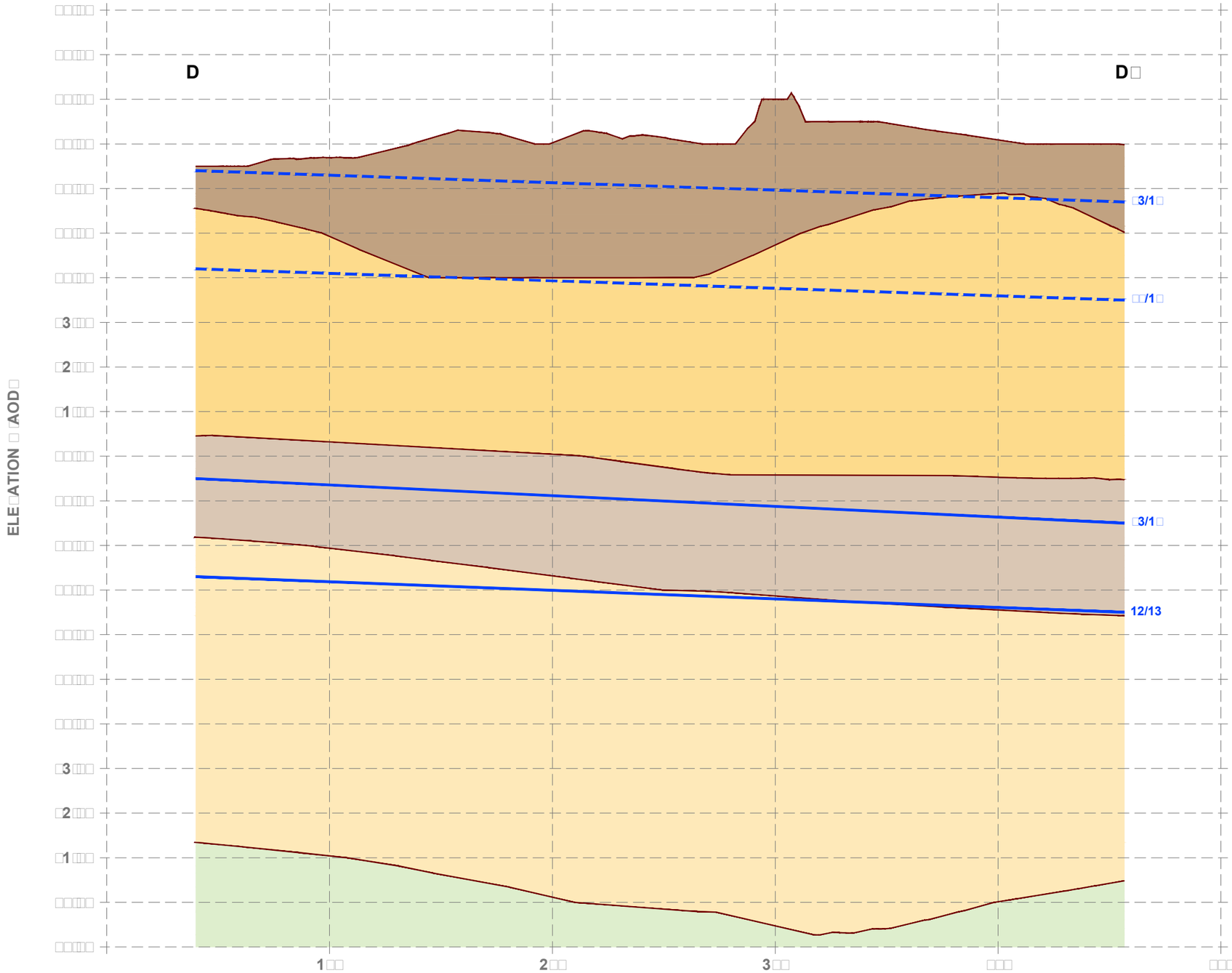
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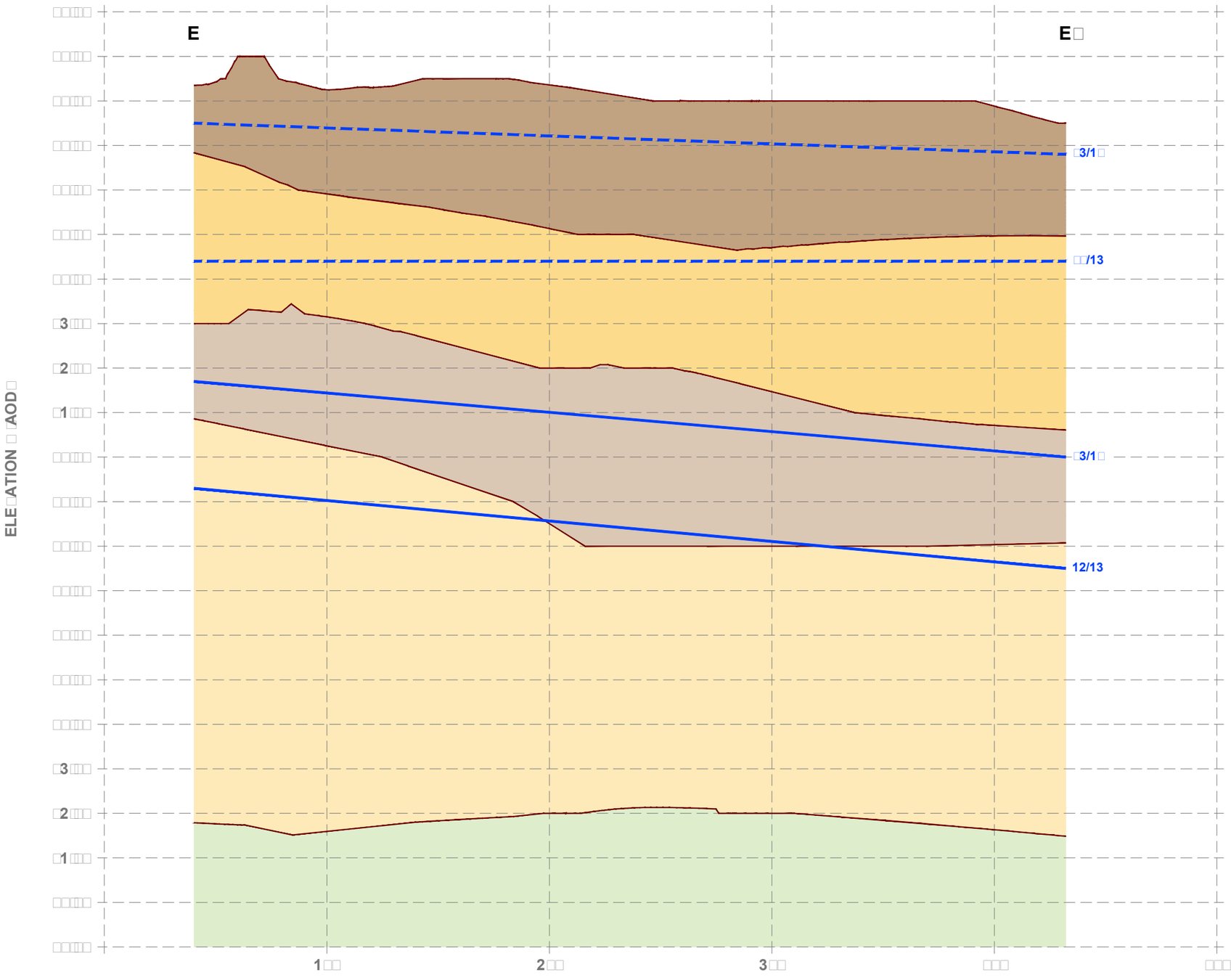
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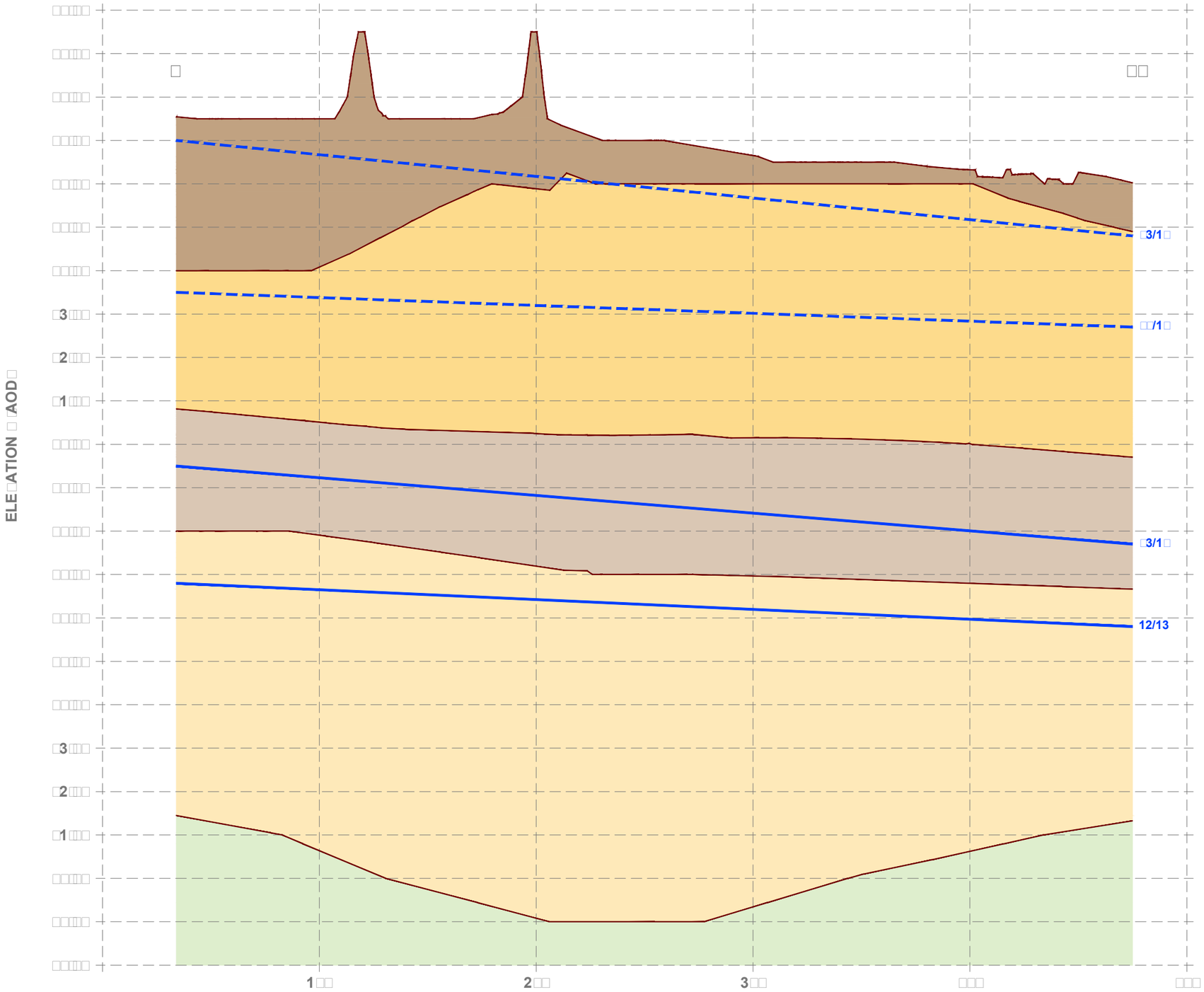
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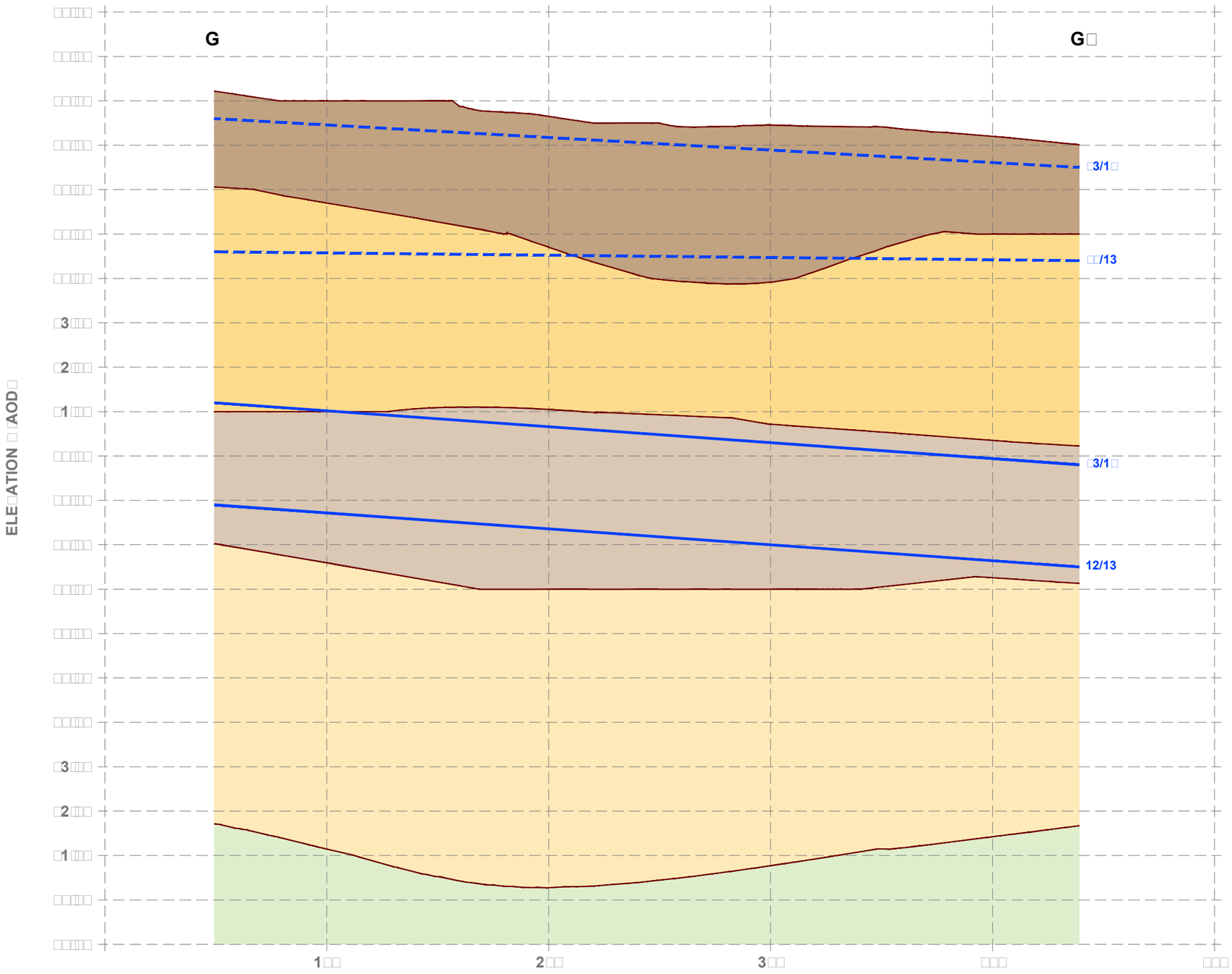
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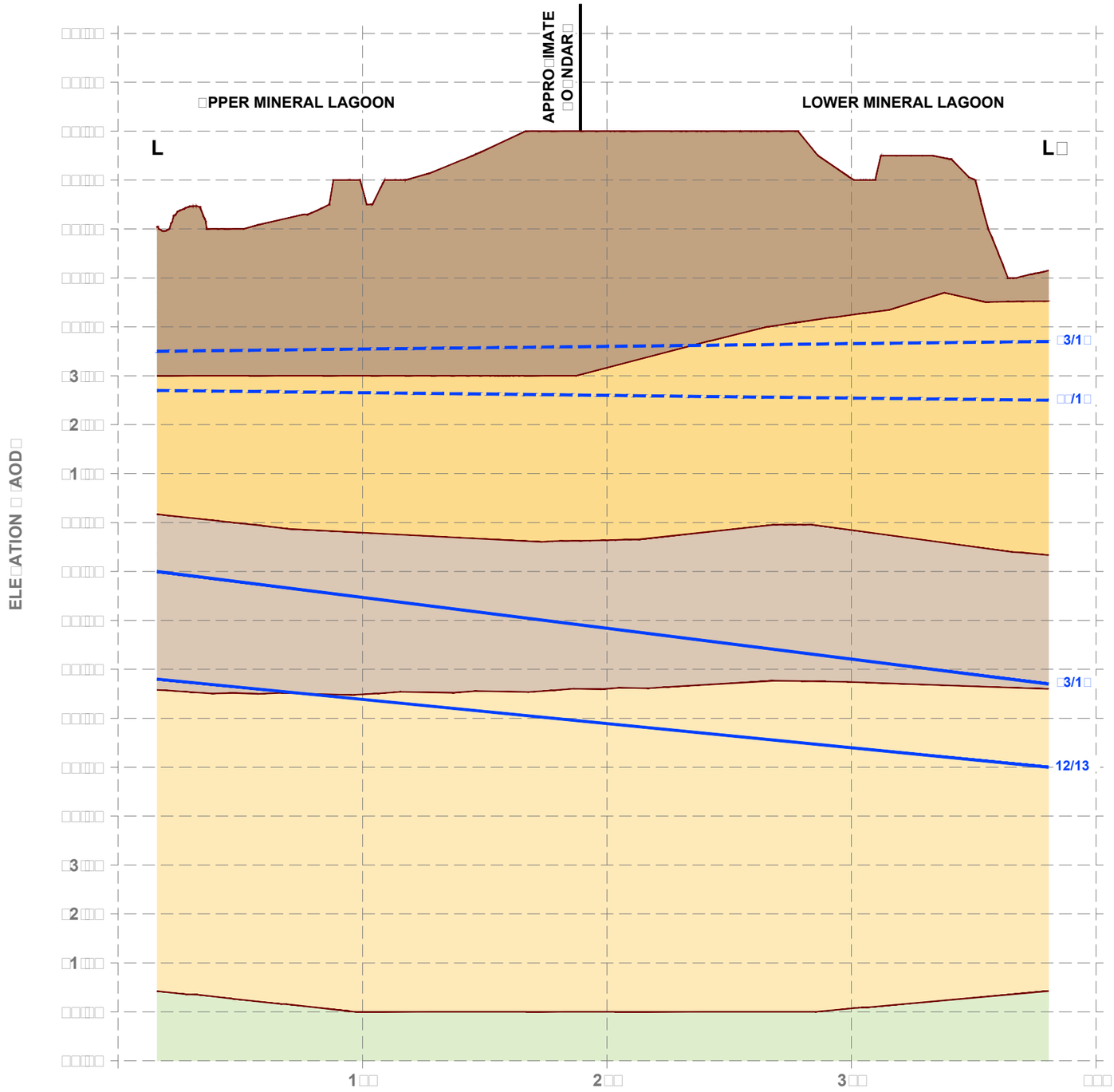
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□PPER AND LOWER MINERAL LAGOONS
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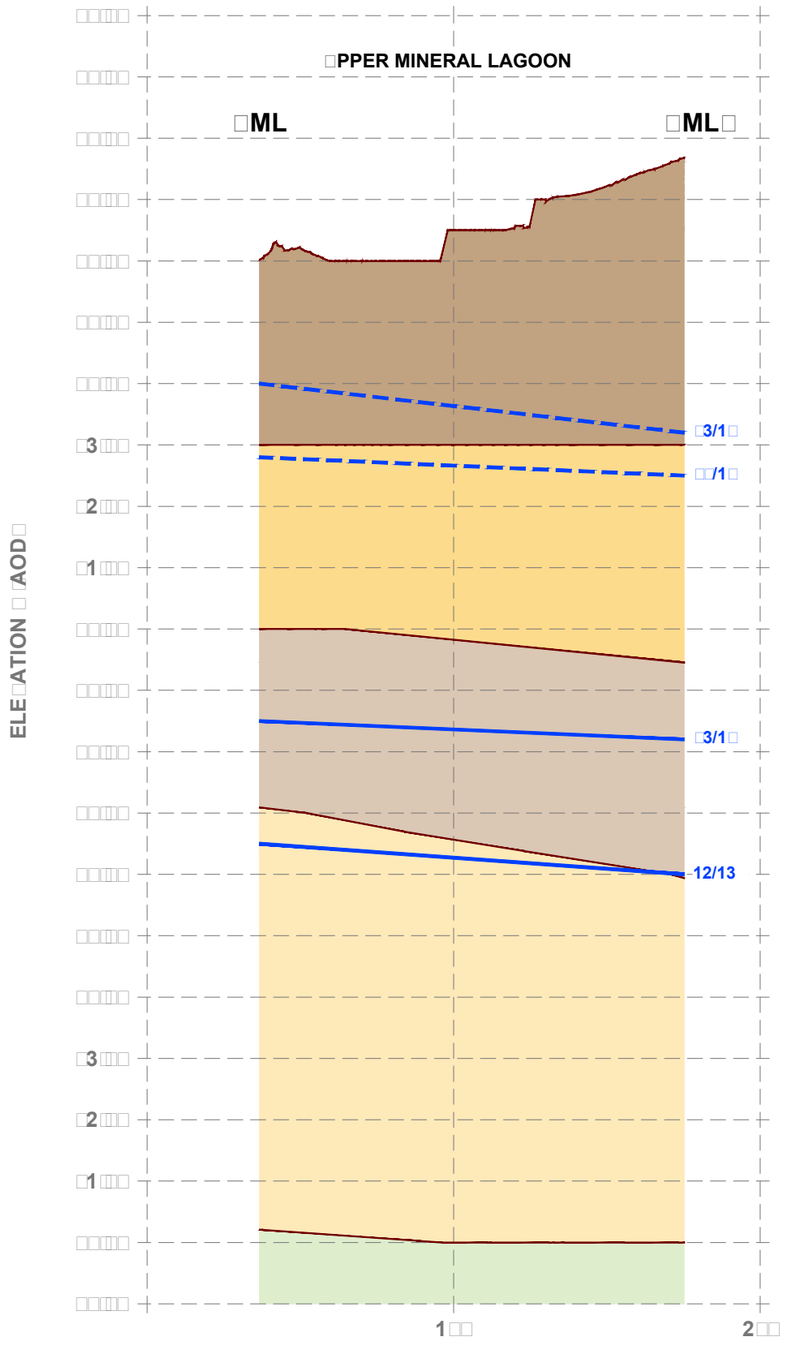
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□PPER AND LOWER MINERAL LAGOONS
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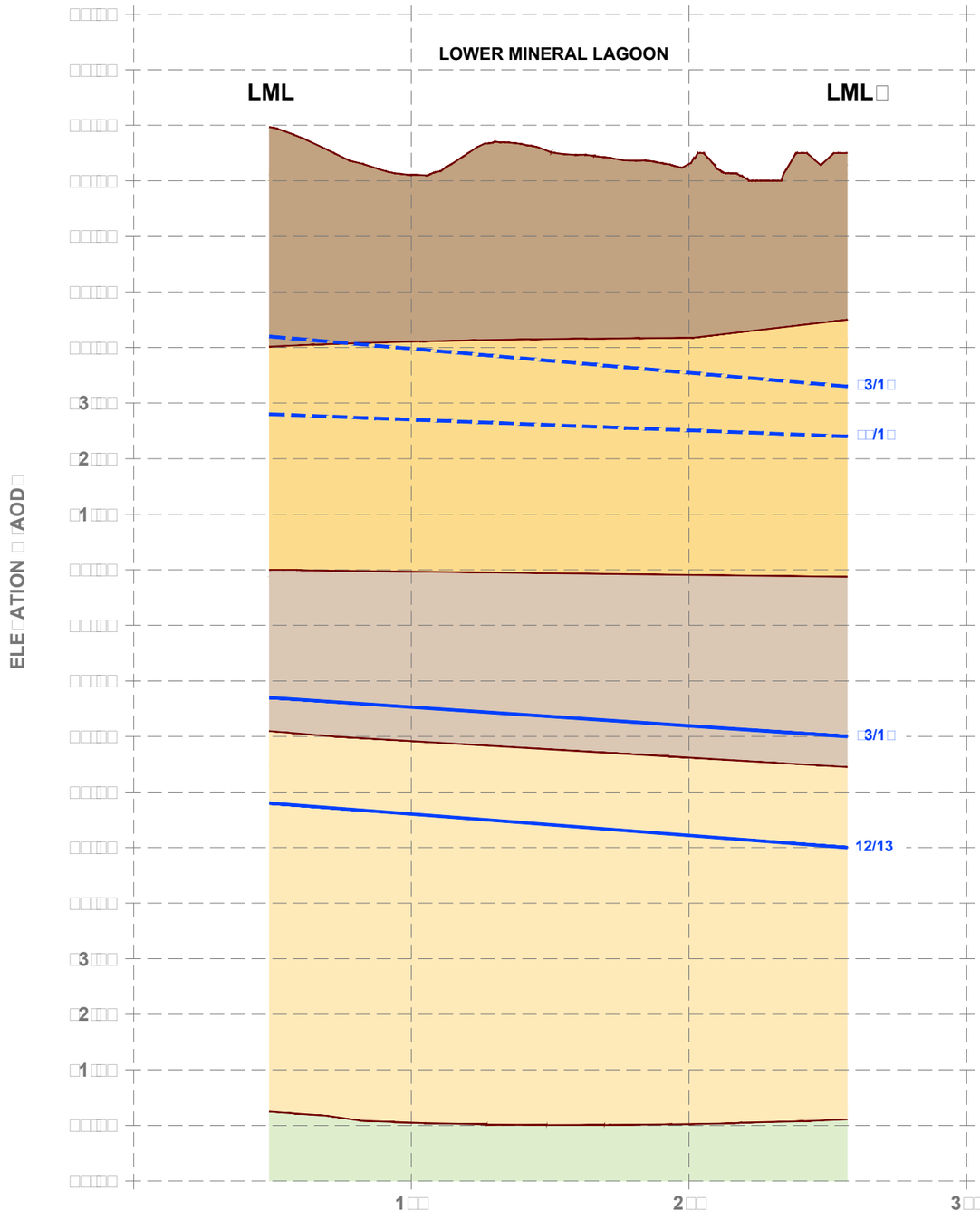
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LEGEND

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APPENDIX 02: RESPONSE TO LEAD LOCAL FLOOD AUTHORITY CONSULTATION

7 July 2016

Chay Dempster
Hertfordshire County Council
County Hall
Pegs Lane
Hertford
Herts, SG13 8DN
via email: FRMConsultations@hertfordshire.gov.uk

Our Ref: 403.01009.00132

Dear Chay

RE: HATFIELD QUARRY, FORMER HATFIELD AERODROME, HERTFORDSHIRE: RESPONSE TO HERTFORDSHIRE COUCNTY COUNCIL OBJECTION

1.0 INTRODUCTION

This letter has been prepared to address comments from the Hertfordshire County Council contained in their letter dated 18 February 2016. These relate to the Flood Risk Assessment (FRA) for the proposed sand and gravel quarry, including new access onto the A1057, an aggregate processing plant, concrete batching plant and other ancillary facilities on land at the former Hatfield Aerodrome, Hertfordshire (the application site).

We understand from the aforementioned correspondence that Hertfordshire County Council would object to the grant of planning permission for the proposed development as:

> *'The FRA carried out by SLR reference 403.01009.00132 dated November 2015 submitted with this application does not comply with the requirements set out in the Planning Practice Guide (as revised 6 April 2015) to the National Planning Policy Framework. The submitted FRA does not therefore; provide a suitable basis for assessment to be made of the flood risks arising from the proposed development.*
>
> *In order for the Lead Local Flood Authority to advise the relevant local planning authority that the site will not increase flood risk to the site and elsewhere and can provide appropriate sustainable drainage techniques, the following information is required as part of the flood risk assessment;*
>
> 1. *Detailed drainage strategy*
> 2. *Site specific infiltration tests to confirm the permeability of the site for infiltration options in accordance with BRE Digest 365*
> 3. *Details on the proposed works to The Nast/Ordinary Watercourse'*

Following discussions with your colleague Sana Ahmed, we understand that the information provided within the Environmental Statement (ES) and Water Framework Directive Compliance Assessment (WFDCA), is sufficient to satisfy items 1 to 3 of your objection. We have therefore collated the relevant information against each of the 4 items and provided further clarification of the propsoals.

2.0 ASSESSMENT OF FLOOD RISK

The proposed works lie within Flood Zone 1. The focus of the FRA was therefore to development a Surface Water Management Strategy to manage groundwater and surface water at the application site during the operational and restoration phases.

2.1 Groundwater Management

2.1.1 Operational Phase

The quarry would be worked in phases to allow for progressive restoration as illustrated on Drawings HQ 3/6 to 3/12 (Appendix A). Sand and gravel would be worked from the two discrete horizons described above; the Upper Mineral Horizon (UMH) and the Lower Mineral Horizon (LMH).

The UMH is overlain by a clayey material (referred to as '*overburden*'), above which is the soil horizon. The two mineral horizons are separated by a laterally continuous layer of boulder clay (referred to as '*interburden*'). The overburden and interburden would be used to control groundwater ingress and to infill the base of the workings to provide a suitable low permeability geological barrier on which the imported material would be placed.

Two infiltration lagoons will be constructed; one into the UMH and a second into the LMH. These would be used to manage the groundwater and surface water discharge generated during the operation of the application site. Groundwater from the LMH would be discharged only to the LMH lagoon. UMH groundwater will be discharged to the UMH and/or the LMH lagoon if additional capacity is required.

Prior to the excavation of each phase it will be isolated from the adjacent aquifer by the construction of a clay barrier or perimeter bund. This will be installed into a trench excavated into the UMH, and keyed into the underlying interburden clays. This will require localised pumping to install the bund in a dry excavation. Groundwater from this dewatering will discharged into UMH Lagoon.

The perimeter bund will be installed with a back-drain to control groundwater levels behind the bund which will drain to the recharge UMH Lagoon. The back-drain design will be different for each phase; some will be controlled through gravity and some by pumping from sumps.

Once the perimeter bund is installed the mineral in the phase will be dewatered and the mineral excavated in the dry. The pumping rate will decline over time until the only pumping requirement is equal to rainfall recharge and to remove groundwater in storage within the phase. Groundwater from this dewatering will discharged into UMH Lagoon.

Limited dewatering may be required to excavate the interburden in the dry, although this will not be needed for all phases. Groundwater from this dewatering will discharged into LMH Lagoon. Once the interburden has been removed the LMH will be worked wet, i.e. it will not be dewatered.

2.1.2 Restoration Phase

The clay bund along the outer perimeter of extraction works will be retained after restoration. This will impede groundwater flow within the UMH. It is therefore proposed to retain the back-drain to phases E and G as a 500mm deep open channel to intercept groundwater levels to ensure that historic high water table elevations are not exceeded.

At restoration the two recharge lagoons will be connected and backfilled to allow recharge only into the UMH. Groundwater in the Phase E and G back drain will be directed to this lagoon as shown on Drawing No. HQ 3/10 (Appendix A).

2.2 Surface Water Management

2.2.1 Operational Phase Dewatering

Management of rainfall within each phase during the LMH excavation period will be through pumping and the discharge water to the UMH Lagoon.

2.2.2 Access Road

The proposed access road, shown on Drawing No. HQ 3/2, will predominantly be constructed of sand and gravel thereby continuing to shed runoff to ground. However, a 100m section of the access road, off the A1057 (Hatfield Road/St Albans Road), will be laid to hardstanding. With reference to the chapter 3 of the ES, a new drainage ditch will be constructed to intercept surface from this section of the access road.

The ditch will be designed to provide both conveyance and the necessary attenuation prior to discharge at greenfield rate into Thames Water sewer network.

The rainfall intensity for a 60 minute 1% Annual Exceedance Probability (AEP) storm event at Hatfield from the Flood Estimation Handbook (FEH) CD-ROM[1], is reported to be 48.89mm/hr.

Each phase is expected to last 4 years, therefore over the proposed 7 phases (A – G), the total operational phases would last until approximately 2044. Therefore, with reference to guidance published by the Environment Agency[2], a 20% uplift in rainfall intensity should be considered. With climate change applied the rainfall intensity increases to 58.67mm/hr.

A conservative approach has been adopted and assumes all rainfall onto the proposed impermeable section of the access road will result in surface water runoff. Therefore, over an area of approximately 0.04ha, 23m^3 of surface water runoff would result from the access road.

The ditch geometry required to store the anticipated surface water runoff volume has been determined as follows:

- Base width = 0.3m
- Base to top of bank = 0.3m
- Bank side slopes = 1 in 2
- Longitudinal Gradient = 1 in 1,000

A swale channel of the above geometry has a storage capacity of 27m^3, in excess of the design volume.

[1] FEH CD-ROM v3. *Flood Estimation Handbook*. Centre for Ecology and Hydrology, 2009.

[2] Environment Agency, February 2016. Flood risk assessments: climate change allowances (Accessed 17 June 2016 at https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances)

2.2.3 Restoration Phase

Following extraction works, the application site will be infilled to an elevation ranging between approximately 76mAOD and 78.0mAOD with a slope in a general east-north-east direction towards the single UMA lagoon. Surface water runoff will be intercepted by a network of lined swales and ponds before discharging to the infiltration lagoon.

2.3 Groundwater and Surface Water Management Infiltration Capacity

An assessment was made in the ES to demonstrate that the recharge lagoons had the capacity to manage the predicted surface water and groundwater volumes.

Estimates of the water volumes that may need to be managed and the capacity of the recharge lagoons are presented in Appendix 6/10 of the ES (a copy of which is enclosed with this report for ease of reference) and summarised in Table 2-1 (Superscript references refer to the relevant sections of Appendix 6/10).

Table 2-1
Estimated Volume of Water to be Managed and Lagoon Capacity

Line	Source of Water	Estimated Volume (m^3/day)	Discharge Location & Capacity
1	Dewater for bund construction	59 – 299 [1(b)]	UMH lagoon (LMH if required)
2	Backflow Drain	28 – 133 [1(c)]	
3	Groundwater and rainfall within each phase	125 – 147 [2]	
4	LMH groundwater if above interburden base	155 – 811 [3(b)]	LMH lagoon
5	Back-drain discharge from restored site (Phase E & G only)	134 – 269 [7]	UMH lagoon (LMH if required)
6	Restored site runoff	41,000 [8]	UMH Lagoon (enlarged)
7	UMH Lagoon Infiltration Capacity LMH Lagoon Infiltration Capacity		289 – 579 [5(a)] 1,158 – 2,316 [5(b)]

An explanation of each line in Table 2-1 is given below:

- Line 1 is the range in groundwater abstraction required to dewater the UMH during construction of the perimeter bund to each Phase.
- Line 2 is the volume of groundwater collected in back drains installed around each Phase during operation.
- Line 3 is the volume of groundwater and surface water pumping required from each Phase to dewater the UMH.
- Line 4 is the volume of dewatering required from the LMH to enable excavation of the interburden.
- Line 5 is the estimated groundwater flow into the back drain, post restoration, at the western perimeter of the application site.
- Line 6 is the 1% Annual Exceedance Probability (AEP) surface water runoff from the restored phase inclusive of an allowance for climate change.
- Line 7 is the estimated infiltration capacity of the UMH and the LMH Lagoons. The variation is due to the range in aquifer properties and the variation in rest water level in the lagoon.

Note, for Line 6, the greatest increase in surface water runoff from the proposed development will be during the restored phase which will comprise the largest area of impermeable surface due to the underlying fill and capping. While the FRA allowed for a 30% uplift in rainfall intensity for the restored phase, under new guidance published by the Environment Agency[3], a 40% uplift in rainfall intensity should be considered. With reference to the Flood Estimation Handbook Depth Duration Frequency model data, a 1% AEP 1 hour storm duration results in a rainfall intensity of 48.89mm/hr, or 68.45mm/hr inclusive of climate change. A conservative approach has been adopted that assumes all rainfall onto the proposed extraction works will result in surface water runoff. Over the proposed extraction works area of 53.4ha, 36,550m^3 of surface water runoff would result from the restored phase.

As well as the stated infiltration capacity, the combined UMH lagoon has a storage range of between 93,000m^3 and 167,000m^3 (depending on UMH static groundwater elevation at the time of storm event), which is more than double the surface water runoff volume from the restored phase. Therefore, in the event of a second 1% AEP rainfall event at the application site within a 24 hour period, the combined UMH lagoon will have ample capacity to store the runoff.

A comparison of the groundwater and surface water being produced and the infiltration capacity of the lagoons indicate that the discharge capacity is sufficient for its purpose. A secondary outfall will be provided into the Nast at the south east boundary of the application site to allow for management of groundwater and surface water during an extreme event. It is of note that flow into the Nast will be attenuated to the 100% AEP greenfield runoff rate of 1.37l/s/ha for the application site.

2.3.1 Infiltration Rate Analysis

In the letter dated 18 February 2016 prepared by Hertfordshire County Council, we note that '*infiltration tests in accordance with BRE Digest 365 are required to demonstrate that the proposed infiltration lagoons will be feasible to drain the proposed works and after restoration has been complete for all rainfall events up to and including the 1 in 100 year event plus climate change.*'

[3] Environment Agency, February 2016. Flood risk assessments: climate change allowances (Accessed 17 June 2016 at https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances)

The proposed infiltration lagoons are significant in area and depth and have been conceptually designed to re-infiltrate the combined discharge of surface water runoff and groundwater generated by back drains and from groundwater pumping. Table 2-1 illustrates the mass balance between water volume being planned for and the capacity of the lagoons to accept its discharge.

There is a fundamental difference between the conceptual assumptions of BRE365 for design of a soakaway in unsaturated soils, and that of two large infiltration lagoons with a radius of 88m and 109m, that in the case of the UML fully extends through the aquifer. The LML will have a base some 11m deep with low permeability sidewalls extending to ground surface so it would therefore be impossible to test the LMA using a typical BRE365 shallow soakaway approach.

The fundamental parameter for determining both the groundwater abstraction rate and the capacity of the lagoons for infiltration in the saturated aquifer is its hydraulic conductivity (k). In this case estimates for k have been derived from falling and rising head tests across the site (included as table 6-5 in ES Chapter 6), which has been used in the Environment Agency's spreadsheet 'Assessing the impacts of dewatering on water resources' spreadsheet Version 1.6, for determining abstraction rate and infiltration capacity using the steady state Theim equation. Full details and worked examples are given in the ES Chapter 6. Appendix 6/10.

3.0 MANAGEMENT OF ORDINARY WATERCROUSES

With reference to the Flood and Water Management Map[4] published by Hertfordshire County Council, there are two Ordinary Watercourses within the proposed 'area of disturbance' which comprises the extraction works and proposed facilities as shown on Drawing No. 005. The impact of the proposed development on the two watercourse, the Nast and a drain to the west of Popefield Farm are discussed separately below.

3.1 The Nast

3.2 Operational Phase

During the operational phase the existing open reach of the Nast to the north of the quarry workings will be diverted south and along the northern perimeter of the working areas. This is required to enable the construction of the proposed processing facility. As there will remain significant activity above and/or adjacent to the Nast associated with both the proposed processing facility and the quarry workings it is proposed to culvert the existing open channel reach of the Nast during the operational phase.

The existing culverted reach of the Nast, that passes through the excavation phases of the application site, will also be diverted to allow the mineral workings and infilling to take place. It is proposed that the culvert be diverted to the east of the proposed infiltration lagoons. At this location ground levels during operational phase will be approximately 80m AOD (see Drawing HQ 3/6), and as, the existing open channel of the Nast has an invert level of 74m AOD (see topographic survey Appendix A of the FRA) at its downstream end, an open channel to the east of the infiltration lagoon would need to be 6m deep which is not deemed viable.

[4] Hertfordshire County Council Website (Accessed on 17 June 2016) http://webmaps.hertsdirect.org/ordwater/ordwater.htm

3.3 Restoration Phase

Upon restoration of the application site, the Nast to the north of the excavation phases will be reinstated along its pre-quarry alignment within the northern part of the application site.

The remaining culverted section to the east of the infiltration lagoons will be retained. It is not possible to reinstate the culvert along its former alignment as this will be in filled material which will settle and potential cause the culvert to collapse. With reference to Drawing HQ 3/11 enclosed in Appendix A, ground levels to the east of the infiltration lagoon will be lowered to approximately 76m AOD. The invert level of existing reach of the Nast at the south eastern boundary of the application site is 71.78m AOD, some 4m below restored ground levels. An open channel this deep is not deemed viable.

It is of note that the restoration works will comprise the construction of a network of open ditch/swale as shown Drawing HQ 3/11, thereby providing a net improvement across the application site.

A secondary outfall will be provided into the Nast at the south east boundary of the application site to allow for management of groundwater and surface water during an exceedance event, should one occur. However, as discussed at Section 2, this will be limited to the 100% AEP greenfield runoff rate of 1.37l/s/ha for the application site.

3.4 Existing Drain

The topographic survey completed in November 2014 (enclosed in Appendix A of the FRA) indicates that the drain is likely to intercept surface water runoff flowing by gravity from the west and drain to pond P8 identified within the Ecological Impact Assessment prepared by Bioscan (UK) Ltd (Report No. E1823R1, January 2016).

With reference to Drawing No. HQ 3/1 (Appendix A), the drain to the west of Popefield Farm along with the associated catchment will be removed as part of the Phase F extraction works, over a period of approximately 4 years. There will therefore be no increase in flood risk downstream, and in particular to Popefield Farm and the A1057 (Hatfield Road/St Albans Road), as a result of the removal of the drain.

As discussed above, the restoration works will comprise the construction of a network of open ditch/swale as shown Drawing HQ 3/11, thereby providing a net improvement across the application site.

4.0 CONCLUSIONS

Technical information presented within this report on behalf of Brett Aggregates Limited seeks to demonstrate that a sustainable and integrated groundwater and surface water management scheme can be implemented for the application site during the operational and restoration phases. That is, groundwater and surface water will be managed on site without causing increasing flood risk elsewhere.

Should you have any queries or wish to discuss any aspect of this letter report in greater detail please do not hesitate to contact me in our Bradford on Avon Office on 01225 309 400.

Yours sincerely
SLR Consulting Limited

Caroline Jeanne
Associate Hydrologist

Enc.

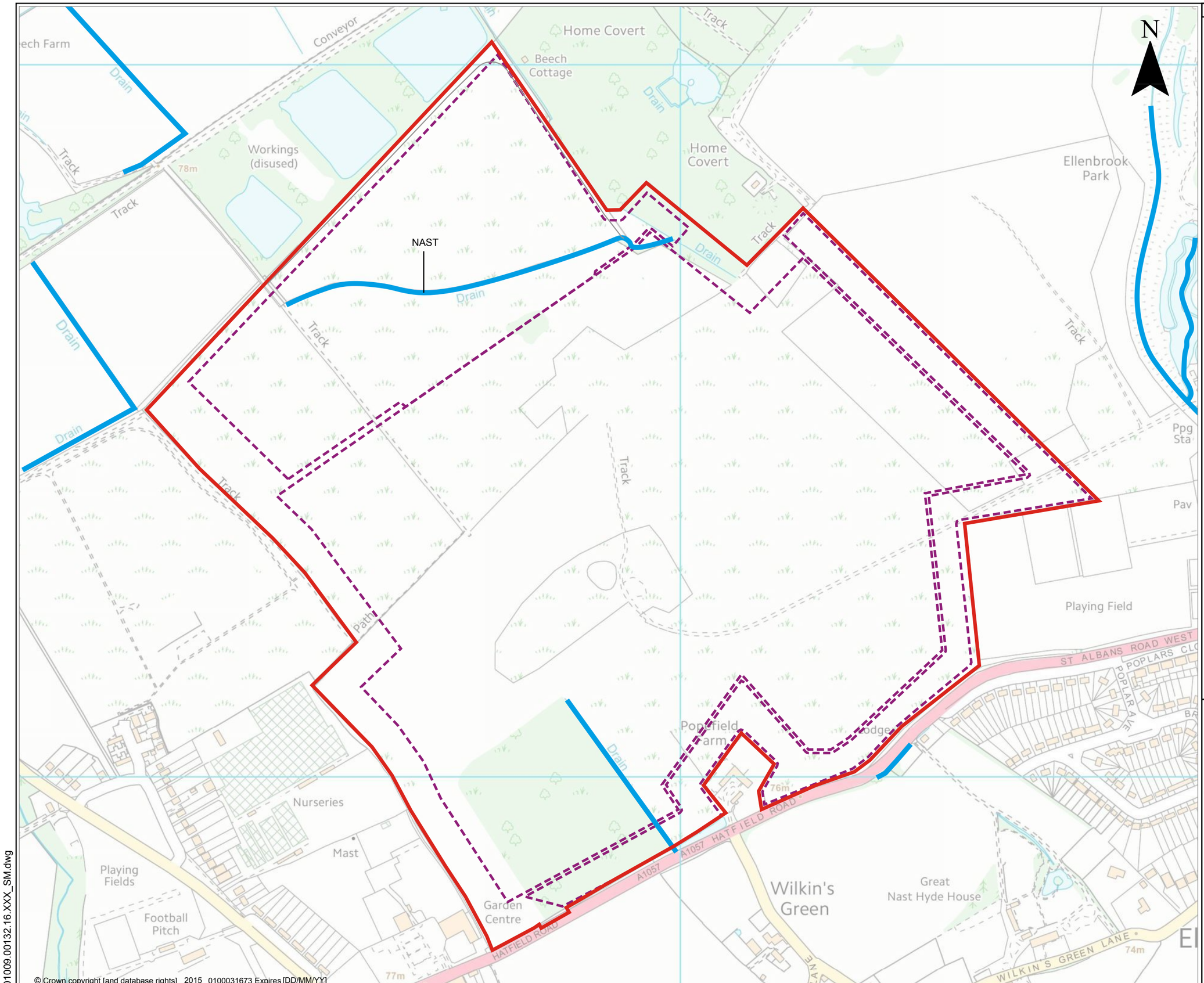
Drawing No. 005 **Location of Ordinary Watercourses**

Appendix A **Phasing drawings from the ES**

Appendix 6/10[5] **Groundwater, Surface Water and Drain Management**

[5] This is the reference used in the ES

Drawing No. 005 Location of Ordinary Watercourses



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LEGEND

- APPLICATION SITE BOUNDARY
- AREA OF DISTURBANCE
- HCC WATER MANAGEMENT ORDINARY WATER COURSE

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PLANNING APPLICATION

Ordinary Water Courses

DRAWING_NO 005

Scale 1:5,000 @ A3

Date JUNE 2016

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Appendix A Phasing drawings from the ES

EPHEMERAL RIVER NAST TO BE DIVERTED AROUND LANDSCAPE AND ECOLOGICAL CORRIDOR AROUND SITE BOUNDARY

PLANT SITE, STOCKPILES AND LAGOONS

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND PLACED INTO TEMPORARY STORAGE AROUND PERIMETER. FORMATION LEVELS TO THEN BE BUILT UP TO EXISTING USING SUITABLE AS-DUG UMH FROM RECHARGE LAGOONS, AVERAGE 1.5m THICKNESS.

REFER TO DRAWING HQ 3/3 FOR PLANT SITE LAYOUT

PROPOSED ADVANCE HEDGEROW AND TREE PLANTING ALONG ECOLOGICAL CORRIDOR

NORTHERN PART OF PUBLIC RIGHT OF WAY DIVERTED AROUND SITE PERIMETER, ALONG ENHANCED LANDSCAPE AND ECOLOGICAL CORRIDOR

INTERNAL HAUL ROAD

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND PLACED INTO TEMPORARY STORAGE AROUND PERIMETER.

ROAD TO THEN BE BUILT UP TO EXISTING USING AS-DUG FROM UPPER MINERAL LAGOON.

CROSSING POINT FOR PERMISSIVE PATH

UPPER AND LOWER MINERAL RECHARGE LAGOON AND ADJACENT STRIP TO SOUTH

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND PLACED INTO TEMPORARY STORAGE AROUND PERIMETER.

THEN TO BE STRIPPED OF OVERBURDEN AND USED TO FORM PERIMETER SEALS AROUND LAGOONS, WITH SURPLUS PLACED INTO PERIMETER STORAGE MOUNDS ADJACENT.

IF SUITABLE, AS-DUG MINERAL TO BE USED TO BUILD FORMATION LEVELS IN PLANT SITE, STOCKING AREA AND INTERNAL ROADS.

INTERBURDEN TO BE STRIPPED FROM LMH LAGOON AND PLACED INTO PERIMETER STORAGE MOUNDS FOR LATER REUSE IN RESTORATION, EXPOSING LMH TO BE TAKEN TO PLANT SITE.

UMH RECHARGE LAGOON

LMH RECHARGE LAGOON

N:208500

N:208500

NAST TO BE DIVERTED TO STANDOFF TO EAST, TO CONNECT TO EXISTING CULVERT AT EDGE OF SITE

EXTRA PLANTING ON BUND

EXISTING NAST CULVERT. INVERT AT MONITORING POINT ALONG THE SIDE OF THE ROAD AT 71.78m AOD.

PERMISSIVE ROUTE TO CONNECT TO ROADSIDE PATH

N:208000

NEW INTERNAL ROAD TO BE CONSTRUCTED AT 10m STANDOFF TO GAS PIPE, AND TO INCORPORATE NEW DRAINAGE CHANNEL TO INTERCEPT SURFACE WATER AND STOCK-PROOF FENCE ON BOUNDARY.

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND PLACED INTO TEMPORARY STORAGE AROUND PERIMETER.

SUBJECT TO SUITABILITY, FORMATION LEVELS TO THEN BE BUILT UP TO EXISTING USING AS-DUG UMH FROM RECHARGE LAGOONS, AVERAGE 1.5m THICKNESS.

SUBSEQUENT WEARING COURSE TO BE DETERMINED.

ACOUSTIC FENCE TO BE CONSTRUCTED ALONG PART OF WESTERN SITE BOUNDARY, AS REQUIRED, TO INCLUDE CLIMBING PLANTS ON OUTSIDE FACE. ALIGNMENT TO BE AT 10m STANDOFF TO GAS PIPE

ROAD ACCESS

ACCESS POINT OVER BUND FOR PERMISSIVE PATH LEADING FROM ROADSIDE PATH

PROPOSED PERIMETER BUND

BUNDS TO INCLUDE SOILS FROM RECHARGE LAGOONS, ROADS AND PLANT SITE, WITH OVERBURDEN AND INTERBURDEN TO BE PLACED ALONGSIDE RECHARGE LAGOONS FOR BACKFILLING UMH LAGOON AS PART OF FINAL RESTORATION.

3m HIGH ALONG HATFIELD ROAD, 4m HIGH ELSEWHERE. 1:3 OUTER SIDE SLOPES ALONG PROW TO NORTH, HATFIELD ROAD TO SOUTH AND PLAYING FIELD TO SOUTH-EAST AND 1:2 SLOPES ELSEWHERE. 5M STAND OFF FROM TOE OF BUND TO EXTRACTION AREA AND SITE BOUNDARY.

TOPSOIL TO BE STRIPPED FROM BENEATH INTERBURDEN, OVERBURDEN AND SUBSOIL STORAGE BUNDS IN ADVANCE AND PLACED OVER THE TOP AS FINAL COVER. ALL BUNDS TO BE GRASS SEEDED. CONTRASTING UNITS TO BE SEPARATED BY GEOTEXTILE

0 50 100 150 200m 300 400 500

Metres 1:5000

N

LEGEND

- SITE BOUNDARY
- PROPOSED CONTOURS (2m INTERVALS)
- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- MINERAL EXTRACTION AREA
- PUBLIC RIGHT OF WAY (INC DIVERTED SECTION)
- PERMISSIVE RIGHT OF WAY (INC DIVERTED SECTION)
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- PROPOSED AREA OF DISTURBANCE FROM SITE PREPARATION WORKS
- PROPOSED PERIMETER STORAGE BUNDS
- PROPOSED PERIMETER SEALS
- LANDSCAPE AND ECOLOGICAL CORRIDOR
- UNDISTURBED LAND WITHIN APPLICATION SITE
- ADVANCE HEDGEROW AND STANDARD TREE PLANTING
- EXISTING VEGETATION

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PLANNING APPLICATION

INITIAL SITE PREPARATION

HQ 3/6

Scale 1:5,000 @ A3

Date DEC 2015

160107_01009.00132.29.000_HQ3-6_SITEPREP1_SM.dwg

PHASE A

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND PLACED INTO TEMPORARY STORAGE AROUND PERIMETER.

TO BE STRIPPED OF OVERBURDEN AND USED TO FORM PERIMETER SEALS AROUND PHASE, WITH SURPLUS PLACED INTO WORKED OUT VOID. SUITABLE IMPORTED MATERIALS MAY BE USED TO FORM THE PERIMETER SEALS.

INTERBURDEN TO BE PROGRESSIVELY STRIPPED AND PLACED BACK INTO VOID AS 2m THICK GEOLOGICAL SEAL.

UMH AND LMH TO BE PROGRESSIVELY TAKEN TO PLANT SITE.

CROSSING POINT FOR PERMISSIVE PATH

PLANT SITE, STOCKPILES AND LAGOONS

NORTHERN PART OF PUBLIC RIGHT OF WAY DIVERTED AROUND SITE PERIMETER, ALONG ENHANCED LANDSCAPE AND ECOLOGICAL CORRIDOR

UMH RECHARGE LAGOON

LMH RECHARGE LAGOON

PHASE A - EXTRACTION AREA

PERMISSIVE ROUTE TO CONNECT TO ROADSIDE PATH

ROAD ACCESS

ACCESS POINT OVER BUND FOR PERMISSIVE PATH LEADING FROM ROADSIDE PATH

PROPOSED PERIMETER BUND

BUND EXTENDED ALONG HATFIELD ROAD AND AROUND POPEFIELD FARM.

3m HIGH ALONG HATFIELD ROAD AND 1:2 SLOPES. 5M STAND OFF FROM TOE OF BUND TO EXTRACTION AREA AND SITE BOUNDARY.

TOPSOIL TO BE STRIPPED FROM BENEATH SUBSOIL STORAGE IN ADVANCE AND PLACED OVER THE TOP AS FINAL COVER. ALL BUNDS TO BE GRASS SEEDED. CONTRASTING UNITS TO BE SEPARATED BY GEOTEXTILE

N:209000 N:208500 N:208000 E:519500

0 50 100 150 200m 300 400 500

Metres 1:5000

N

LEGEND

- SITE BOUNDARY
- 70 PROPOSED CONTOURS (2m INTERVALS)
- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- MINERAL EXTRACTION AREA
- PUBLIC RIGHT OF WAY (INC DIVERTED SECTION)
- PERMISSIVE RIGHT OF WAY
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- PROPOSED AREA OF DISTURBANCE FROM SITE
- PROPOSED PERIMETER STORAGE BUNDS
- PROPOSED PERIMETER SEALS
- LANDSCAPE AND ECOLOGICAL CORRIDOR
- UNDISTURBED LAND WITHIN APPLICATION SITE
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PLANNING APPLICATION

PHASE A - ILLUSTRATION

HQ 3/7

Scale 1:5,000 @ A3

Date DEC 2015

160107_01009.00132.29.000_HQ3-7_PHASEA_SM.dwg

CROSSING POINT FOR PERMISSIVE PATH

PHASE B

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND PLACED INTO TEMPORARY STORAGE TO PERIMETER / PHASE G.

TO BE STRIPPED OF OVERBURDEN AND USED TO FORM PERIMETER SEALS AROUND PHASE, WITH SURPLUS PLACED INTO WORKED OUT VOID IN PHASE A OR PHASE B. SUITABLE IMPORTED MATERIALS MAY BE USED TO FORM THE PERIMETER SEALS.

INTERBURDEN TO BE PROGRESSIVELY STRIPPED AND PLACED BACK INTO VOID AS 2m THICK GEOLOGICAL SEAL.

UMH AND LMH TO BE PROGRESSIVELY TAKEN TO PLANT SITE.

PLANT SITE, STOCKPILES AND LAGOONS

NORTHERN PART OF PUBLIC RIGHT OF WAY DIVERTED AROUND SITE PERIMETER, ALONG ENHANCED LANDSCAPE AND ECOLOGICAL CORRIDOR

UMH RECHARGE LAGOON

LMH RECHARGE LAGOON

PHASE B - EXTRACTION AREA

PHASE A - EXTRACTION AND INFILL AREA

TEMP DIVIDING BUND BETWEEN PHASE A AND B

TO BE REMOVED AND PLACED INTO ADJACENT VOID OR USED TO FORM SEAL ELSEWHERE

PERMISSIVE ROUTE TO CONNECT TO ROADSIDE PATH

PROPOSED PERIMETER BUND

BUND EXTENDED WITHIN FOOTPRINT OF MINERAL EXTRACTION PHASE G. BASED ON BEING 3m HIGH AND 1:2 SLOPES.

TOPSOIL TO BE STRIPPED FROM BENEATH SUBSOIL STORAGE IN ADVANCE. ALL BUNDS TO BE GRASS SEEDED. CONTRASTING UNITS TO BE SEPARATED BY GEOTEXTILE

ROAD ACCESS

ACCESS POINT OVER BUND FOR PERMISSIVE PATH LEADING FROM ROADSIDE PATH

N:208500

N:208000

E:519500

E:520500

0 50 100 150 200m 300 400 500

Metres 1:5000

N

LEGEND

- SITE BOUNDARY
- 70 — PROPOSED CONTOURS (2m INTERVALS)
- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- MINERAL EXTRACTION AREA
- PUBLIC RIGHT OF WAY (INC DIVERTED SECTION)
- PERMISSIVE RIGHT OF WAY
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- PROPOSED AREA OF DISTURBANCE FROM SITE
- PROPOSED PERIMETER STORAGE BUNDS
- PROPOSED PERIMETER SEALS
- LANDSCAPE AND ECOLOGICAL CORRIDOR
- UNDISTURBED LAND WITHIN APPLICATION SITE
- ADVANCE HEDGEROW AND STANDARD TREE PLANTING
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PLANNING APPLICATION

PHASE B - ILLUSTRATION

HQ 3/8

Scale 1:5,000 @ A3

Date DEC 2015

160107_01009.00132.29.000_HQ3-8_PHASEB_SM.dwg

PHASE C

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND DIRECT PLACED ONTO PREVIOUSLY PREPARED FORMATION LEVELS IN PHASE C, ACCORDING TO SPECIFICATION AND PROFILES TO MAXIMIZE HABITAT CREATION POTENTIAL.

OVERBURDEN TO BE USED TO FORM PERIMETER SEALS AROUND PHASE, WITH SURPLUS PLACED INTO PREVIOUSLY WORKED OUT VOIDS. SUITABLE IMPORTED MATERIALS MAY BE USED TO FORM THE PERIMETER SEALS.

INTERBURDEN TO BE PROGRESSIVELY STRIPPED AND PLACED BACK INTO VOID AS 2m THICK GEOLOGICAL SEAL.

UMH AND LMH TO BE PROGRESSIVELY TAKEN TO PLANT SITE.

PLANT SITE, STOCKPILES AND LAGOONS

NORTHERN PART OF PUBLIC RIGHT OF WAY DIVERTED AROUND SITE PERIMETER, ALONG ENHANCED LANDSCAPE AND ECOLOGICAL CORRIDOR

CROSSING POINT FOR PERMISSIVE PATH

UMH RECHARGE LAGOON

PHASE C - EXTRACTION AREA

PHASE B - EXTRACTION AND INFILL AREA

LMH RECHARGE LAGOON

TEMP DIVIDING BUND BETWEEN PHASE B AND C

TO BE REMOVED AND PLACED INTO ADJACENT VOID OR USED TO FORM SEAL ELSEWHERE

PHASE A - INFILL AND RESTORATION AREA

PERMISSIVE ROUTE TO CONNECT TO ROADSIDE PATH

ROAD ACCESS

ACCESS POINT OVER BUND FOR PERMISSIVE PATH LEADING FROM ROADSIDE PATH

N:208500

N:208000

E:519500

E:520500

0 50 100 150 200m 300 400 500

Metres 1:5000

N

LEGEND

- SITE BOUNDARY
- PROPOSED CONTOURS (2m INTERVALS)
- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- MINERAL EXTRACTION AREA
- PUBLIC RIGHT OF WAY (INC DIVERTED SECTION)
- PERMISSIVE RIGHT OF WAY
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- PROPOSED AREA OF DISTURBANCE FROM SITE
- PROPOSED PERIMETER STORAGE BUNDS
- PROPOSED PERIMETER SEALS
- LANDSCAPE AND ECOLOGICAL CORRIDOR
- UNDISTURBED LAND WITHIN APPLICATION SITE
- PROPOSED SEMI-NATURAL SPECIES-RICH GRASSLAND
- ADVANCE HEDGEROW AND STANDARD TREE PLANTING
- EXISTING VEGETATION

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PLANNING APPLICATION

PHASE C - ILLUSTRATION

HQ 3/9

Scale 1:5,000 @ A3

Date DEC 2015

160107_01009.00132.29.000_HQ3-9_PHASEC_SM.dwg

PLANT SITE, STOCKPILES AND LAGOONS

NORTHERN PART OF PUBLIC RIGHT OF WAY DIVERTED AROUND SITE PERIMETER, ALONG ENHANCED LANDSCAPE AND ECOLOGICAL CORRIDOR

PHASE C - INFILL AND RESTORATION AREA

UMH RECHARGE LAGOON

LMH RECHARGE LAGOON

PHASES A & B - RESTORED AREA

PHASE E - EXTRACTION AREA

PHASE D - EXTRACTION AND INFILL AREA

PERMISSIVE ROUTE TO CONNECT TO ROADSIDE PATH

ROAD ACCESS

ACCESS POINT OVER BUND FOR PERMISSIVE PATH LEADING FROM ROADSIDE PATH

N:208500

N:208000

E:520500

N

0 50 100 150 200m 300 400 500

Metres 1:5000

PHASE E

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1m AND DIRECT PLACED ONTO PREVIOUSLY PREPARED FORMATION LEVELS IN PHASE C, ACCORDING TO SPECIFICATION AND PROFILES TO MAXIMIZE HABITAT CREATION POTENTIAL

OVERBURDEN TO BE USED TO FORM PERIMETER SEALS AROUND PHASE, WITH SURPLUS PLACED INTO PREVIOUSLY WORKED OUT VOIDS. SUITABLE IMPORTED MATERIALS MAY BE USED TO FORM THE PERIMETER SEALS.

INTERBURDEN TO BE PROGRESSIVELY STRIPPED AND PLACED BACK INTO VOID AS 2m THICK GEOLOGICAL SEAL.

UMH AND LMH TO BE PROGRESSIVELY TAKEN TO PLANT SITE.

LEGEND

- SITE BOUNDARY
- 70 — PROPOSED CONTOURS (2m INTERVALS)
- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- MINERAL EXTRACTION AREA
- PUBLIC RIGHT OF WAY (INC DIVERTED SECTION)
- PERMISSIVE RIGHT OF WAY
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- PROPOSED AREA OF DISTURBANCE FROM SITE
- PROPOSED PERIMETER STORAGE BUNDS
- PROPOSED PERIMETER SEALS
- LANDSCAPE AND ECOLOGICAL CORRIDOR
- UNDISTURBED LAND WITHIN APPLICATION SITE
- PROPOSED SEMI-NATURAL SPECIES-RICH GRASSLAND
- ADVANCE HEDGEROW AND STANDARD TREE PLANTING
- EXISTING VEGETATION

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PLANNING APPLICATION

PHASE E - ILLUSTRATION

HQ 3/10

Scale 1:5,000 @ A3

Date DEC 2015

160107_01009.00132.29.000_HQ3-10_PHASEE_SM.dwg

PLANT SITE AND STOCKING AREA TO BE RESTORED TO ACID GRASSLAND MOSAIC USING RESIDUAL MINERAL LEFT OVER AT END OF SITE CLEARANCE, WITH RIDGE AND FURROW, MICRO-TOPOGRAPHICAL VARIATION AND MANAGED AS TRANQUIL AREA FOR NATURE CONSERVATION.

DISCHARGE FROM BACK DRAIN TO SURFACE WATER SWALE

TWO EXISTING GREAT CRESTED NEWT PONDS ON MARGIN OF SITE RETAINED

FRESHWATER AND SILT LAGOONS RETAINED AS PERMANENT WATERBODIES AS PART OF RESTORATION

THE TWO RECHARGE LAGOONS TO BE RETAINED AS PERMANENT WATERBODIES, BUT PARTIALLY BACKFILLED TO TOP OF INTERBURDEN USING SITE DERIVED AND IMPORTED MATERIAL

AA

CAR PARKING AND SITE OFFICES TO BE RETAINED FOR RECREATIONAL USE

PUBLIC RIGHT OF WAY REINSTATED ALONG ORIGINAL ALIGNMENT

OVERFLOW/OUTFALL FROM RESTORED WATERBODY AS DITCH/PIPE AT 75.5m AOD TO DRAIN TO DIVERTED NAST CULVERT

NEW DRAINAGE CHANNEL TO INTERCEPT GROUND WATER

INVERT OF EXISTING NAST CULVERT ALONG THE SIDE OF THE ROAD AT 71.78m AOD.

SEMI-NATURAL SPECIES_RICH GRASSLAND TO INCLUDE RIDGE AND FURROW, MICROTOPOGRAPHICAL AND SUBSTRATE VARIATION TO MAXIMISE OVERALL POTENTIAL HABITAT VALUE AND INTEREST

SW7A (71.788) & SW7B (71.896)

PARTS OF PERIMETER SOIL BUND TO BE RETAINED AS A LOW BERM AROUND THE SITE FOR RECREATIONAL ACCESS AND VIEWS

DISCHARGE FROM BACK DRAIN TO SURFACE WATER SWALE

ACCESS ROAD RETAINED

N:208500

N:208000

E:519500

E:520000

E:520500

0 50 100 150 200m 300 400 500

Metres 1:5000

SCALE 1:5,000 @ A3

LEGEND

- SITE BOUNDARY
- PROPOSED CONTOURS (2m INTERVALS) — 70
- PROPOSED OPEN DITCH/SWALE
- ADVANCE HEDGEROW AND TREE PLANTING
- EXISTING TREES AND SHRUBS
- PROPOSED HEDGROW
- PROPOSED SCRUB
- PROPOSED SEMI-NATURAL SPECIES RICH GRASSLAND
- PROPOSED MARGINAL VEGETATION/REEDBED
- WATER BODY / PONDS
- UNIMPROVED NEUTRAL-ACIDIC GRASSLAND
- NEUTRAL-ACIDIC GRASSLAND
- CALCAREOUS GRASSLAND
- PROPOSED RIDGE AND FURROW
- CULVERTED REACH OF NAST

REFER TO DRAWING HQ 3/12 FOR SECTION ILLUSTRATIONS

LEGEND

- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- PUBLIC RIGHT OF WAY
- PERMISSIVE RIGHT OF WAY
- MINERAL EXTRACTION AREA
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- RETAINED ACCESS ROAD
- POTENTIAL INDICATIVE LOCATION OF BACK DRAIN

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ILLUSTRATIVE RESTORATION CONCEPT

HQ 3/11

Scale: AS SHOWN

Date: DEC 2015

160107_01009.00132.29.000_HQ3-11_RESTORATION_SM.dwg

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NEUTRAL-ACID GRASSLAND TO BE CREATED WITHIN FORMER PLANT SITE AREA USING RESIDUAL SAND AND GRAVEL MIXED WITH SUBSOIL

UNIMPROVED NEUTRAL / ACID GRASSLAND TO BE CREATED ON AREAS RESTORED USING SUBSOIL OR BOULDER CLAY

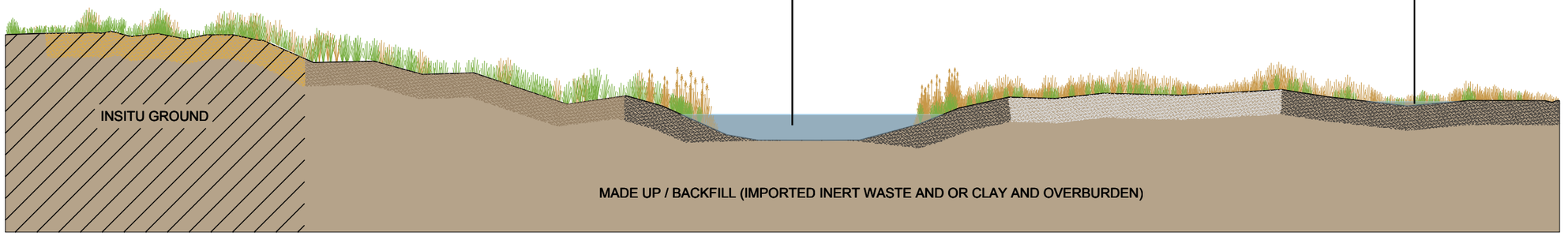
AREAS OF REED SWAMP FORMED ON LOWER LYING AREAS OF TOPSOIL AND SUBSOIL

CALCAREOUS GRASSLAND TO BE CREATED ON AREAS RESTORED USING CALCAREOUS CLAY AND/OR BROKEN CONCRETE SUBSTRATES AND SOILS

AREAS OF WETLAND GRASSLAND AND SCRUB USING TOPSOIL AND SUBSOIL

DEEPER WATER BODIES TO ATTRACT DIVING DUCKS

SEASONALLY WET SCRAPES IN DEPRESSIONS



INDICATIVE DETAIL SECTION OF RESTORATION SUBSTRATES AND MICRO-TOPOGRAPHY

NOT TO SCALE

FINAL RESTORATION LANDFORM CREATED USING SITE DERIVED AND IMPORTED MATERIAL

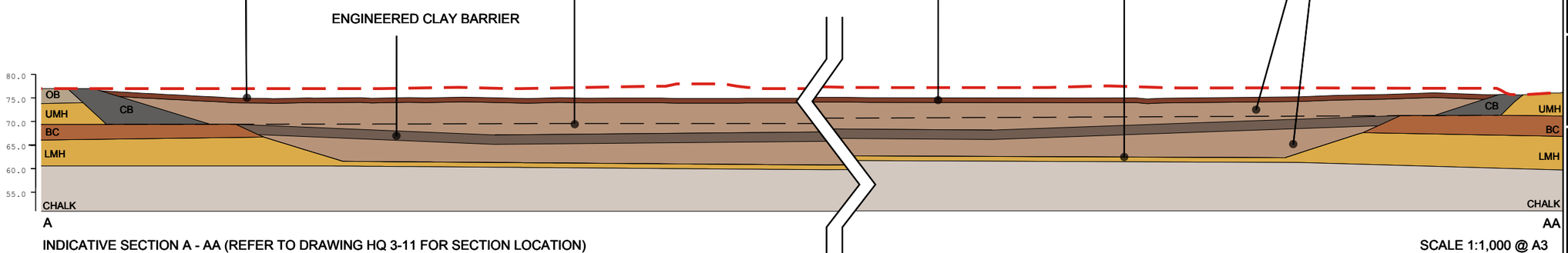
ORIGINAL TOP OF INTERBURDEN BOULDER CLAY

ENGINEERED CLAY BARRIER

1M RESTORATION PROFILE (SUBSTRATE VARIES ACCORDING TO DETAIL ABOVE)

BASE OF QUARRY 1m ABOVE IN SITU CHALK

IMPORTED INERT WASTE AND/OR SITE DERIVED CLAY AND OVERBURDEN INCLUDING ENGINEERED BARRIER



INDICATIVE SECTION A - AA (REFER TO DRAWING HQ 3-11 FOR SECTION LOCATION)

SCALE 1:1,000 @ A3

LEGEND

SECTION LEGEND

EXISTING LANDFORM

INSITU HORIZONS

OB — SOIL AND OVERBURDEN

BC — INTERBURDEN BOULDER CLAY

UMH / LMH — UPPER MINERAL HORIZON AND LOWER MINERAL HORIZON (INSITU)

CHALK — CHALK

SITE DERIVED AND IMPORTED MATERIALS AS BACKFILL

1M THICK RESTORATION PROFILE (SUBSTRATE VARIES ACCORDING TO DETAIL)

IMPORTED INERT WASTE AND SITE DERIVED MATERIAL

ENGINEERED CLAY CAP / BARRIER

CB — ENGINEERED CLAY PERIMETER SEAL/ EMBANKMENT

RESTORATION SUBSTRATES

RESIDUAL SAND AND GRAVEL MIXED WITH SUBSOIL

SUBSOIL OR BOULDER CLAY

TOPSOIL AND SUBSOIL

CALCAREOUS CLAY OR BROKEN CONCRETE AND SOILS

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PLANNING APPLICATION

ILLUSTRATIVE SECTIONS

HQ 3/12

Scale: AS SHOWN

Date: DEC 2015

160107_01009.00132.29.000_HQ3-12_SECTIONS_SM.dwg

Appendix 6/10[6] Groundwater, Surface Water and Drain Management

[6] This is the reference used in the ES

<table>
<tr><th>Objective</th><th>Task</th><th>Description</th><th>Mineral Management</th><th>Water Management Control Process</th><th>Water Volume</th></tr>
<tr><td>Isolate UMH aquifer within each 4 Year Operational Phase (Phase A through G).</td><td>1(a)</td><td>Excavate overburden and UMH around the perimeter of the mineral excavation phase down to a depth equal to the water saturated mineral. The depth will vary by season and phase.</td><td rowspan="4">Segregate mineral from overburden and stockpile and/or process accordingly</td><td>None required</td><td></td></tr>
<tr><td rowspan="3">Install UMH Perimeter Bund Wall.</td><td>1(b)</td><td>Install well points and/or sumps along the perimeter of each phase to selectively dewater the UMH along the phase perimeter. Excavate UMH down to the upper surface of the Interburden in suitable section lengths (20m wide x 65m length) to allow for installation of the perimeter bund and back drain. Allow for a 1:4 grade haul road down to the upper surface of the interburden.</td><td>Actively dewater the UMH aquifer at a rate to allow placement of the perimeter bund keyed into the interburden. Depending on suspended load groundwater from the UMH will be discharged into a settlement lagoon followed by the UMH Recharge Lagoon, or directly to the UMH Recharge Lagoon.</td><td>
<table>
<tr><th>Confined m³/day</th><th>Unconfined[1] m³/day</th></tr>
<tr><td colspan="2">Ro=200</td></tr>
<tr><td>59 – 149</td><td>72 - 144</td></tr>
<tr><td colspan="2">Ro=100</td></tr>
<tr><td>149 - 299</td><td>92 - 288</td></tr>
</table>
</td></tr>
<tr><td>1(c)</td><td>Install UMH perimeter clay bund with a back drain, keying the bund into the overburden surface. Bund crest elevations will be as detailed below, which are above the highest UMH groundwater levels (AOD) recorded on the site (March 2014):
<table>
<tr><th>Phase</th><th>Bund Crest (AOD)</th><th>Bund Length (m)[2]</th></tr>
<tr><td>A</td><td>76m</td><td>770</td></tr>
<tr><td>B</td><td>76m</td><td>760</td></tr>
<tr><td>C</td><td>77m (west), 76m (east)</td><td>780</td></tr>
<tr><td>D</td><td>77m (west), 76m (east)</td><td>570</td></tr>
<tr><td>E</td><td>78m (west), 77m (east)</td><td>900</td></tr>
<tr><td>F</td><td>78m (west), 77m (east)</td><td>560</td></tr>
<tr><td>G</td><td>78m</td><td>620</td></tr>
</table>
</td><td>The back drain will control the maximum groundwater head outside of the Phase bund. Drain invert elevations (AOD, listed below) will vary for each Phase, but the intention is to manage the groundwater head at 1m below the maximum recorded water level for that Phase.
<table>
<tr><th>Phase</th><th>Back Drain IL (mAOD)</th><th>Groundwater Level in the UMH (mAOD)[3]</th></tr>
<tr><td>A</td><td>74m</td><td>75.5 – 74</td></tr>
<tr><td>B</td><td>74.5</td><td>75.5 – 74</td></tr>
<tr><td>C</td><td>76m</td><td>76.8 – 74.5</td></tr>
<tr><td>D</td><td>76m</td><td>76.7 – 75.5</td></tr>
<tr><td>E</td><td>76.5m</td><td>77.6 – 77.0</td></tr>
<tr><td>F</td><td>76.5m</td><td>77.0 – 76.0</td></tr>
<tr><td>G</td><td>76.5m</td><td>77.5 – 76.0</td></tr>
</table>
</td><td>
<table>
<tr><th colspan="3">Back Drain Flow (m³/day and L/sec)[4]</th></tr>
<tr><td>A</td><td>97-193[5]</td><td>1.1-2.2</td></tr>
<tr><td>B</td><td>59-118</td><td>0.7-1.4</td></tr>
<tr><td>C</td><td>64-128</td><td>0.7-1.5</td></tr>
<tr><td>D</td><td>38-75</td><td>0.4-0.9</td></tr>
<tr><td>E</td><td>85-169</td><td>1.0-2.0</td></tr>
<tr><td>F</td><td>28-55</td><td>0.3-0.6</td></tr>
<tr><td>G</td><td>66-133</td><td>0.8-1.5</td></tr>
</table>
</td></tr>
<tr><td>1(d)</td><td>Repeat Tasks 1(a-c) for the remaining perimeter sections of each phase until a continuous clay bund has been constructed around the perimeter of the site.

This scenario corresponds with the final reinstated site condition.</td><td>The perimeter back drains will control UMH groundwater levels during the site restoration stage to a maximum elevation of 76.5mAOD. The reinstatement back drain will be constructed in 2 halves with flow around the north and the south sides of the site to where ground levels will fall below 76.5mAOD. This approximates to the lateral extent of Phase E and G.
It should be recognised that for the period of monitoring UMH groundwater only exceeded 76.5mAOD during the months of January to mid-March in 2014 following an extremely wet winter period. Water levels did not reach this elevation in 2015, which means that the E and G back drains would not have captured groundwater.</td><td>
<table>
<tr><th colspan="3">Back Drain Flow (m³/day and L/sec)[6]</th></tr>
<tr><td>E</td><td>73-147</td><td>0.8-1.7</td></tr>
<tr><td>G</td><td>61-122[7]</td><td>0.7-1.4</td></tr>
<tr><td>E+G</td><td>134-269</td><td>1.6-3.1</td></tr>
</table>
</td></tr>
</table>

[1] Calculated using Tab12. Well Points (UC) in 'Assessing the impacts of dewatering on water resources', Tier 1 Analytical Tools, Version 1.6; Environment Agency
[2] Length excludes the shared internal bund if it is to be removed (See Task 6)
[3] Seasonal high water level (March 2014)
[4] Calculations are based upon highest recorded groundwater level using March 2014 data (worse case). For significant period of the year there will be very little to no flow from the back drain.
[5] Calculated using Tab 8. Trench with Flow One Side (UC) in 'Assessing the impacts of dewatering on water resources', Tier 1 Analytical Tools, Version 1.6; Environment Agency
[6] As footnote 5 above.
[7] As footnote 1 above

<table>
<tr><th>Objective</th><th>Task</th><th>Description</th><th>Mineral Management</th><th>Water Management Control Process</th><th colspan="4">Water Volume</th></tr>
<tr><td rowspan="3">Excavate Overburden and UMH for storage, blending and processing.</td><td rowspan="3">2</td><td rowspan="3">Overburden and UMH within the bunded area of each phase will be excavated down to the Interburden surface in areas equivalent to an annual operating period</td><td rowspan="3"></td><td rowspan="3">Reduce and maintain groundwater levels in the UMH inside the Phase using ditches, and sump pumps to control water levels.

Maintenance pumping will also be required to capture and discharge flow generated by precipitation.

Each Phase will be dewatered at a sustainable rate equal to recharge plus the volume held in storage. Discharge rates will be managed according to the available recharge lagoon infiltration capacity, supplemented by recharge into the LMH aquifer within the confines of each phase as its worked.</td><td>Phase</td><td>Water in Storage (m^3/day)</td><td>Precipitation Recharge (m^3/day)</td><td>Combined Discharge Requirement (m^3/day)</td></tr>
<tr><td>A
B
C
D
E
F
G</td><td>51
53
45
50
63
63
69</td><td>73
83
66
91
82
82
79</td><td>125
136
111
141
145
146
147</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td rowspan="2">Preparation for extraction of LMH mineral beneath the interburden.

It is advantageous if the interburden can be removed without a positive upward pressure from groundwater below.</td><td>3a</td><td>For site phases where the LMH groundwater levels are below the base of the Interburden for a significant seasonal period (unconfined aquifer conditions), then the interburden will be excavated from suitably sized working ‘cells’ with an approximate dimension of 75m x 75m.</td><td rowspan="2">Cohesive material from the interburden will be stockpiled for future bund construction, backfilling of the LMH excavation, or will be placed directly into previously excavated LMH ‘cells’.</td><td>Monitoring of groundwater levels indicates that no active groundwater pumping will be required from the LMH for Phase A and B (and possibly C, D and F, depending on seasonal conditions). This conclusion is drawn from Drawings B through K that illustrates geological cross sections for each Phase with the maximum and minimum seasonal water levels in both the UMH and the LMH aquifers). The maximum and minimum water levels are based upon the groundwater hydrographs in Appendix 6/3 of the Environmental Statement.</td><td colspan="4">No water generating activities required</td></tr>
<tr><td>3b</td><td>For site phases where the LMH groundwater levels are above the base of the Interburden for a significant seasonal period (confined aquifer conditions), then the interburden will be excavated from suitably sized working ‘cells’.</td><td>Monitoring of groundwater levels indicates that active groundwater pumping will be required from the LMH aquifer during extraction of the interburden in Phase E and G (Phase c, D and F may or may not require active lowering of the water table – this will be determined at the time of working). For these 2 phases the working ‘cells’ will be reduced to a size of approximately 30m x 100m (3,000m^2)to limit the volume of water being pumped and recharged into the LMH Recharge Lagoon. Once the interburden has been removed from each ‘cell’ then pumping will be stopped and LMH aquifer water levels will be allowed to recover and re-equilibrate.
The volume calculations are sensitive to a number of assumptions, e.g., permeability and hydraulic connection with the Chalk being important.</td><td colspan="2">Phase</td><td colspan="2">Pumping rate to lower water level to the base of the interburden[8]</td></tr>
<tr><td colspan="4"></td><td colspan="2">A
B
C
D
E
F
G</td><td colspan="2">Not required
Not required
155 – 310
215 – 431
278 – 558
472 – 945
405 – 811</td></tr>
<tr><td>Extraction of LMH mineral.</td><td>4</td><td>‘Wet excavation’ of the LMH will occur once the interburden has been removed from the working ‘cell’.</td><td>LMH mineral will be excavated ‘wet’ from the working ‘cell’ for stockpiling and processing using long reach excavators</td><td>No active groundwater management is anticipated during the LMH mineral extraction operation.</td><td colspan="4">No water generating activities required</td></tr>
</table>

[8] Calculated using Tab 1. Thiem (C) in ‘Assessing the impacts of dewatering on water resources’, Tier 1 Analytical Tools, Version 1.6; Environment Agency

Objective	Task	Description	Mineral Management	Water Management Control Process	Water Volume	
Recharge into UMH aquifer	5a	Water generated by the following tasks will be discharged to the UMH recharge lagoon: • Task 1 (b) Dewatering UMH during placement of perimeter bunds • Task 1 (c) Back drain discharge once UMH perimeter bunds are in place • Task 2 Maintenance water management (storage in UMH and precipitation) during all excavations	None required associated with this stage. Care will be taken to ensure both lagoons do not accumulate silt with the potential for decreasing infiltration rates	Lagoon recharge capacity is controlled by the physical properties of the aquifer, as well as with season due to changes in the water level at the time of discharge. A range of potential recharge values have been calculated using the Theim equation and the following assumptions: K = 4m to 8m/d (from piezometer test data) Ro = 200m, acting as a locally confined aquifer by the overburden Minimum head change in lagoon 2m (winter conditions) Maximum head change in lagoon 2.7m (summer conditions)	K = 4m/d 160 – 289m^3/day	K = 8m/d 322 – 579m^3/day
Recharge into LMH aquifer	5b	Water generated by the following task will be discharged to the LMH recharge lagoon. • Task 3 (b) Lowering of the piezometric surface of the LMH aquifer to the base of the interburden • Tasks 1(b), (c), 2, if required		The Theim equation has also been used to calculate the recharge capacity for the LMH lagoon with the following assumptions: K = 10m to 20m/d (from piezometer tests) Ro = 1000m Maximum available head change in the LMH lagoon is 6m	K = 10m/d 1,158m^3/day	K = 20m/d 2,316m^3/day
Removal of internal bund walls in neighbouring Phases.	6	Internal bund walls will be removed during construction of neighbouring phases that share a bund. Clay material won from the bund will be reused for subsequent bund preparation works.	Mineral will be excavated beneath the former bund for processing	Once the internal perimeter bund has been removed there may be groundwater seepage from the adjacent reinstated UMH in the adjacent phase.	Negligible quantity assumed	
Final Restoration	7	Perimeter bund drainage	None	The perimeter drain for Phase E and G will remain in place during the restoration stage and discharge into the interior of the restored site within shallow swales and hedgerow boundary ditches that will eventually discharge into the combined UMH recharge lagoon (see Task 8 below). Following a period of water level review, the perimeter drain around Phase A, B, C (part of), D and F will be removed.	136m^3/d – 269m3/d[9]	
Combined Lagoons	8	Create a pathway for surface water (comprising a) Rainfall runoff b) Groundwater fed runoff (Phase E and G) All to be recharged into the UMH and LMH lagoons (combined as a single UMH lagoon).	None	The LMH lagoon will be reinstated to the upper surface of the interburden. The bund between the the UMH and LMH lagoon will be removed so forming a single UMH lagoon. a) RW runoff for the reinstated site will be at the greenfield rate b) The Phase E & G drain will be set at 76.5mAOD and is designed to capture rising groundwater, if any c) Combined lagoon recharge capacity	The combined flow to the infiltration lagoon will comprise:	
					a) RW runoff b) E & G GW runoff	36 – 41,000m^3 134 – 269m^3/day
					Combined lagoon recharge capacity	
					K = 4m/d 370 – 666m^3/day	K = 8m/d 740 – 1,333m^3/day
				The combined lagoon will have a storage capacity equal to its area X the available rise in water head from the static water level up to the spill point at 75.5mAOD The static water level recorded at the lagoon area ranges seasonally from 72.8m to 74mAOD so a rise in available head of 2.7m to 1.5m.	167,000m^3 to 93,000m^3	

[9] Refer back to task 1(d)

Assumptions and Example Calculations

Task 1b Install well points to dewater UMH along the alignment of the perimeter bund for each phase.

Water volumes have been estimated using the analytical tool 'Assessing the impacts of dewatering on water resources', Tier 1 Analytical Tools, Version 1.6; Environment Agency, specifically Tab 12 solution Well Points (UC).

An example of the output is provided in the spreadsheet image below. Significant assumptions are:

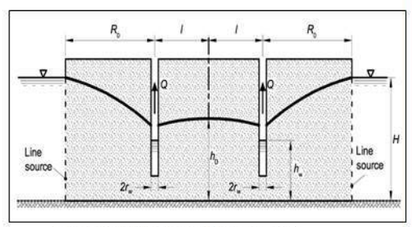
- Aquifer thickness is a maximum for each phase
- Hydraulic conductivity (K) = 4m/d and 8m/d
- Ro = 200m
- Drawdown requirements vary according to average aquifer thickness in each phase
- Length of trench= 65m along which dewatering is undertaken.

12) Partial penetration by a double row of wellpoints of an unconfined aquifer midway between two equidistant and parallel line sources

$$Q=\left[\left(0.73+0.27\frac{(H-h_w)}{H}\right)\frac{Kx}{R_0}(H^2-h_w^2)\right]$$

Essential input
Optional input
Calculated

		expected		min	max	
Head						
Height of water table at radius of influence	H	7.5	m	6	6	m
Height of water table at well	h_w	0.3	m	0.3	0.3	m
Conductivity						
Hydraulic conductivity of aquifer	K	4	m/d	10	10	m/d
Length of trench	x	65	m	65	65	m
Distance to line source, equal to radius of influence	R_0	200	m	100	400	m
Total discharge from wellpoints	Q	72.22	m^3/d	23.03	361.10	m^3/d
Height of WT at centre of dewatered area	$h_D=h\left[\frac{C_1C_2}{R_0}(H-h)+1\right]$					
Distance to centre of dewatered area	l	10	m			
	l/h	33.3333				
Coefficient 1	C_1	1.01				
Radius of each well	r_w	0.05	m			
	r_w/H	0.00667				
Coefficient 2	C_2	1.37				
Height of WT at centre of dewatered area	h_D	0.31	m			



(Figures adapted from Mansur & Kaufman, 1962)

The following assumptions apply to this equation
- the slot is infinite in length
- R_0/H greater than or equal to 3
- the aquifer is unconfined
- the aquifer is homogeneous, isotropic and of uniform thickness
- the Dupuit Forcheimer assumption is valid
- the aquifer has reached steady state conditions
- the initial water table is horizontal

(Mansur & Kaufman, 1962)

Task 1c Calculation of Back Drain Flow for each Phase

Water volumes have been estimated using the analytical tool 'Assessing the impacts of dewatering on water resources', Tier 1 Analytical Tools, Version 1.6; Environment Agency, specifically Tab 8 Trench with Flow One Side (UC).

An example of the output is provided in the spreadsheet image below. Significant assumptions are:

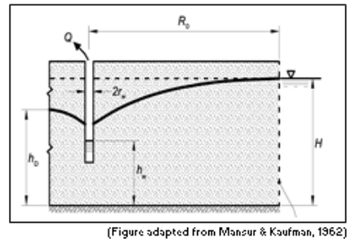
- Aquifer thickness is a maximum for each phase
- Drawdown is between 0.5m and 1.5m and varies for each phase
- Hydraulic conductivity (K) = 4m/d and 8m/d
- Ro = 200m
- The length of the active perimeter for each phase is different and varies between 570m and 900m in length along which a flow is generated. The example below is for Phase A.

8) Partial penetration by a single row of wellpoints of an unconfined aquifer fed from a single line source

$$Q=\left[\left(0.73+0.27\frac{(H-h_l)}{H}\right)\frac{Kx}{2R_0}(H^2-h_w^2)\right]$$

Essential input
Optional input
Calculated

		expected		min	max	
Head						
Height of water table at radius of influence	H	6	m	48	52	m
Height of water table at well	h_w	4.5	m	43	47	m
Conductivity						
Hydraulic conductivity of aquifer	K	4	m/d			m/d
Radius						
Length of trench	x	770	m			
Radius of influence	R_0	200	m	250	400	m
Is R_0/H greater than or equal to 3 ?		Yes		Yes	Yes	
Total discharge from wellpoints	Q	96.72	m^3/d	#######	#######	m^3/d
Height of WT downstream of slot	$h_D=h_w\left[\frac{1.48}{R_0}(H-h_w)+1\right]$					
Height of WT downstream of slot	h_D	4.55	m			



(Figure adapted from Mansur & Kaufman, 1962)

The following assumptions apply to this equation
- the slot is infinite in length
- R_0/H greater than or equal to 3
- the aquifer is unconfined
- the aquifer is homogeneous, isotropic and of uniform thickness
- the Dupuit Forcheimer assumption is valid
- the aquifer has reached steady state conditions
- the initial water table is horizontal

(Mansur & Kaufman, 1962)

Task 1d **Final Restoration Phase – Back Drain Flow**

It is proposed that an active back drain will remain upon completion of all mineral excavation works. The intention is to maintain a maximum UMH groundwater head below that recorded on site during the maximum water level recorded on site in March 2014.

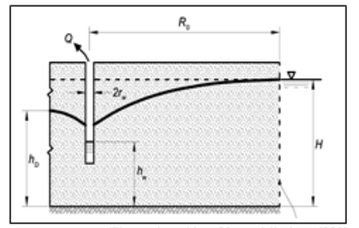
The invert elevation of the back drain will be set at 67.5mAOD and will surround the perimeter to a point where ground surface levels are also at 67.5mAOD. At this location the drain will 'daylight' at the surface and a flow will discharge to the interior of the restored site. Flow will occur approximately between January and March although whether a flow occurs will be dictated by groundwater levels in the aquifer which are controlled by seasonal rainfall events. Flow has been calculated using the same formula illustrated in Task 1c as shown below for the location of the back drain around Phase G.

8) Partial penetration by a single row of wellpoints of an unconfined aquifer fed from a single line source

$$Q=\left[\left(0.73+0.27\frac{(H-h_u)}{H}\right)\frac{Kx}{2R_0}(H^2-h_u^2)\right]$$

Essential input
Optional input
Calculated

			expected		min	max	
Head							
Height of water table at radius of influence	H	7.5	m		48	52	m
Height of water table at well	h_u	6.5	m		43	47	m
Conductivity							
Hydraulic conductivity of aquifer	K	4	m/d				m/d
Radius							
Length of trench	x	570	m				
Radius of influence	R_0	200	m		250	400	m
Is R_0/H greater than or equal to 3 ?		Yes			Yes	Yes	
Total discharge from wellpoints	**Q**	61.13	m^3/d		######	######	m^3/d



(Figure adopted from Mansur & Kaufman, 1962)

Height of WT downstream of slot

$$h_D=h_w\left[\frac{1.48}{R_0}(H-h_w)+1\right]$$

Height of WT downstream of slot h_D 6.5481 m

The following assumptions apply to this equation
- the slot is infinite in length
- R_0/H greater than or equal to 3
- the aquifer is unconfined
- the aquifer is homogeneous, isotropic and of uniform thickness
- the Dupuit Forcheimer assumption is valid
- the aquifer has reached steady state conditions
- the initial water table is horizontal

(Mansur & Kaufman, 1962)

Task 2 **Operational discharge estimates to dewater the UMH once the perimeter drain is installed plus an estimate of rainfall recharge**

Once the perimeter bund of each phase is constructed there will be a requirement to dewater the UMH within the phase. Each phase is approximately 4 years of operation so the total volume of water to be removed prior to mineral excavation will be the volume of water held in storage at the time of perimeter bund completion plus recharge. The table below presents the calculations:

- Precipitation (PPT) – 662mm/year

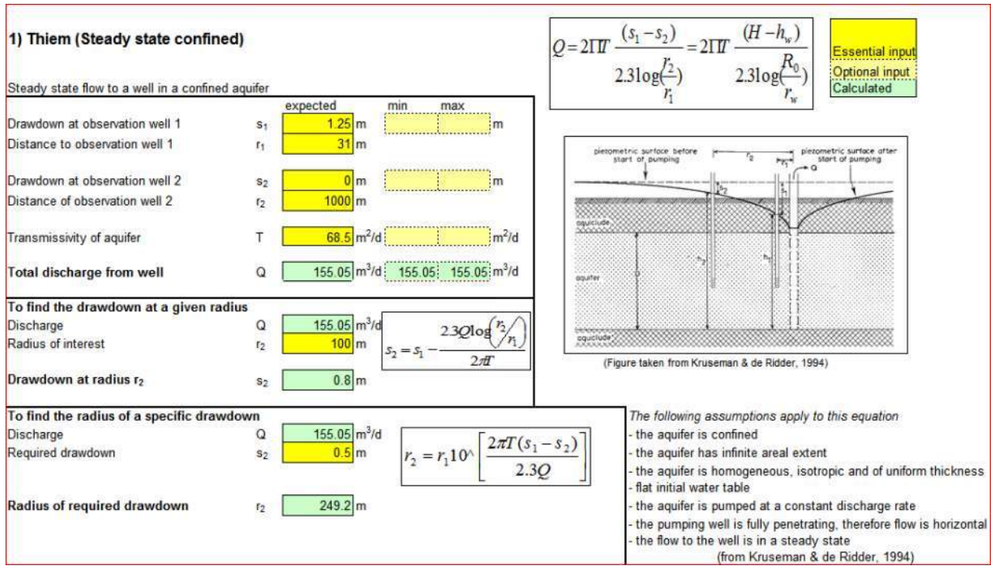
Phase Area		Groundwater in Storage					Recharge		Combined Flow to Discharge per day (Storage + Recharge) (m^3)
Phase	Area (m^2)	Saturated Thickness (m)	Porosity	Water Volume in Storage (m^3)	Annual Water Volume in Storage (m^3)	Daily Water Volume (m^3)	Ave Annual PPT (m^3)	Ave Daily PPT	
A	62274	6	0.2	74729	18682	51	26797	73	125
B	70505	5.5	0.2	77556	19389	53	30338	83	136
C	56335	5.8	0.2	65349	16337	45	24241	66	111
D	77532	4.7	0.2	72880	18220	50	33362	91	141
E	69380	6.6	0.2	91582	22895	63	29854	82	145
F	69239	6.8	0.2	94165	23541	64	29794	82	146
G	66805	7.5	0.2	100208	25052	69	28746	79	147

Note: Average annual PPT is calculated using an assumption that 65% of PPT is recharged.

Task 3b Lower Mineral Horizon (LMH) Groundwater Lowering

The example calculation illustrates the volume of water discharge generated to lower the confined aquifer water level to the base of the interburden. The need for pumping at all, and the amount of pumping required will vary according to the water level in the aquifer and the aquifers physical parameters. Water volumes have been estimated using the analytical tool 'Assessing the impacts of dewatering on water resources', Tier 1 Analytical Tools, Version 1.6; Environment Agency, specifically Tab 1 Theim (Steady State Confined). The important assumptions used in this calculation are that:

- The aquifer is assumed to be the LMH and not the Chalk + LMH (the chalk surface is characterised as a putty chalk with a relatively low hydraulic conductivity)
- Hydraulic conductivity (K) of the LMH has been assumed to be in the range of 10m/day and 20m/day
- The cell to be dewatered is equivalent to an area of 3,000m^2 (a circle with a radius of 31m)



(Figure taken from Kruseman & de Ridder, 1994)

Phase	Water Elev (high) = H	Top of Chalk (ave)	Base of Interburden (Ave) = h	Mineral Thickness	Sat Thickness	Required head change	K	T	r	Q (m3/d)
C	70	61.9	68.75	6.85	8.1	1.25	10	68.5	31	155
D	69	60.3	67.3	7	8.7	1.7	10	70	31	215
E	71.5	61.8	69.5	7.7	9.7	2	10	77	31	278
F	71	60.2	67.35	7.15	10.8	3.65	10	71.5	31	472
G	71	61.1	67.5	6.4	9.9	3.5	10	64	31	405

Phase	Water Elev (high) = H	Top of Chalk (ave)	Base of Interburden (Ave) = h	Mineral Thickness	Sat Thickness	Required head change	K	T	r	Q (m3/d)
C	70	61.9	68.75	6.85	8.1	1.25	20	137	31	310
D	69	60.3	67.3	7	8.7	1.7	20	140	31	431
E	71.5	61.8	69.5	7.7	9.7	2	20	154	31	558
F	71	60.2	67.35	7.15	10.8	3.65	20	143	31	945
G	71	61.1	67.5	6.4	9.9	3.5	20	128	31	811

Task 5a **Recharge into UMH Lagoon**

The Thiem equation has been used to calculate recharge for the UMH lagoon. The assumptions used in this calculation include:

- Transmissivity of the aquifer is K(hydraulic conductivity) x b (thickness) where b is take as the mineral thickness (3.5m) excluding overburden
- 2 values for K have been used, 4m/d and 8m/d
- Area of the LMH lagoon is 24,361m^2, equivalent to a circle with the radius of 88m
- Available +ve head change in the lagoon will be set by the bund height (elevation of 76mAOD) and spill point elevation (75.5mAOD) which will range between +2m and +2.7m above the static water level
- Ro = 200m

1) Thiem (Steady state confined)

$$Q = 2\pi T \frac{(s_1 - s_2)}{2.3\log(\frac{r_2}{r_1})} = 2\pi T \frac{(H - h_w)}{2.3\log(\frac{R_0}{r_w})}$$

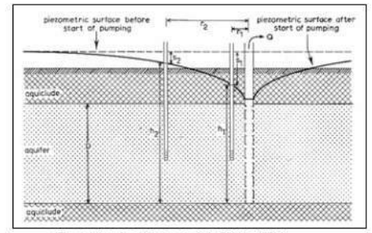
Essential input / Optional input / Calculated

Steady state flow to a well in a confined aquifer

		expected		min	max	
Drawdown at observation well 1	s_1	2.7	m			m
Distance to observation well 1	r_1	88	m			
Drawdown at observation well 2	s_2	0	m	0.2	0.8	m
Distance of observation well 2	r_2	200	m			
Transmissivity of aquifer	T	28	m^2/d			m^2/d
Total discharge from well	Q	579.24	m^3/d	407.61	579.24	m^3/d
To find the drawdown at a given radius						
Discharge	Q	579.24	m^3/d			
Radius of interest	r_2	100	m			
Drawdown at radius r_2	s_2	2.3	m			

$$s_2 = s_1 - \frac{2.3Q\log(r_2/r_1)}{2\pi T}$$

To find the radius of a specific drawdown				
Discharge	Q	579.24	m^3/d	
Required drawdown	s_2	1	m	$r_2 = r_1 10^{\wedge}\left[\frac{2\pi T(s_1 - s_2)}{2.3Q}\right]$
Radius of required drawdown	r_2	147.6	m	



(Figure taken from Kruseman & de Ridder, 1994)

The following assumptions apply to this equation
- the aquifer is confined
- the aquifer has infinite areal extent
- the aquifer is homogeneous, isotropic and of uniform thickness
- flat initial water table
- the aquifer is pumped at a constant discharge rate
- the pumping well is fully penetrating, therefore flow is horizontal
- the flow to the well is in a steady state

(from Kruseman & de Ridder, 1994)

Task 5b **Recharge into LMH Lagoon**

The Thiem equation has been used to calculate recharge for the LMH lagoon. The assumptions used in this calculation include:

- Transmissivity of the aquifer is K(hydraulic conductivity) x b (thickness) where b is take as the mineral thickness (6.8m)
- 2 values for K have been used, 10m/day and 20m/day
- Area of the LMH lagoon is 37,594m^2, equivalent to a circle with the radius of 109m
- Available +ve head change in the lagoon will be set by the bund height (elevation of 76mAOD) which will be approximately +6m above the LMH static water level
- Ro = 1000m

1) Thiem (Steady state confined)

$$Q = 2\pi T \frac{(s_1 - s_2)}{2.3\log(\frac{r_2}{r_1})} = 2\pi T \frac{(H - h_w)}{2.3\log(\frac{R_0}{r_w})}$$

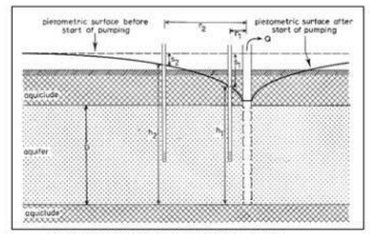
Essential input / Optional input / Calculated

Steady state flow to a well in a confined aquifer

		expected		min	max	
Drawdown at observation well 1	s_1	-6	m			m
Distance to observation well 1	r_1	109	m			
Drawdown at observation well 2	s_2	0	m			m
Distance of observation well 2	r_2	1000	m			
Transmissivity of aquifer	T	136	m^2/d			m^2/d
Total discharge from well	Q	-2315.84	m^3/d	-2315.84	#######	m^3/d
To find the drawdown at a given radius						
Discharge	Q	-2315.84	m^3/d			
Radius of interest	r_2	209	m			
Drawdown at radius r_2	s_2	-4.2	m			

$$s_2 = s_1 - \frac{2.3Q\log(r_2/r_1)}{2\pi T}$$

To find the radius of a specific drawdown				
Discharge	Q	-2315.84	m^3/d	
Required drawdown	s_2	-3.2	m	$r_2 = r_1 10^{\wedge}\left[\frac{2\pi T(s_1 - s_2)}{2.3Q}\right]$
Radius of required drawdown	r_2	306.6	m	



(Figure taken from Kruseman & de Ridder, 1994)

The following assumptions apply to this equation
- the aquifer is confined
- the aquifer has infinite areal extent
- the aquifer is homogeneous, isotropic and of uniform thickness
- flat initial water table
- the aquifer is pumped at a constant discharge rate
- the pumping well is fully penetrating, therefore flow is horizontal
- the flow to the well is in a steady state

(from Kruseman & de Ridder, 1994)

Task 7 **Restoration Phase, Back Drain Flow (see Task 1d)**

Task 8e Restoration Phase – Combined Lagoon Discharge Capacity

The Thiem equation has been used to calculate recharge for the combined UMH and LMH lagoon areas. The assumptions used in this calculation include:

- Transmissivity of the aquifer is K(hydraulic conductivity) x b (thickness) where b is take as the mineral thickness (3.5m) excluding overburden
- 2 values for K have been used, 4m/day and 8m/day
- Area of the LMH lagoon is 61,955m^2 (24,361+37,594) equivalent to a circle with the radius of 140m
- Available +ve head change in the lagoon will be set by the bund height (elevation of 76mAOD) and spill point elevation (75.5mAOD) which will range between +2m and +2.7m above the static water level
- Ro = 200m

1) Thiem (Steady state confined)

$$Q = 2\pi T \frac{(s_1 - s_2)}{2.3\log(\frac{r_2}{r_1})} = 2\pi T \frac{(H - h_w)}{2.3\log(\frac{R_0}{r_w})}$$

Essential input
Optional input
Calculated

Steady state flow to a well in a confined aquifer

		expected	min	max	
Drawdown at observation well 1	s_1	2.7 m			m
Distance to observation well 1	r_1	140 m			
Drawdown at observation well 2	s_2	0 m	0.2	0.8	m
Distance of observation well 2	r_2	200 m			
Transmissivity of aquifer	T	28 m^2/d			m^2/d
Total discharge from well	Q	1333.27 m^3/d	938.22	1333.27	m^3/d

To find the drawdown at a given radius

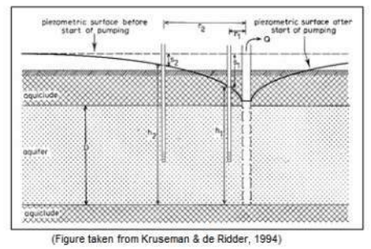
Discharge	Q	1333.27 m^3/d
Radius of interest	r_2	100 m
Drawdown at radius r_2	s_2	5.2 m

$$s_2 = s_1 - \frac{2.3Q\log(r_2/r_1)}{2\pi T}$$

To find the radius of a specific drawdown

Discharge	Q	1333.27 m^3/d
Required drawdown	s_2	1 m
Radius of required drawdown	r_2	175.3 m

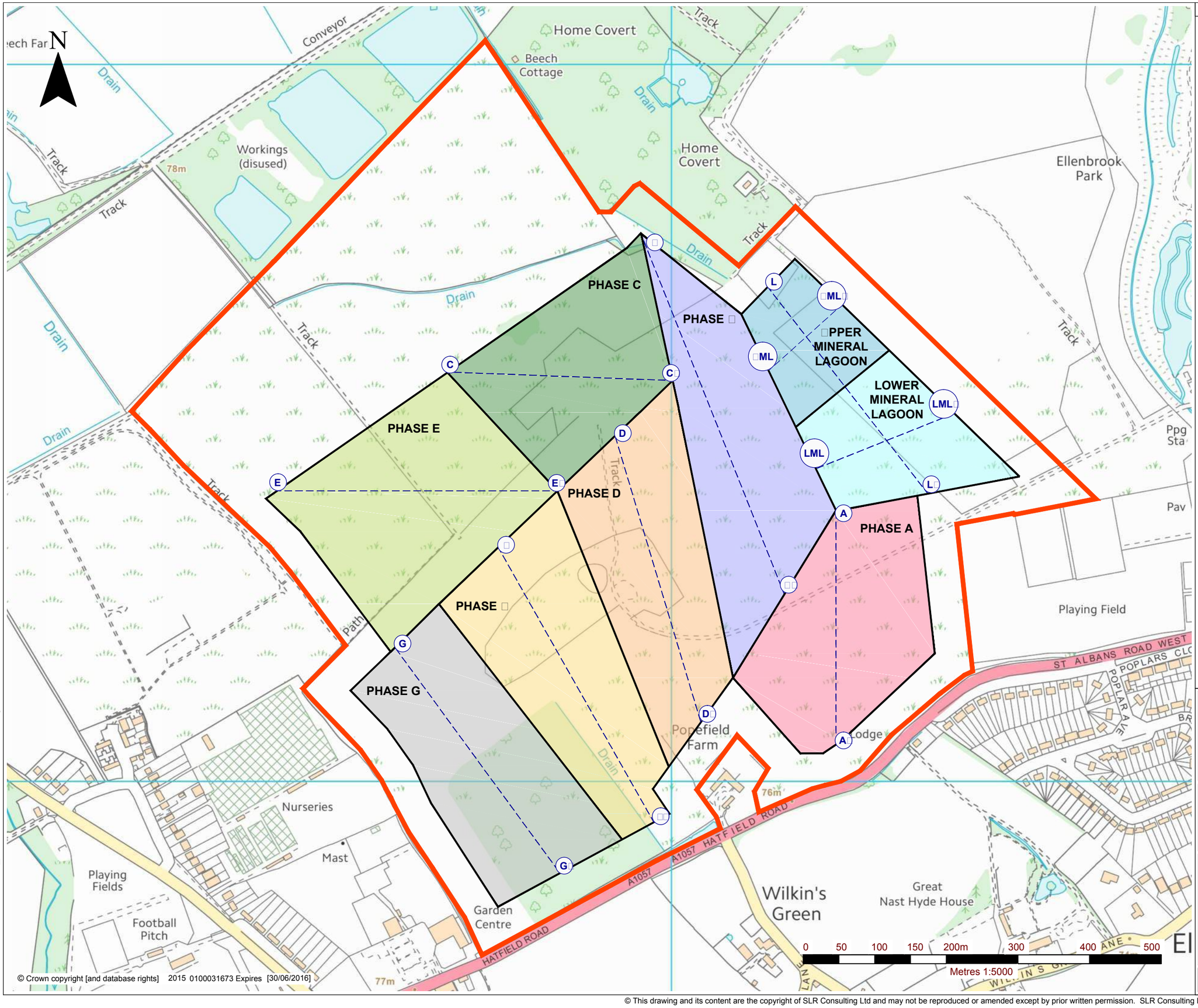
$$r_2 = r_1 10^{\wedge}\left[\frac{2\pi T(s_1 - s_2)}{2.3Q}\right]$$



(Figure taken from Kruseman & de Ridder, 1994)

The following assumptions apply to this equation
- the aquifer is confined
- the aquifer has infinite areal extent
- the aquifer is homogeneous, isotropic and of uniform thickness
- flat initial water table
- the aquifer is pumped at a constant discharge rate
- the pumping well is fully penetrating, therefore flow is horizontal
- the flow to the well is in a steady state

(from Kruseman & de Ridder, 1994)



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LEGEND

- SITE BOUNDARY
- PHASE BOUNDARY
- SECTION LINE

PHASES

- PHASE A
- PHASE B
- PHASE C
- PHASE D
- PHASE E
- PHASE F
- PHASE G
- PHASE UPPER MINERAL LAGOON
- PHASE LOWER MINERAL LAGOON

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PHASING PLAN AND LINES O□ SECTION

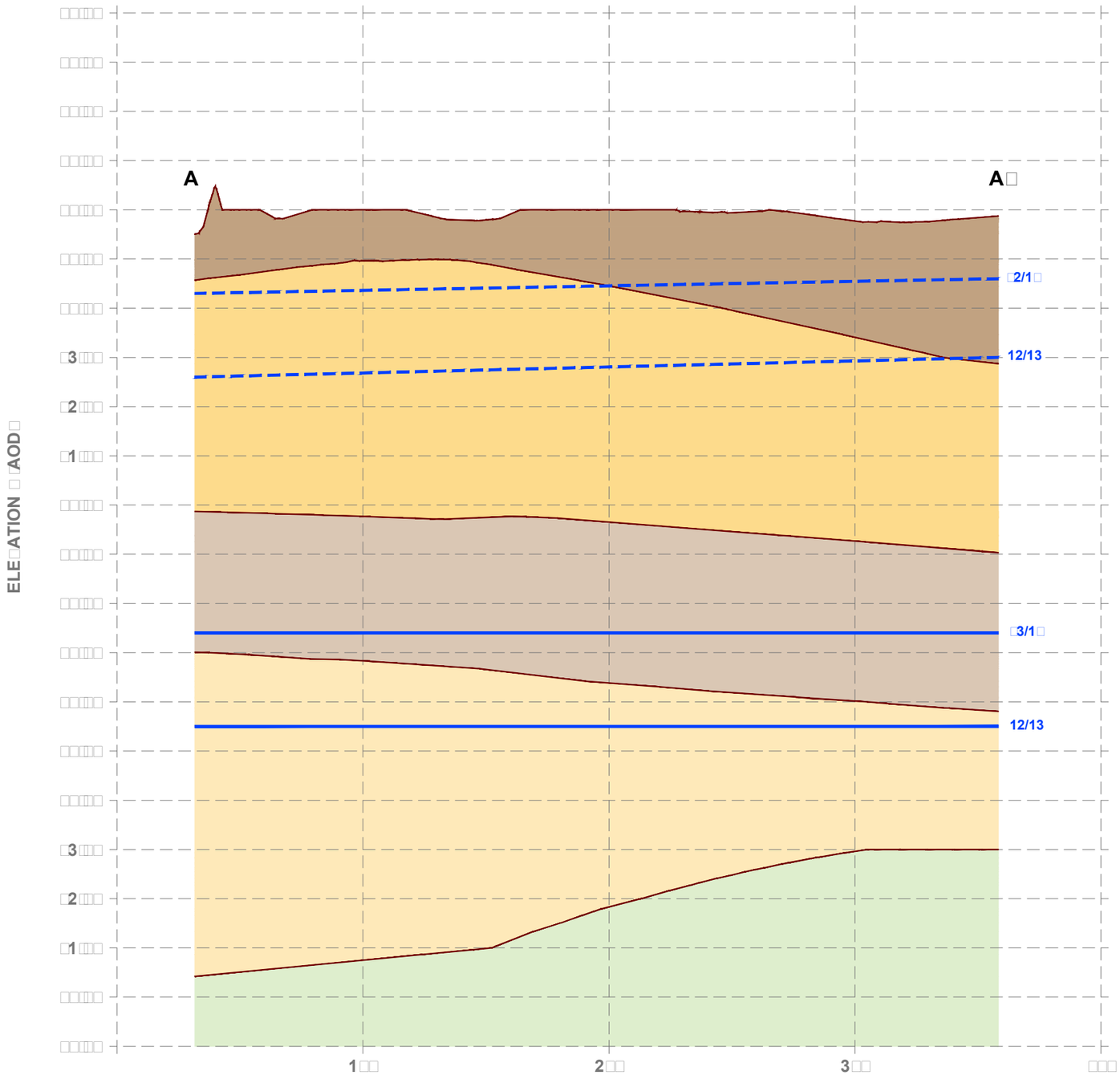
DRAWING A

Scale	Date
1:5000 @ A3	NOVEMBER 2015

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PHASE A
SECTION A □A□



□ERTICAL SCALE 1□1□□□HORI□ONTAL SCALE 1□2□□□

LEGEND

- UMA PIEZOMETRIC SURFACE
- LMA PIEZOMETRIC SURFACE
- OVERBURDEN
- UM HORIZON
- INTERBURDEN
- LM HORIZON
- CHALK

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ENVIRONMENTAL STATEMENT

SECTION A □A□

DRAWING □

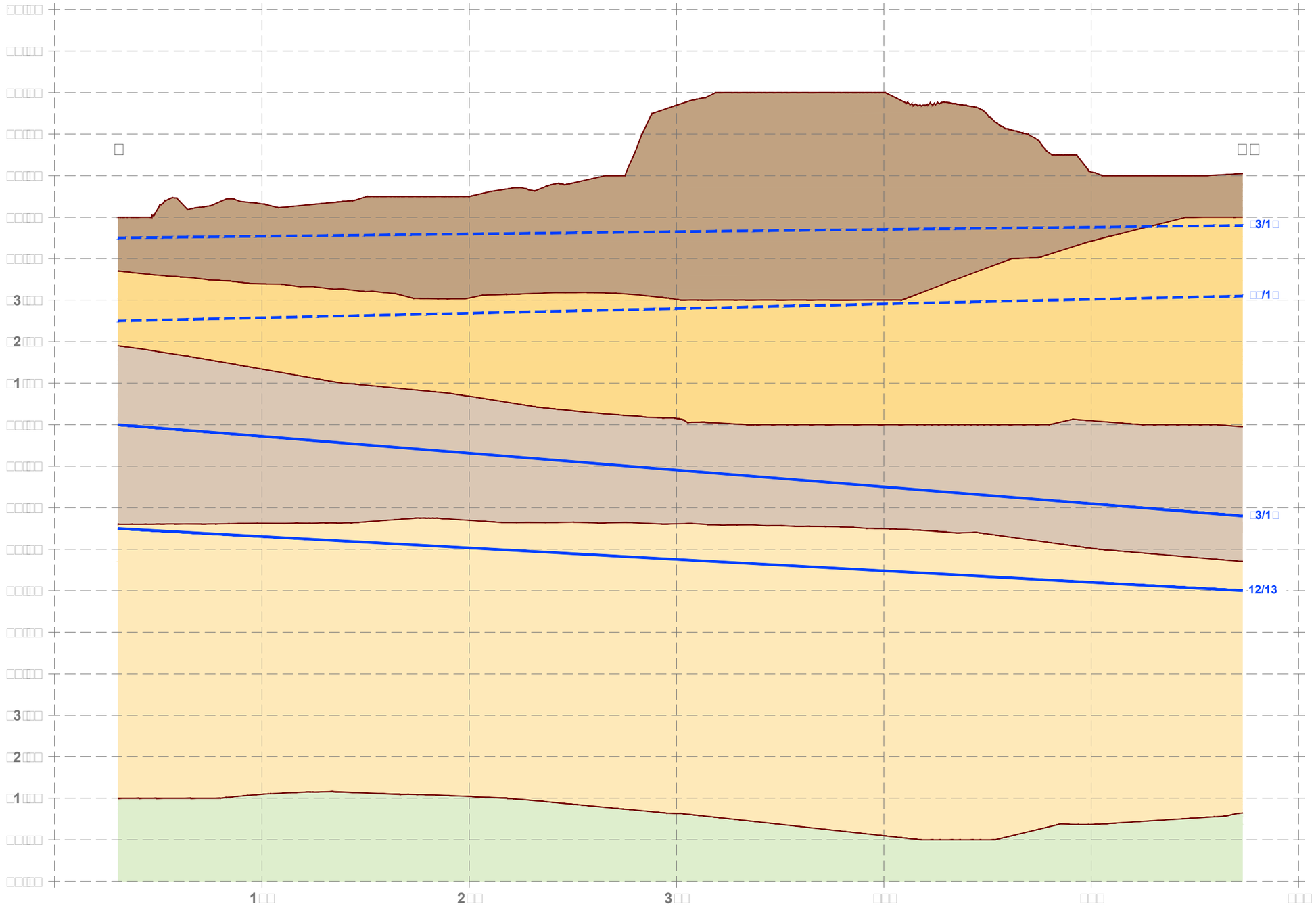
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Date: NOVEMBER 2015

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PHASE □
SECTION □ □□□



□ERTICAL SCALE 1□1□□□HORI□ONTAL SCALE 1□2□□□

LEGEND

- UMA PIEZOMETRIC SURFACE
- LMA PIEZOMETRIC SURFACE
- OVERBURDEN
- UM HORIZON
- INTERBURDEN
- LM HORIZON
- CHALK

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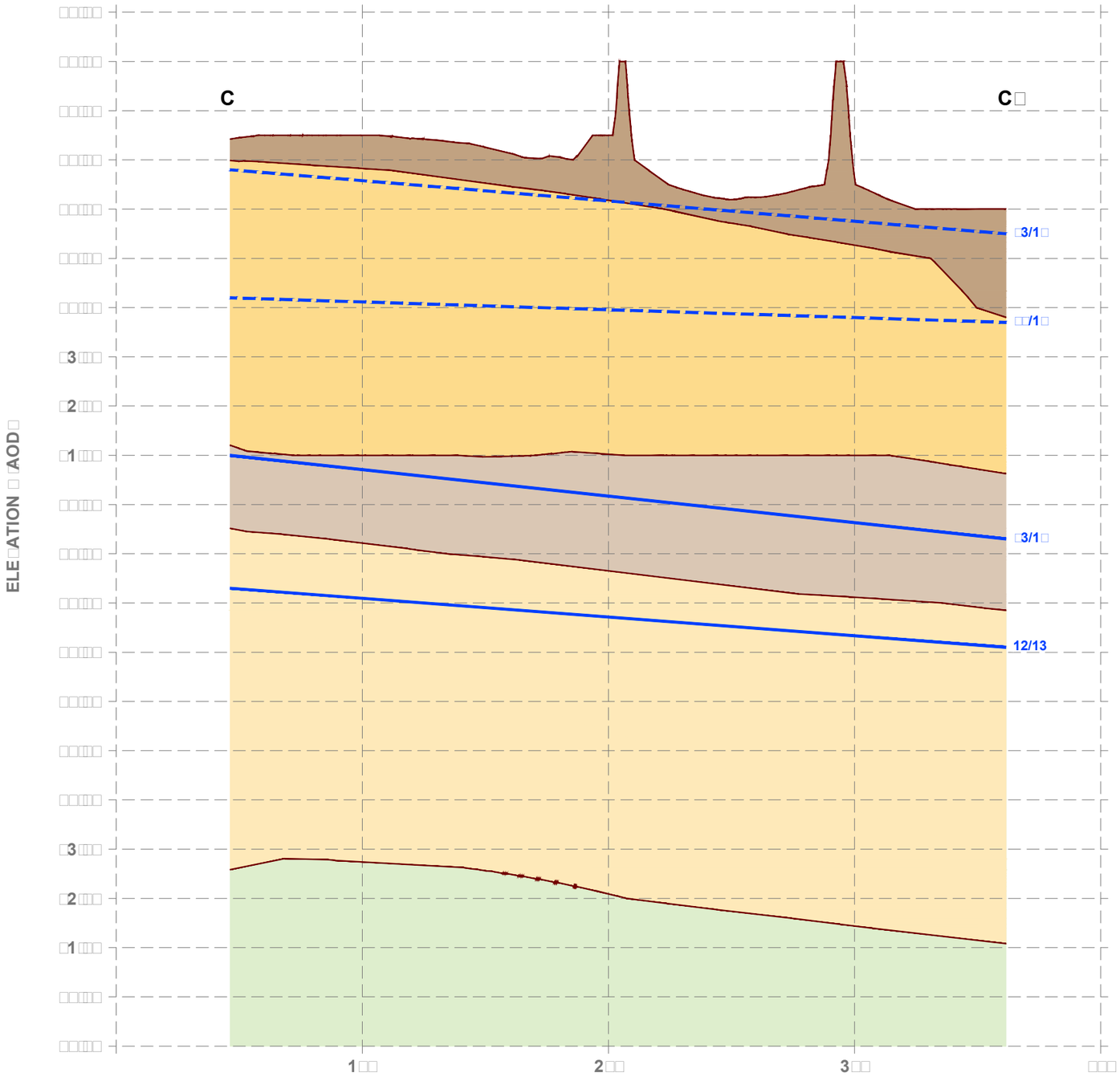
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PHASE C
SECTION C □C□



□ERTICAL SCALE 1□1□□□HORI□ONTAL SCALE 1□2□□□

LEGEND

- UMA PIEZOMETRIC SURFACE
- LMA PIEZOMETRIC SURFACE
- OVERBURDEN
- UM HORIZON
- INTERBURDEN
- LM HORIZON
- CHALK

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ENVIRONMENTAL STATEMENT

SECTION C □C□

DRAWING D

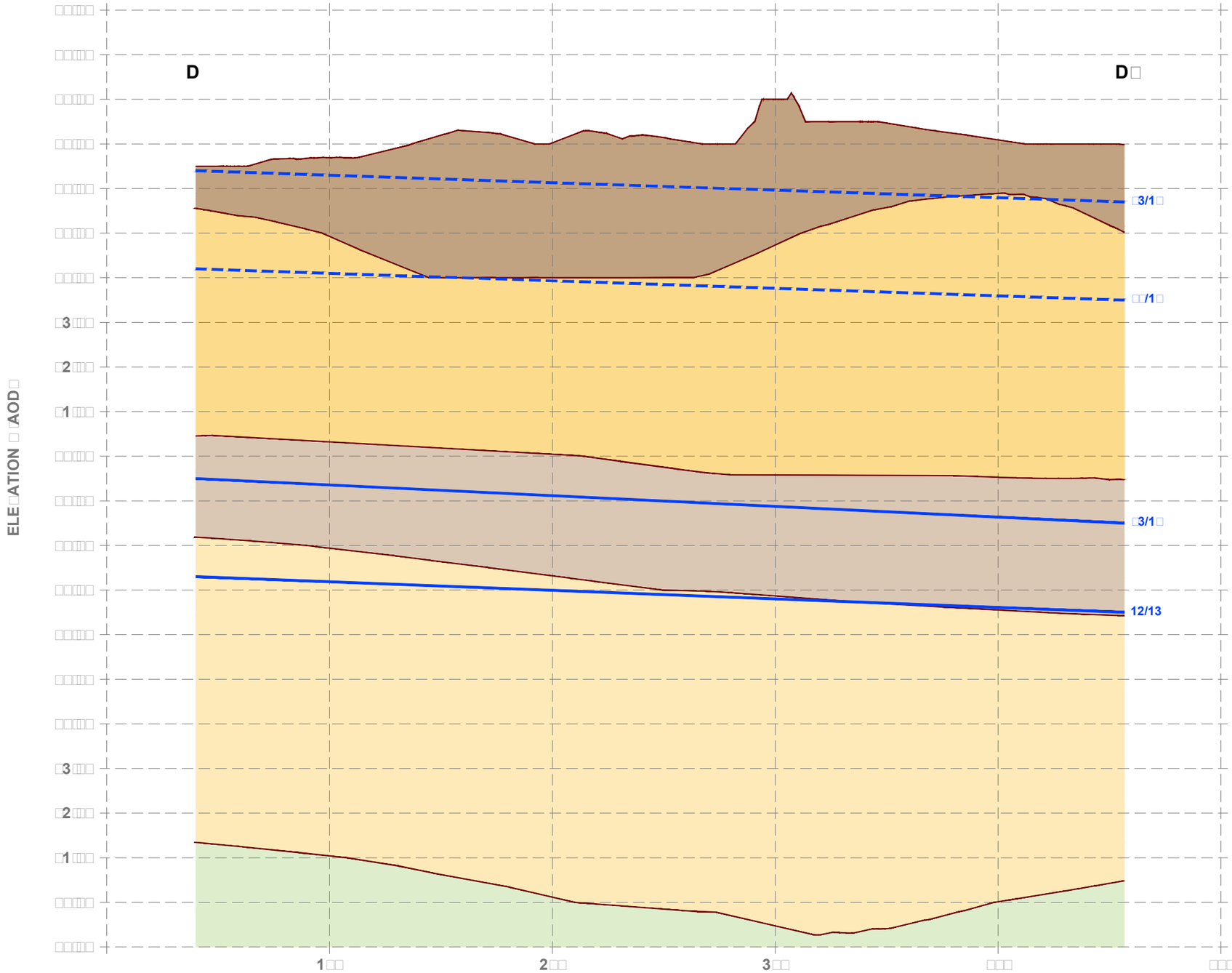
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Date: NOVEMBER 2015

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PHASE D
SECTION D □D□



□ERTICAL SCALE 1□1□□□HORI□ONTAL SCALE 1□2□□□

LEGEND

- UMA PIEZOMETRIC SURFACE
- LMA PIEZOMETRIC SURFACE
- OVERBURDEN
- UM HORIZON
- INTERBURDEN
- LM HORIZON
- CHALK

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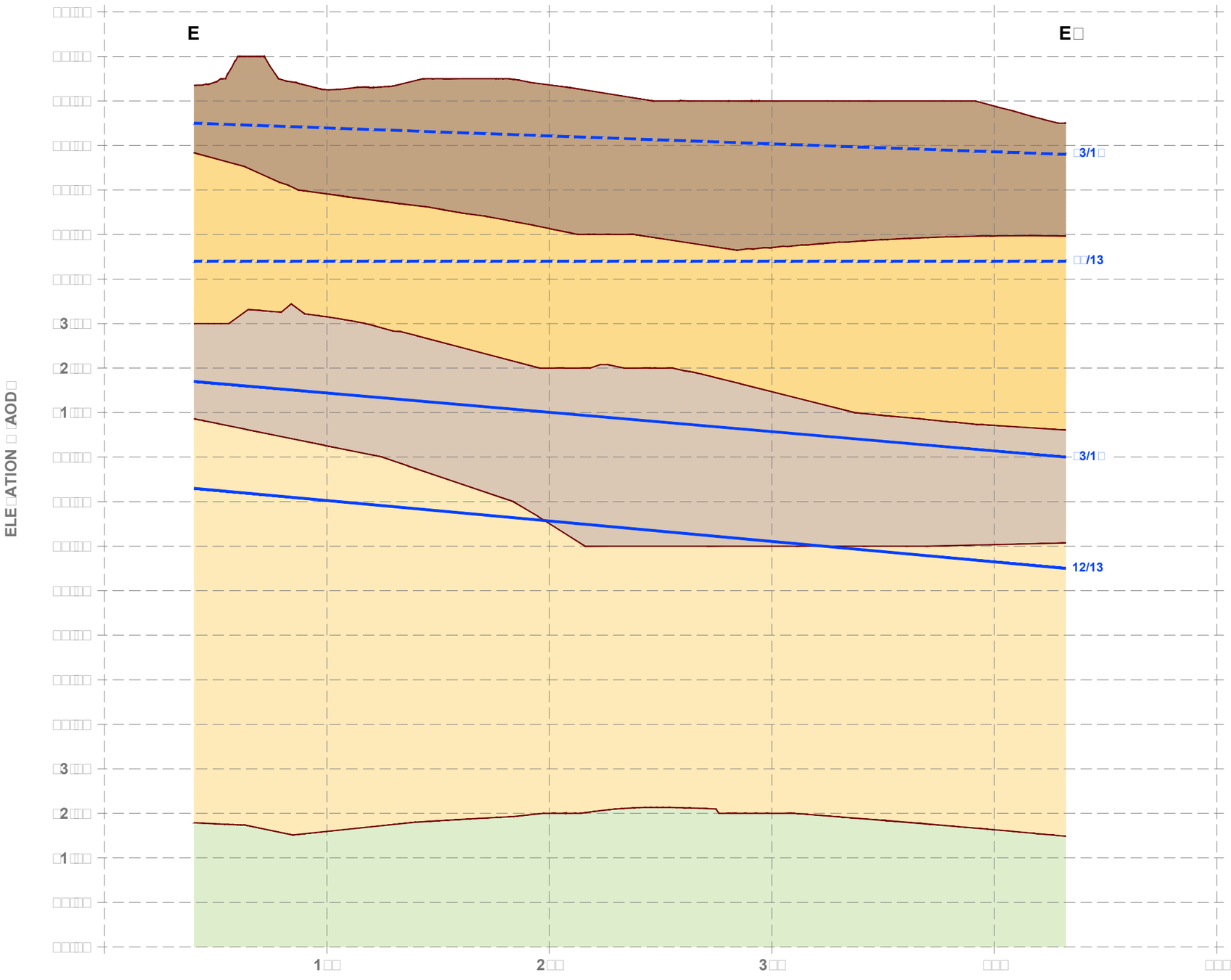
DRAWING E

Scale	Date
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PHASE E
SECTION E □E□



□ERTICAL SCALE 1□1□□□HORI□ONTAL SCALE 1□2□□□

LEGEND

- UMA PIEZOMETRIC SURFACE
- LMA PIEZOMETRIC SURFACE
- OVERBURDEN
- UM HORIZON
- INTERBURDEN
- LM HORIZON
- CHALK

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

SECTION E □E□

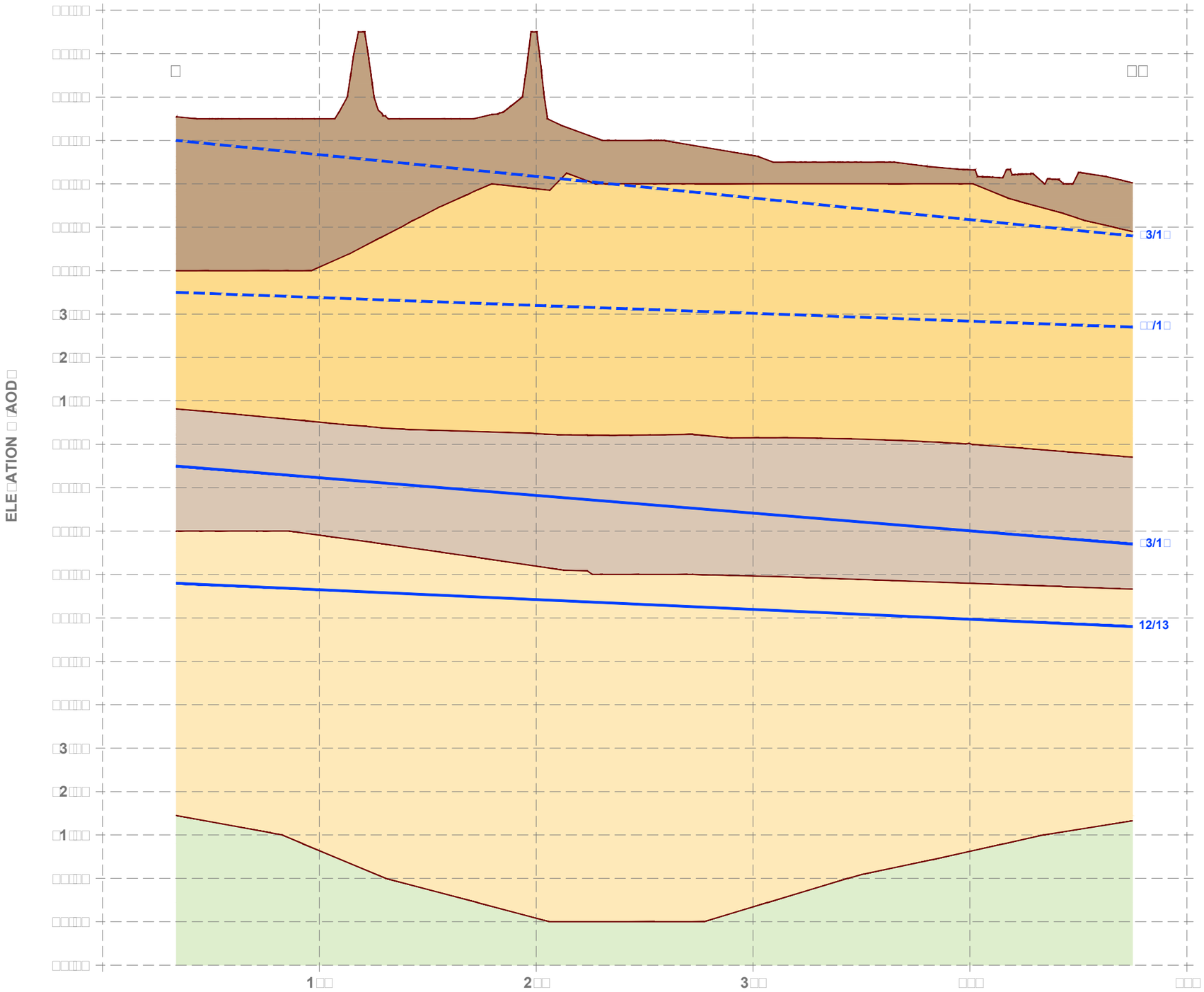
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Scale	Date
SEE DRAWING (A3)	NOVEMBER 2015

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PHASE □
SECTION □ □□□



□ERTICAL SCALE 1□1□□□HORI□ONTAL SCALE 1□2□□□

LEGEND

- UMA PIEZOMETRIC SURFACE
- LMA PIEZOMETRIC SURFACE
- OVERBURDEN
- UM HORIZON
- INTERBURDEN
- LM HORIZON
- CHALK

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ENVIRONMENTAL STATEMENT

SECTION □ □□□

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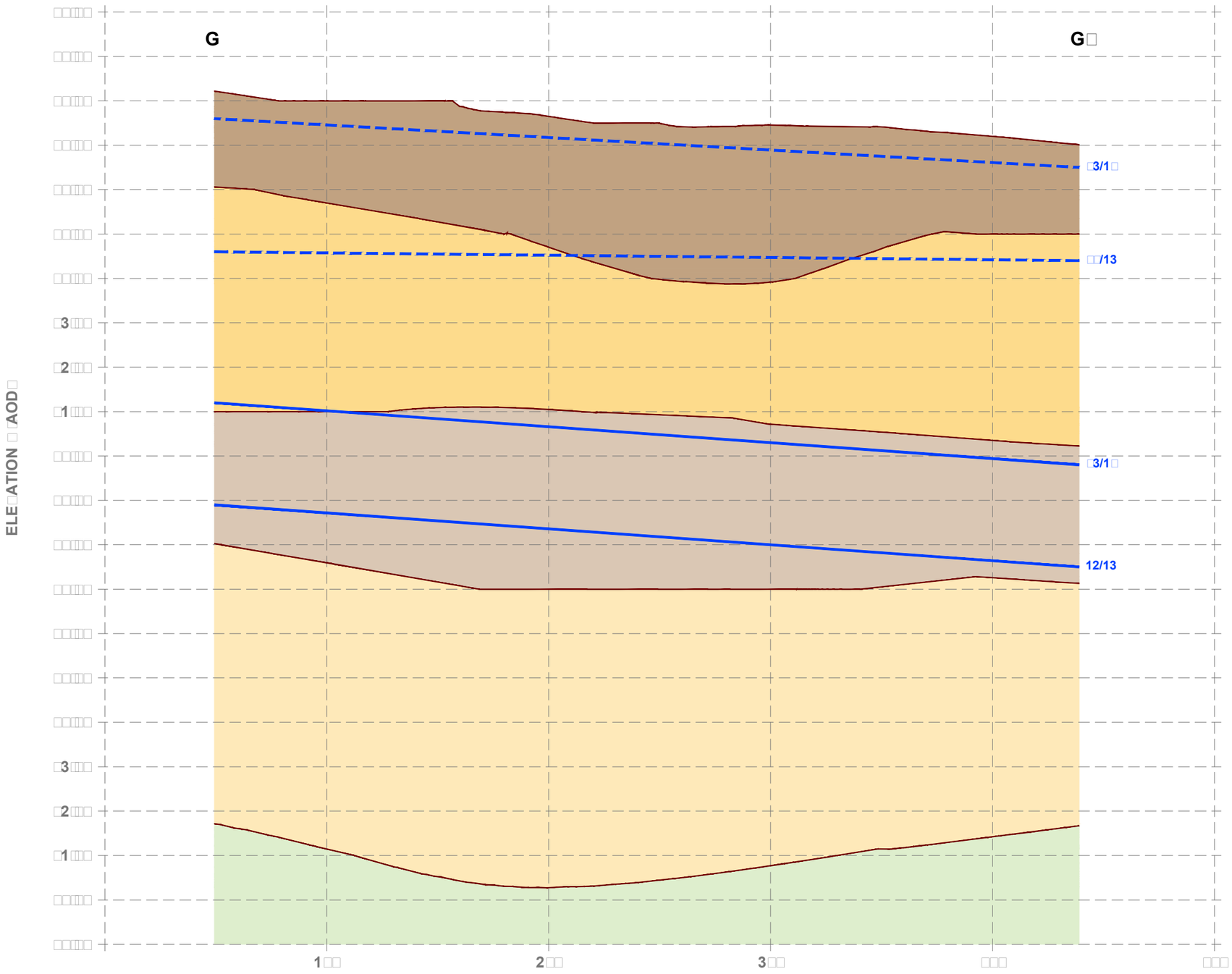
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PHASE G
SECTION G □G□



□ERTICAL SCALE 1□1 □□□HORI□ONTAL SCALE 1□2□□□

LEGEND

- UMA PIEZOMETRIC SURFACE
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SECTION G □G□

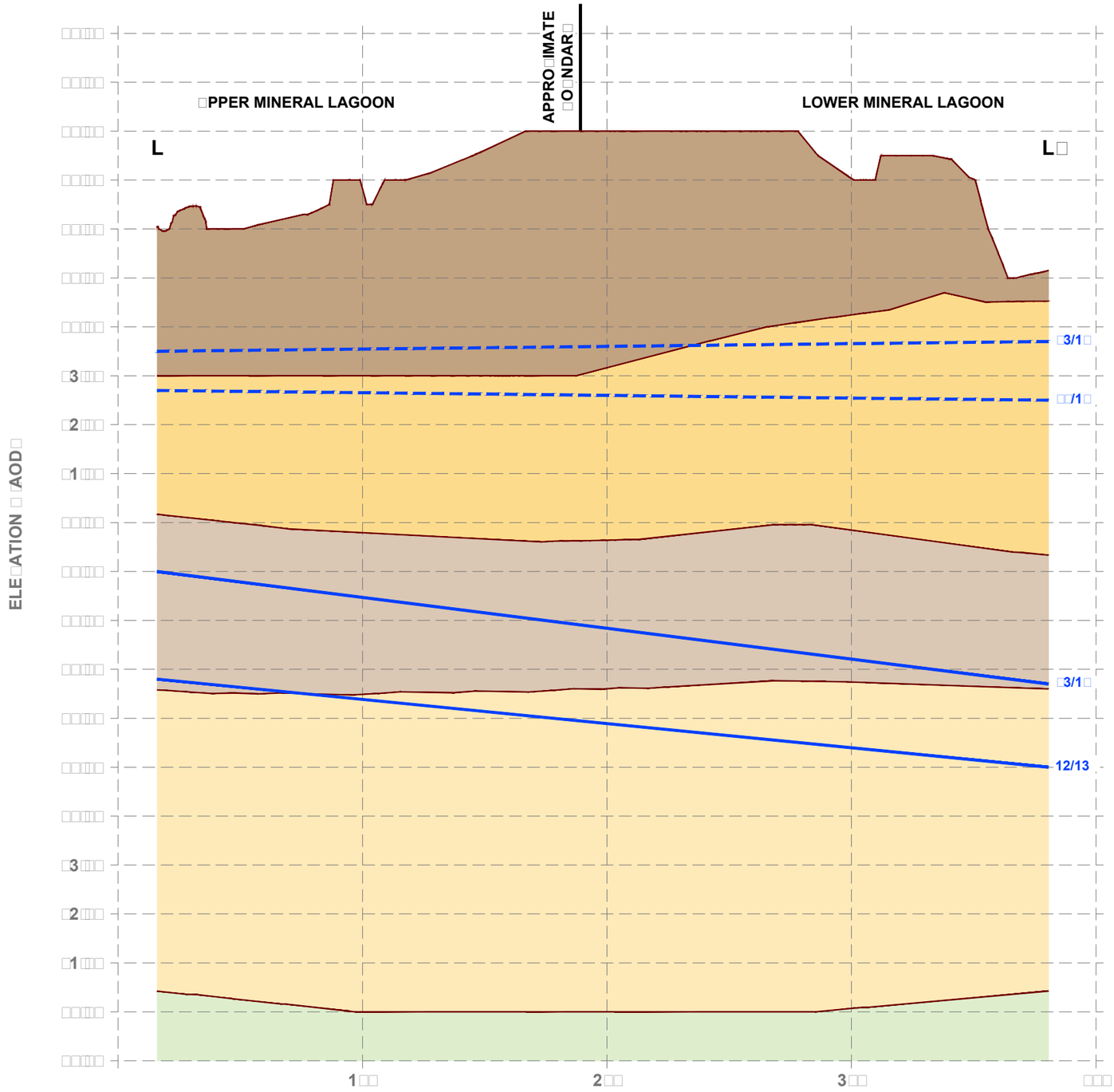
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□PPER AND LOWER MINERAL LAGOONS
SECTION L □L□



□ERTICAL SCALE 1□1□□□HORI□ONTAL SCALE 1□2□□□

LEGEND

- UMA PIEZOMETRIC SURFACE
- LMA PIEZOMETRIC SURFACE
- OVERBURDEN
- UM HORIZON
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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

SECTION L □L□

DRAWING I

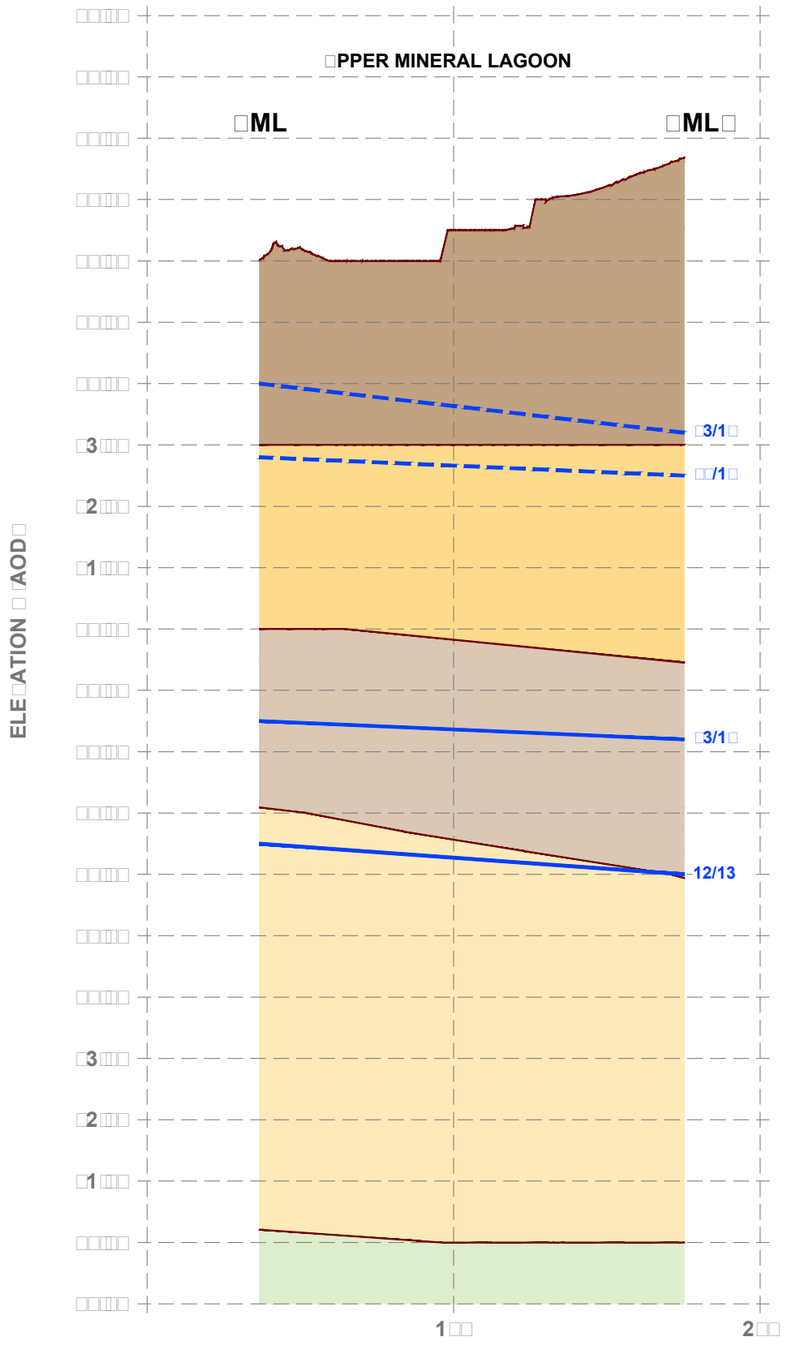
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□PPER AND LOWER MINERAL LAGOONS
SECTION □ML □□ML□



□ERTICAL SCALE 1□1□□□HORI□ONTAL SCALE 1□2□□□

LEGEND

- UMA PIEZOMETRIC SURFACE
- LMA PIEZOMETRIC SURFACE
- OVERBURDEN
- UM HORIZON
- INTERBURDEN
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SECTION □ML □□ML□

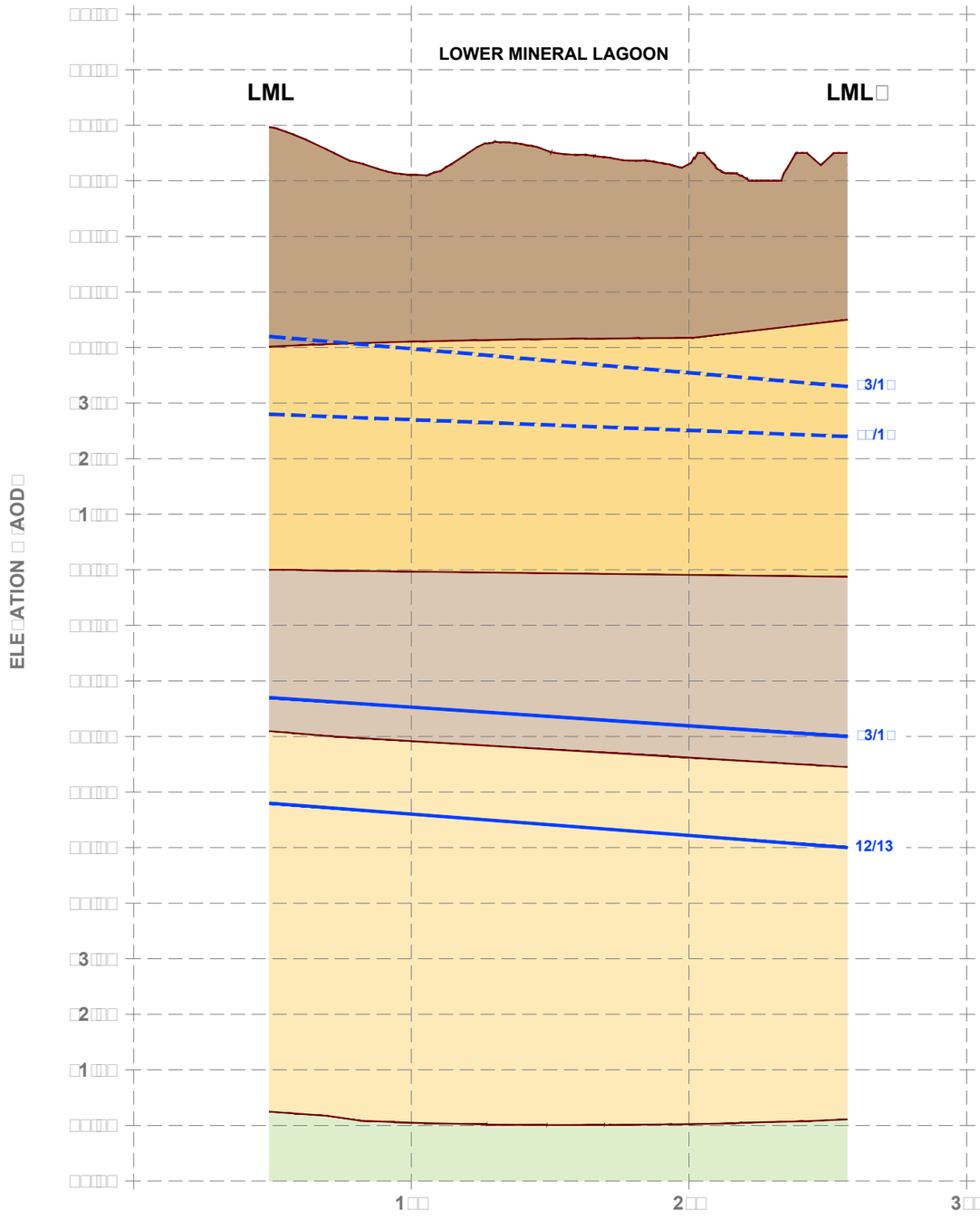
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Scale	Date
SEE DRAWING (A3)	NOVEMBER 2015

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□PPER AND LOWER MINERAL LAGOONS
SECTION LML □LML□



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LEGEND

- UMA PIEZOMETRIC SURFACE
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APPENDIX 03: TOPOGRAPHIC SURVEY

N

0 50 100 150 200m 300 400 500

Metres 1:5000

NOTES

1. DRAWING IS BASED ON BRETT TOPOGRAPHICAL SURVEY RECIEVED NOVEMBER 2014.

LEGEND

SITE BOUNDARY

PHASE BOUNDARY

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E□TRACTION AREA TOPOGRAPH□

DRAWING □

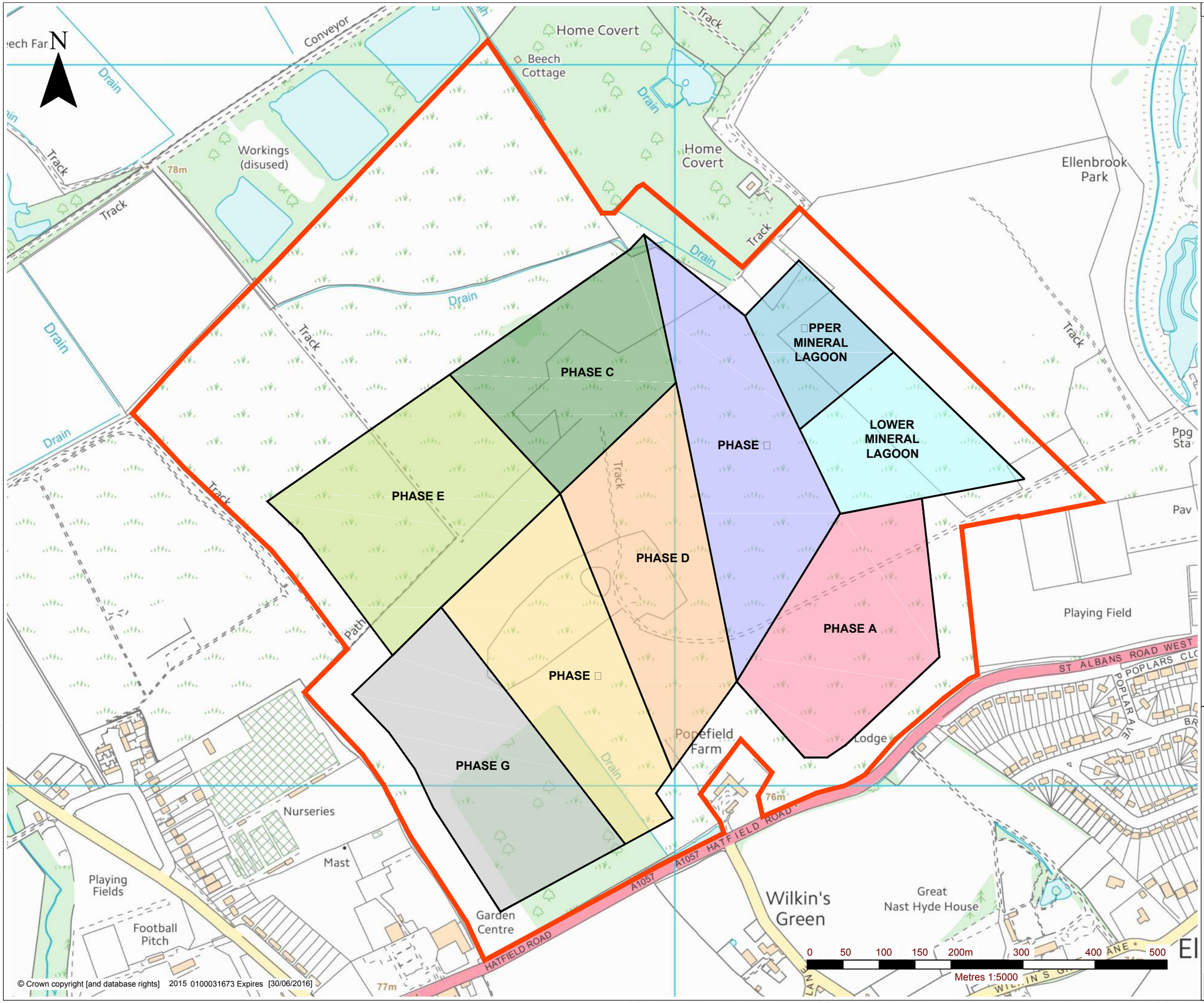
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Date NOVEMBER 2015

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APPENDIX 03: PHASING PLAN



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LEGEND

- SITE BOUNDARY
- PHASE BOUNDARY

PHASES

- PHASE A
- PHASE B
- PHASE C
- PHASE D
- PHASE E
- PHASE F
- PHASE G
- PHASE UPPER MINERAL LAGOON
- PHASE LOWER MINERAL LAGOON

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

PHASING PLAN

DRAWING A

Scale 1:5000 @ A3

Date NOVEMBER 2015

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APPENDIX 05: EMAP REPORT

Report Reference: EMS-329807_444292

Client Reference: EMS_329807_444292

Report Date 16 Oct 2015

Report Delivery Method: Email - pdf

Client Email: sales@emapsite.com

Groundsure Floodinsight

Address: Hatfield,

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Floodinsight** as requested.

If you would like further assistance regarding this report then please contact the emapsite customer services team on 0118 9736883 quoting the above report reference number.

Yours faithfully,

emapsite customer services team

Enc.
Groundsure Floodinsight

Groundsure Floodinsight

Address:	**Hatfield,**
Date:	**16 Oct 2015**
Reference:	**EMS-329807_444292**
Client:	**EmapSite**

NW N NE



W E

SW S SE

Aerial Photograph Capture date:	29-Aug-2005
Grid Reference:	519884,208397
Site Size:	86.78ha

Contents Page

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Overview of Findings 4
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1. Environment Agency Flood Zones 7
2. Environment Agency RoFRaS Flooding Map 12
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Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed.

Section 1: Environment Agency Flood Zones	
1.1 Are there any Enviroment Agency Zone 2 floodplains within 250m of the study site?	Yes
1.2 Are there any Environment Agency Zone 3 floodplains within 250m of the study site	No
1.3 Are there any Flood Defences within 250m of the study site?	No
1.4 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
1.5 Are there any Proposed Flood Defences within 250m of the study site?	No
1.6 Are there any areas used for Flood Storage within 250m of the study site?	No

Section 2: Risk of Flooding from Rivers and the Sea (RoFRaS)	
2.1 What is the Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating for the study site?	High

Section 3: Historic Flood Events	
3.1 Has the site been subject to past flooding as recorded by the Environment Agency?	Yes

Section 4: JBA Surface Water (Pluvial) Flood	
4.1 Is the site or any area within 50m at risk of Surface Water (Pluvial) Flooding?	Yes

Section 5: Surface Water Features	
5.1 Are there any surface water features within 250m of the study site?	Yes

Section 6: Groundwater Flooding	
6.1 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Potential below Surface
6.2 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	High

Section 7: BGS Geological Indicators of historic flooding	
7.1 Are there any geological indicators of historic flooding within 250m of the study site?	Yes

Section 8: JBA Reservoir and Canal Data	
8.1 Is the property located in an area identified as being at potential risk in the event of a reservoir failure?	No
8.2 Is the property located in an area identified as being at potential risk in the event of a canal break?	No

Additional Matters

Riparian ownership

If your land abuts a river, stream or ditch, you may have responsibility to maintain this watercourse, even if Title Deeds show the property boundary to be adjacent to the watercourse. This includes the responsibility for clearing debris and obstructions which may impede the free passage of water and fish, and also includes the responsibilities to accept flood flows through your land, even if these are caused by inadequate capacity downstream. There is no duty in common law for a landowner to improve the drainage capacity of a watercourse. Please contact Groundsure if you need further advice on riparian ownership issues relating to this property.

Sewerage Flooding

Extreme rainfall events may overwhelm sewerage systems and cause local flooding. The water and sewerage companies within the UK are required to maintain 'DG5 – At Risk Registers' which record properties that have flooded from sewers and/or are considered to be at risk of flooding from sewers in the future. If your property is on the 'At Risk' Register, this may be recorded within a standard CON29 Drainage and Water search.

Using this Report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client.

Note: Maps

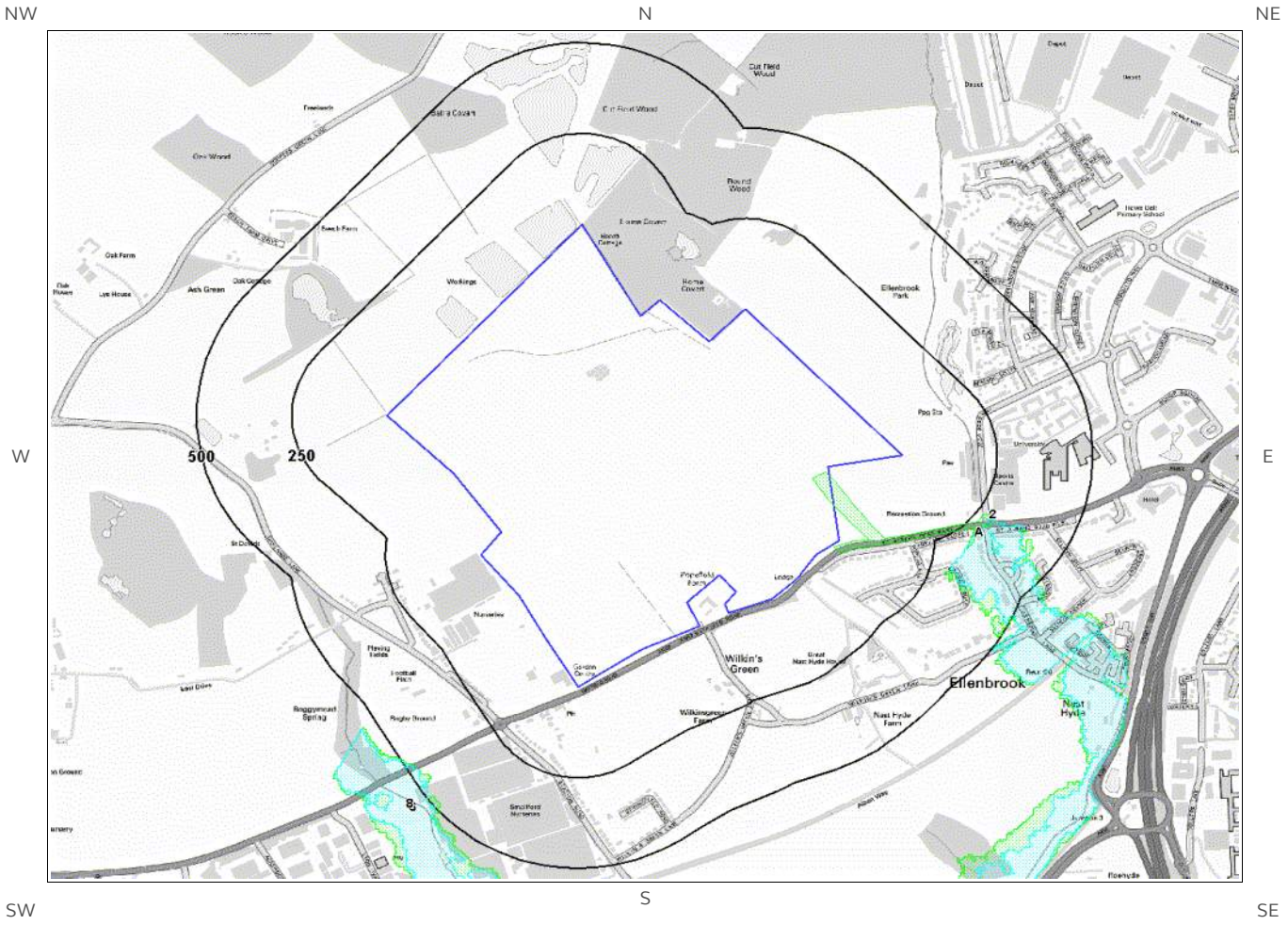
Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier “A” on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as “Not Shown”.

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

---

1. Environment Agency Flood Map for Planning (from rivers and the sea)



Environment Agency Flood Map for Planning Legend

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- Search Centre
- Search Buffers (m) — 100 — 250
- Zone 2 Floodplain
- Zone 3 Floodplain
- Flood Defences
- Area used for Flood Storage
- Proposed Flood Defence Scheme
- Area Benefiting from Flood Defences

1. Environment Agency Flood Zones

1.1 River and Coastal Zone 2 Flooding

Is the site within 250m of an Environment Agency Zone 2 floodplain? Yes

Environment Agency Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 1 – Flood Map for Planning:

ID	Distance (m)	Direction	Update	Type
1	0.0	On Site	02-Oct-2015	Zone 2 - (Fluvial / Tidal Models)

1.2 River and Coastal Zone 3 Flooding

Is the site within 250m of an Environment Agency Zone 3 floodplain? No

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 1 – Flood Map for Planning.

Database searched and no data found.

1.3 River and Coastal Flood Defences

Are there any Flood Defences within 250m of the study site ? No

This search consists only of flood defences present in the dataset provided by the Environment Agency. Any relevant data is represented on Map 1 – Flood Map for Planning.

Database searched and no data found.

1.4 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? No

Any relevant data is represented on Map 1 – Flood Map for Planning.

1.5 Areas of Proposed Flood Defences

Are there any Proposed Flood Defences within 250m of the study site? No

* This illustrates the number of households that move from 'very significant' or 'significant' to 'moderate' or 'low' probability of flood risk bands if the proposed flood scheme is to be implemented.

Any relevant data is represented on Map 1 – Flood Map for Planning.

Guidance: This search consists only of proposed flood defences present in the dataset provided by the Environment Agency. Please note that proposed flood defence schemes will not influence the current RoFRaS ratings for the site.

1.6 Areas used for Flood Storage

Are there any areas used for Flood Storage within 250m of the study site? No

Flood Storage Areas are considered part of the functional floodplain, and are areas where water has to flow or be stored in times of flood. Technical Guidance to the National Planning Policy Framework states that only water-compatible development and essential infrastructure should be permitted within flood storage areas, and existing development within this area should be relocated to an area with a lower risk of flooding. Any relevant data is represented on Map 1 – Flood Map for Planning.

Notes on Flood Zone Data:

This data relates solely to flooding from rivers or the sea. The Environment Agency estimate that over 2.5 million properties are at risk of flooding within England and Wales. River flooding occurs when a watercourse cannot cope with the water draining into it from the surrounding land. This can happen, for example, when heavy rain falls on an already waterlogged catchment. Coastal flooding results from a combination of high tides and stormy conditions. If low atmospheric pressure coincides with a high tide, a tidal surge may happen which can cause serious flooding.

The Groundsure Floodinsight Report comments upon whether a property lies in proximity to Environment Agency Zone 2 and Zone 3 floodplains. The Government's Technical Guidance to the National Planning Policy Framework explains how flood risk should be considered at all stages of the planning and development process in order to reduce future damage to property and potential loss of life. The Government looks to planning authorities to ensure that flood risk is properly taken into account in the planning of developments to reduce the risk of flooding and the damage which floods cause.

Flood Zones enable planning authorities to apply the sequential test (see Technical Guidance to the National Planning Policy Framework) for development proposals and prevent inappropriate development.

Technical Guidance to the National Planning Policy Framework defines the flood zones as: -

Zone 1 – little or no risk with an annual probability of flooding from rivers and the sea of less than 0.1%

Zone 2 – low to medium risk with an annual probability of flooding of 0.1-1.0% from rivers and 0.1-0.5% from the sea.

Zone 3 – high risk with an annual probability of flooding of 1.0% or greater from rivers, and 0.5% or greater from the sea.

Flood Zone 3b/Flood Storage Areas - very high risk with the site being used as part of the functional flood plain or as a Flood Storage Area.

The flood zones are the main constraint map underpinning decisions on development and flood risk.

Existing Flood Defences

Flood defences seek to reduce the risk of flooding and to safeguard life, protect property, sustain economic activity and the natural environment. Flood defences are designed to protect against flood events of a particular magnitude, expressed as risk in any one year. For example, defences in urban areas may be built to provide protection against flood events of a size which might occur on average once in one hundred years or less.

Proposed Flood Defences

This information is taken from the Environment Agency's database of Areas to Benefit from New and Reconditioned Flood Defences under the Medium Term Plan (MTP). The dataset contains funding allocation for the first financial year (from April). Funding for the following four financial years is not guaranteed, being only indicative, and will be reviewed annually. Projects within the Medium Term Plan qualify for inclusion in this dataset if:

- the investment leads to a change in the current standard of protection (change projects);
- the investment is a replacement or refurbishment in order to sustain the current standard of protection (sustain projects);
- the project has an initial construction budget of £100,000 or more; and
- the project is included within the first five years of the MTP

The data includes all the Environment Agency's projects over £100K that will change or sustain the standards of flood defence in England and Wales over the next 5 years. It also includes the equivalent schemes for all Local Authority and Internal Drainage Boards. The number of households and areas of land contributing to DEFRA's Outcome Measures (OM) are also attributed i.e. could benefit from major work on flood defences.

These data also contain Intermittence Flood Maintenance Programme that show the annual maintenance programme of work scheduled to be carried by the Environment Agency, Local Authority or Internal Drainage Board on flood defences. Data details routine maintenance as well as intermittent work that has been funded for the coming year. The data contains a start and end coordinate defining the relevant river section where work is planned.

Information Warning

Please note that the maps show the areas where investment is being made to reduce the flood and coastal erosion risk and are not detailed enough to account for individual addresses. Individual properties may not always face the same risk of flooding as the areas that surround them. Also, note that funding figures are indicative and any use or interpretation should account for future updates where annual values may change.

Every possible care is taken to ensure that the maps reflect all the data possessed by the Environment Agency and that they have applied their expert knowledge to create conclusions that are as reliable as possible. The Environment Agency consider that they have created the maps as well as they can and so should not be liable if the maps by their nature are not as accurate as might be desired or are misused or misunderstood, despite their warnings. For this reason, they are not able to promise that the maps will always be accurate or completely up to date.

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Flood Storage Areas

Flood Storage Areas may also act as flood defences. A flood storage area may also be referred to as a balancing reservoir, storage basin or balancing pond. Its purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. It may also delay the timing of a flood peak so that its volume is discharged over a longer time interval.

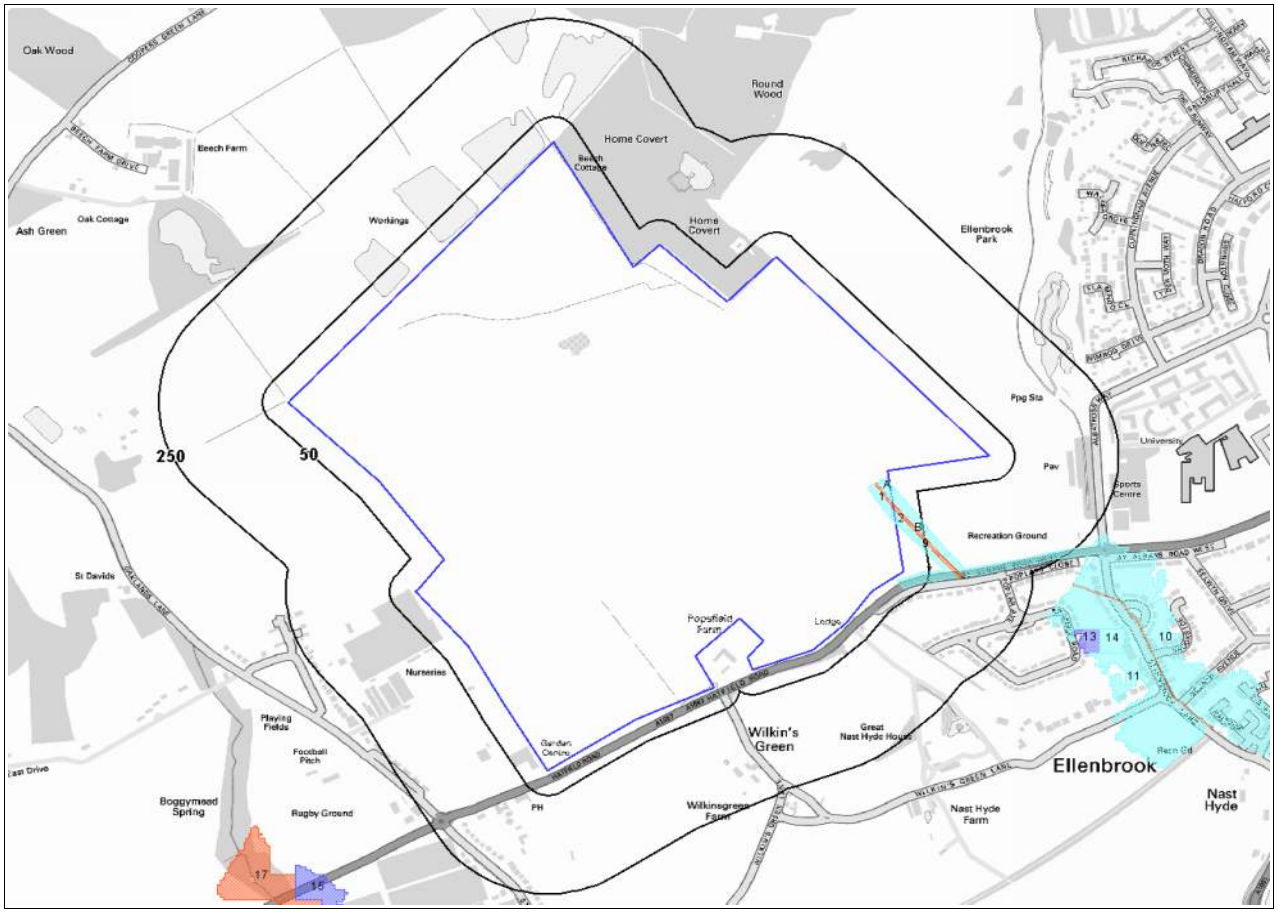
A flood storage area may take the form of a wet or dry reservoir. A wet reservoir is a water storage facility in which storage can be effected by allowing water levels to rise during flood times. A dry reservoir is typically adjacent to a river and comprises an enclosed area that accepts water only at peak times. These areas are also referred to as Zone 3b or 'the functional floodplain' and has a 5% or greater chance of flooding in any given year, or is designed to flood in the event of an extreme (0.1%) flood or another probability which may be agreed between the Local Planning Authority and the Environment Agency, including water conveyance routes. Development within Flood Storage Areas is severely restricted.

2. Environment Agency RoFRaS Flooding Map

NW N NE

W E

SW S SE



Environment Agency RoFRaS Flooding legend

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Site Outline

100 250 Search Buffers (m)

RoFRaS Rating

- Very Low
- Low
- Medium
- High

2. Environment Agency Risk of Flooding from Rivers and the Sea (RoFRaS)

2.1 Environment Agency Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating (River and Coastal)

What is the highest risk of flooding onsite? High

The Environment Agency RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a High (1 in 30 or greater) chance of flooding in any given year.

Any relevant data within 250m is represented on the RoFRaS Flood map. Data to 50m is reported in the table below.

ID	Distance (m)	Direction	RoFRaS Flood Risk
1	0.0	On Site	Low
2	0.0	On Site	Low
3A	0.0	On Site	Low
4B	0.0	On Site	High
5A	0.0	On Site	Low
6B	0.0	On Site	Low
7	6.0	SE	Low
8B	12.0	E	Low
9	36.0	E	Low

Notes on RoFRaS data:

This information is based on the very latest Environment Agency Risk of Flooding from Rivers and the Sea (RoFRaS) data. This data has been created by dividing the flood plain into 50m squares, or smaller areas where a square if intersected by a river or coastline. These are called impact cells. The method then calculates the likelihood that the centre of each impact cell will start to flood using a number of different flood scenarios.

A number of insurance companies providing cover for flood risk use this data as the basis of their risk model, although they may also utilise additional information such as claims histories, which may further influence their decision. Where a high risk of flooding is identified flood risk insurance may be difficult to obtain without further work being undertaken. Property owners of sites within Low and Medium risk areas are still considered to be at risk of flooding and insurance premiums may be increased as a result. Owners of properties within Low, Medium and High risk areas are advised to sign up to the Environment Agency's Flood Warning scheme. The probability estimates for RoFRaS risk bands are as follows:

Very Low – the chance of flooding from rivers or the sea is considered to be less than 1 in 1000 (0.1%) in any given year.

Low – the chance of flooding from rivers or the sea is considered to be less than 1 in 100 (1%) but greater than or equal to 1 in 1000 (0.1%) in any given year.

Medium – the chance of flooding from rivers or the sea is considered to be less than 1 in 30 (3.3%) but greater than 1 in 100 (1%) in any given year.

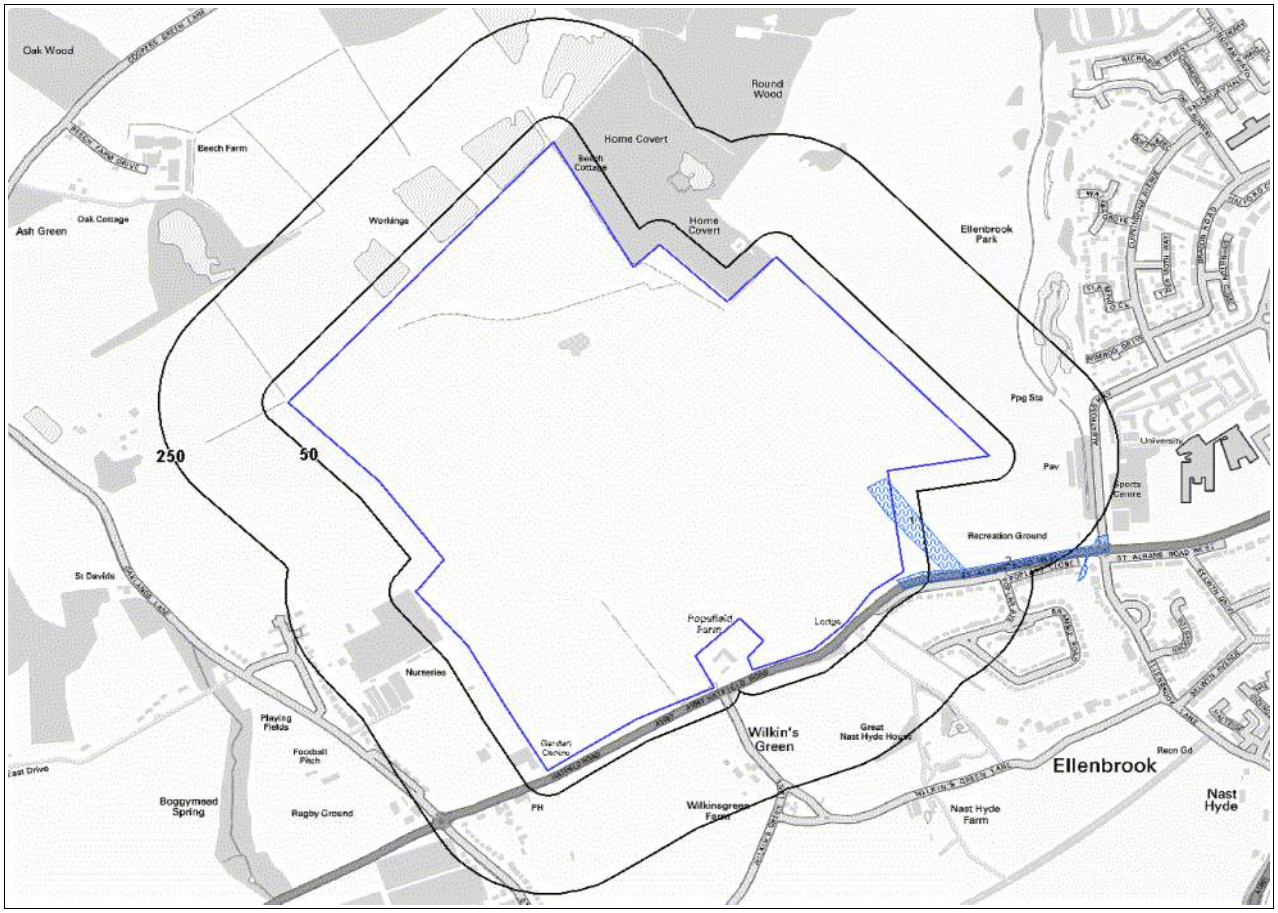
High – the chance of flooding from rivers or the sea is considered to be greater than or equal to 1 in 30 (3.3%) in any given year.

3. Environment Agency Historic Flooding Events Map

NW N NE

W E

SW S SE



Environment Agency Historic Flooding Events legend

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Site Outline

125
250
Search Buffers (m)

Historic Flood Events

3. Environment Agency Historic Flooding Events

3.1 Historic Flood Outlines

Has the site or any area within 250m been subject to historic flooding as recorded by the Environment Agency? Yes

This database shows the individual footprint of every flood event recorded by the Environment Agency and previous bodies.

Any records found within the search radius are displayed on Map 3 – Historic Flooding Events.

ID	Distance	Direction	Event Name	Date of Flood	Flood Source	Flood Cause	Type of Flood
1	0.0	On Site	06JanuaryNewYear2003	Start Date: 23-12-2002 End Date: 12-01-2003	main river	channel capacity exceeded (no raised defences)	Fluvial
2	6.0	SE	06JanuaryNewYear2003	Start Date: 23-12-2002 End Date: 12-01-2003	main river	channel capacity exceeded (no raised defences)	Fluvial

Notes on Historic Flooding data:

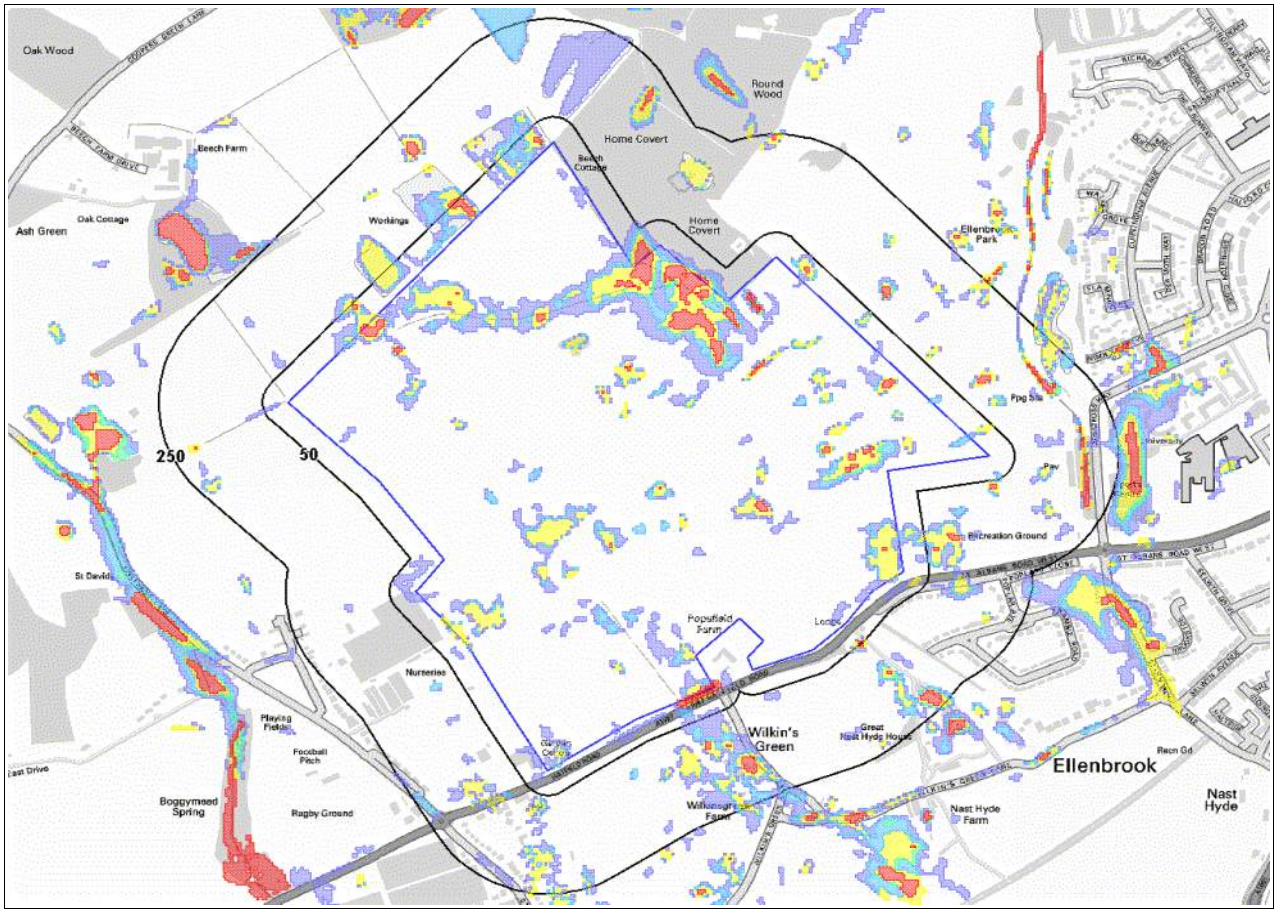
Over 21,000 separate events are recorded within this database, dating back to 1947. This data is used to understand where flooding has occurred in the past and provides details as available. Absence of a historic flood event for an area does not mean that the area has never flooded, but only that the Environment Agency do not currently have records of flooding within the area. Equally, a record of a flood footprint in previous years does not mean that an area will flood again, and this information does not take account of flood management schemes and improved flood defences.

4. JBA Surface Water (Pluvial) Flood Map

NW N NE

W E

SW S SE



JBA Surface Water (Pluvial) Flood Legend

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4. JBA Surface Water (Pluvial) Flooding

Surface Water (pluvial) flooding is defined as flooding caused by rainfall-generated overland flow before the runoff enters a watercourse or sewer. In such events, sewerage and drainage systems and surface watercourses may be entirely overwhelmed.

Surface Water (pluvial) flooding will usually be a result of extreme rainfall events, though may also occur when lesser amounts of rain falls on land which has low permeability and/or is already saturated, frozen or developed. In such cases overland flow and 'ponding' in topographical depressions may occur.

What is the risk of pluvial flooding at the study site? Highly Significant

Guidance: The site or an area in close proximity has been assessed to be at Highly Significant Risk of surface water (pluvial) flooding. This indicates that this area would be expected to be affected by surface water flooding in a 1 in 75 year rainfall event to a depth of greater than 1m.

Flood data provided by JBA RISK MANAGEMENT LIMITED Copyright © JBA RISK MANAGEMENT LIMITED 2008-2015

The following pluvial (surface water) flood risk records within 50m of the study site are shown on the JBA Surface Water Flooding Map:

Distance	Direction	Risk
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High

Distance	Direction	Risk
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High

Distance	Direction	Risk
0.0	On Site	High
0.0	On Site	High
0.0	On Site	High

Distance	Direction	Risk
0.0	On Site	Highly Significant
0.0	On Site	Highly Significant
0.0	On Site	Highly Significant
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low

Distance	Direction	Risk
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low

Distance	Direction	Risk
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low

Distance	Direction	Risk
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low

Distance	Direction	Risk
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low

Distance	Direction	Risk
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low

Distance	Direction	Risk
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low

Distance	Direction	Risk
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low

Distance	Direction	Risk
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low

Distance	Direction	Risk
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate

Distance	Direction	Risk
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate

Distance	Direction	Risk
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate

Distance	Direction	Risk
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate

Distance	Direction	Risk
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate

Distance	Direction	Risk
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate

Distance	Direction	Risk
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate

Distance	Direction	Risk
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Low to Moderate
0.0	On Site	Moderate
0.0	On Site	Moderate
0.0	On Site

Distance	Direction	Risk
0.0	On Site	Significant
0.0	On Site	Significant
0.0	On Site	Significant

Distance	Direction	Risk
1.0	NW	High
1.0	NW	High
1.0	SE	Highly Significant
1.0	SE	Highly Significant
1.0	SW	Low
1.0	SW	Low
1.0	NW	Low
1.0	NE	Low to Moderate
1.0	SW	Low to Moderate
1.0	NW	Low to Moderate
1.0	SE	Significant
1.0	SE	Significant
2.0	NE	High
2.0	NW	Low
2.0	NE	Low
2.0	SE	Low
2.0	SE	Significant
4.0	SE	High
4.0	NE	Low to Moderate
4.0	NW	Low to Moderate
4.0	NE	Moderate
5.0	SE	High
5.0	SE	High
5.0	NW	Low
5.0	NW	Low
5.0	NW	Low
5.0	NE	Low
5.0	NW	Low to Moderate
5.0	NW	Significant
6.0	NW	High
6.0	SE	Low
6.0	NE	Low
6.0	SW	Low
6.0	NW	Low
6.0	NE	Low
6.0	SW	Low
6.0	NW	Low to Moderate
6.0	NW	Low to Moderate
6.0	NW	Low to Moderate

Distance	Direction	Risk
6.0	NW	Low to Moderate
6.0	NE	Low to Moderate
6.0	SE	Moderate to High
7.0	SE	High
7.0	NW	Low
7.0	SE	Low
7.0	NE	Low
7.0	NW	Low
7.0	NW	Low
7.0	NW	Low
7.0	NW	Low to Moderate
7.0	SE	Moderate to High
8.0	SE	High
8.0	E	High
8.0	NW	High
8.0	NE	High
8.0	NW	High
8.0	SE	High
8.0	NW	Low
8.0	NE	Low
8.0	SE	Low
8.0	NE	Low to Moderate
8.0	E	Low to Moderate
8.0	NW	Low to Moderate
8.0	NE	Low to Moderate
9.0	E	High
9.0	NW	High
9.0	NW	Low
9.0	SE	Low
9.0	SE	Low
9.0	NE	Low to Moderate
9.0	E	Low to Moderate
10.0	SE	Low
10.0	E	Low
10.0	NW	Low
10.0	NW	Low
11.0	NE	High
11.0	NE	Low
11.0	NW	Low to Moderate

Distance	Direction	Risk
11.0	NW	Low to Moderate
11.0	NE	Low to Moderate
11.0	NW	Low to Moderate
12.0	NW	High
12.0	NW	High
12.0	NW	Low to Moderate
12.0	NE	Low to Moderate
12.0	NE	Low to Moderate
12.0	NE	Low to Moderate
12.0	NW	Significant
13.0	NE	Low
13.0	E	Low
13.0	SW	Low
13.0	NW	Low to Moderate
13.0	NW	Low to Moderate
14.0	NE	High
14.0	NW	Low
14.0	NE	Low
14.0	NW	Low
14.0	NE	Low to Moderate
15.0	NW	Low
15.0	NE	Low
15.0	NE	Low to Moderate
16.0	NW	Low
16.0	NW	Low
16.0	NW	Low
16.0	NW	Low
16.0	NW	Low
16.0	SE	Low to Moderate
16.0	NW	Low to Moderate
16.0	NE	Low to Moderate
16.0	NW	Low to Moderate
16.0	NW	Low to Moderate
17.0	SW	Low
17.0	NW	Low
17.0	W	Low
17.0	NW	Low
17.0	NW	Low to Moderate
17.0	NW	Low to Moderate

Distance	Direction	Risk
18.0	SE	Low
18.0	SE	Low
18.0	NE	Low
18.0	E	Low to Moderate
19.0	NW	High
19.0	NW	High
19.0	NE	High
19.0	NW	Low
19.0	SE	Low
19.0	NE	Low
19.0	NW	Low
19.0	NW	Low to Moderate
19.0	NW	Low to Moderate
19.0	NE	Significant
20.0	NW	Low
20.0	NW	Low to Moderate
21.0	SE	High
21.0	E	Low to Moderate
21.0	NW	Low to Moderate
22.0	NW	High
22.0	SE	Low
22.0	NW	Low
22.0	NE	Low to Moderate
23.0	NW	Low
24.0	SE	Low
24.0	NW	Low to Moderate
25.0	SE	Low
25.0	SE	Low
25.0	NW	Low to Moderate
25.0	NE	Low to Moderate
26.0	E	Low
26.0	NW	Low
26.0	NE	Low
26.0	E	Low
26.0	NW	Low to Moderate
26.0	E	Low to Moderate
26.0	NW	Low to Moderate
27.0	NW	Low to Moderate
28.0	NW	Low

Distance	Direction	Risk
28.0	NW	Low to Moderate
28.0	NE	Moderate
29.0	NW	Low
29.0	E	Low to Moderate
29.0	NE	Low to Moderate
30.0	E	Low to Moderate
30.0	NE	Low to Moderate
31.0	E	High
31.0	NW	Low
31.0	E	Low
31.0	SE	Low
31.0	NW	Low
31.0	E	Low to Moderate
31.0	NW	Low to Moderate
32.0	NW	Low
32.0	NE	Low
32.0	S	Low
32.0	E	Low to Moderate
33.0	NW	Low
33.0	NE	Low
33.0	NE	Low
34.0	NW	Low to Moderate
35.0	SE	High
35.0	E	Low
35.0	SE	Low
35.0	SE	Low
35.0	NW	Significant
36.0	NW	Low
36.0	NW	Low
36.0	NW	Low
36.0	NE	Low to Moderate
37.0	NW	Low to Moderate
38.0	NW	Low
38.0	SE	Low
38.0	NW	Low to Moderate
38.0	S	Low to Moderate
39.0	SE	Low
39.0	NE	Low
39.0	E	Low

Distance	Direction	Risk
39.0	NW	Low to Moderate
39.0	NE	Low to Moderate
39.0	NW	Low to Moderate
40.0	NW	Low
40.0	SE	Low
40.0	E	Low
41.0	NW	Low to Moderate
42.0	NW	Low
42.0	SE	Significant
43.0	NE	High
43.0	S	Low
44.0	NW	Low to Moderate
45.0	NW	Low
45.0	S	Low
46.0	S	High
46.0	E	Low to Moderate
46.0	NW	Low to Moderate
47.0	NW	Low
47.0	NW	Low
47.0	S	Low to Moderate
47.0	NW	Low to Moderate
47.0	NW	Low to Moderate
48.0	SE	Low
48.0	NW	Low to Moderate
49.0	NW	High
49.0	NW	Low
49.0	NW	Low
50.0	E	Low to Moderate

Notes on Surface water (Pluvial) Flooding data:

JBA Consulting surface water flood map identifies areas likely to flood following extreme rainfall events, i.e. land naturally vulnerable to surface water or "pluvial" flooding. This data set was produced by simulating 1 in 75 year, 1 in 200 year and 1 in 1000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though older ones may even flood in a 1 in 5 year rainstorm event.

The model provides the maximum depth of flooding in each 5m "cell" of topographical mapping coverage. The maps include 7 bands indicating areas of increasing natural vulnerability to surface water flooding. These are:-

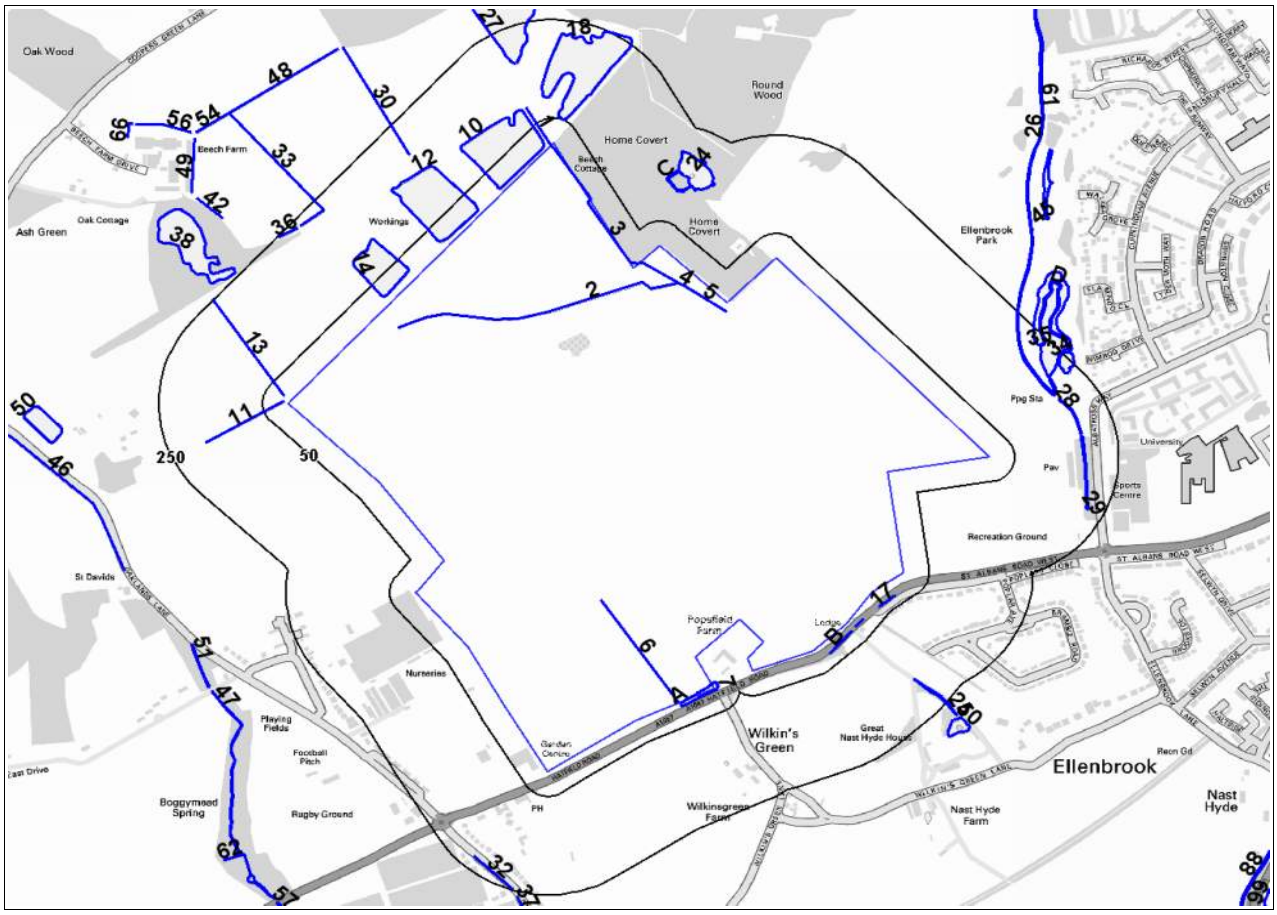
- **Less than 0.1m in a 1 in 1000 year rainfall event** - Negligible
- **Greater than 0.1m in a 1 in 1000 year rainfall event** - Low
- **Between 0.1m and 0.3m in a 1 in 200 year rainfall event** – Low to Moderate
- **Between 0.3m and 1m in a 1 in 200 year rainfall event –** Moderate
- **Greater than 1m in a 1 in 200 year rainfall event** – Moderate to High
- **Between 0.1m and 0.3m in a 1 in 75 year rainfall event** – High
- **Between 0.3m to 1m in a 1 in 75 year rainfall event** - Significant
- **Greater than 1m in a 1 in 75 year rainfall event** – Highly Significant

5. Surface Water Features map

NW N NE

W E

SW S SE



Surface Water Features legend

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Site Outline

Search Buffers (m)

50

250

Surface Water Feature (wider than 5m)

Surface Water Feature (narrower than 5m)

5. Surface Water Features

Are there any surface water features within 250m of the study site? Yes

The following surface water records are represented on mapping:

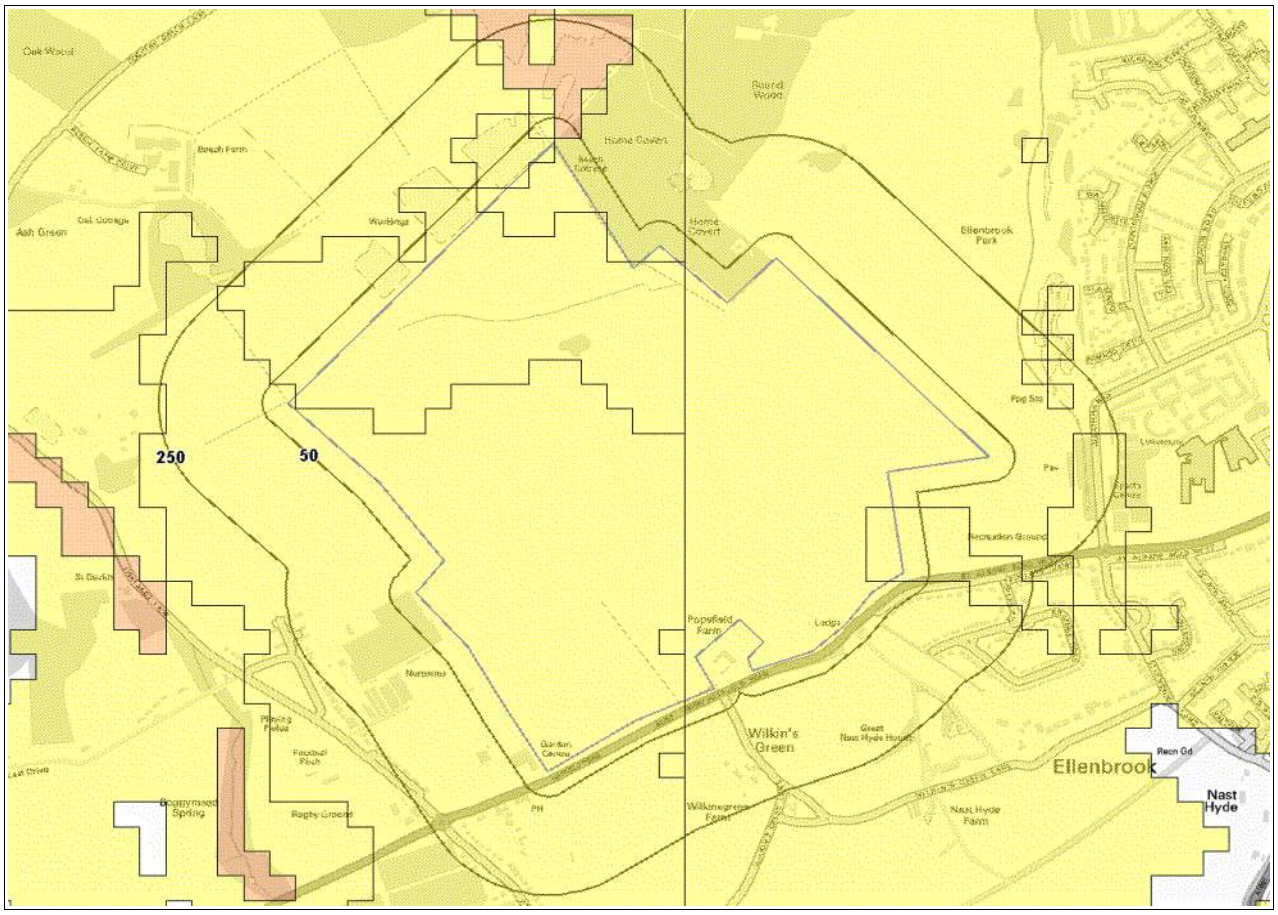
ID	Distance (m)	Direction
1	0.0	On Site
2	0.0	On Site
3	0.0	On Site
4	0.0	On Site
5	0.0	On Site
6	0.0	On Site
7	0.0	On Site
8A	1.0	SE
9A	5.0	SE
10	7.0	NW
11	9.0	NW
12	9.0	NW
13	16.0	NW
14	16.0	NW
15B	17.0	SE
16B	18.0	SE
17	29.0	SE
18	51.0	N
19C	115.0	N
20C	118.0	N
21C	122.0	NE
22C	124.0	NE
23C	150.0	N
24	164.0	NE
25	172.0	SE
26	177.0	NE
27	177.0	NW
28	178.0	NE
29	182.0	E
30	182.0	NW
31D	196.0	NE
32	222.0	SW
33	223.0	NW
34	224.0	NE
35	229.0	NE
36	235.0	NW

6. BGS Groundwater Flooding Map

NW N NE

W E

SW S SE



BGS Groundwater Flooding legend

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Site Outline

50
250
Search Buffers (m)

Limited potential for groundwater flooding to occur

Potential for groundwater flooding of property below ground level

Potential for groundwater flooding to occur at surface

6. Groundwater Flooding

6.1 Groundwater Flooding Susceptibility Areas

Are there any British Geological Survey groundwater flooding susceptibility flood areas within 50m of the boundary of the study site? Yes

What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions? Potential for groundwater flooding of property below ground level

Does this relate to Clearwater Flooding or Superficial Deposits Flooding? Clearwater Flooding

Where potential for groundwater flooding of property situated below ground level is indicated, this means that given the geological conditions there may be a groundwater flooding hazard to basements and other below surface infrastructure. Unless other relevant information, e.g. records of previous flooding, suggests groundwater flooding has occurred before in this area you need take no further action in relation to groundwater flooding hazard. If there are records of previous incidences of groundwater flooding, then is recommended that other information e.g. rainfall history, property type, and land drainage information in addition to previous records of flooding be investigated in order to establish relative, but not absolute, risk of groundwater flooding.

6.2 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result? High

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

Notes on Groundwater Flooding data:

The BGS Susceptibility to Groundwater Flooding hazard dataset identifies areas where geological conditions could enable groundwater flooding to occur and where groundwater may come close to the ground surface.

Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

The susceptibility data is suitable for use for regional or national planning purposes where the groundwater flooding information will be used along with a range of other relevant information to inform land-use planning decisions. It might also be used in conjunction with a large number of other factors, e.g. records of previous incidence of groundwater flooding, rainfall, property type, and land drainage information, to establish relative, but not absolute, risk of groundwater flooding at a resolution of greater than a few hundred metres. The susceptibility data should not be used on its own to make planning decisions at any scale, and, in particular, should not be used to inform planning decisions at the site scale. The susceptibility data cannot be used on its own to indicate risk of groundwater flooding.

7. BGS Geological Indicators of Flooding

Are there any geological indicators of flooding within 250m of the study site? Yes

This dataset identifies the presence of superficial geological deposits which indicate that the site may be, or have been in the past, vulnerable to inland and/or coastal flooding. This assessment does not take account of any man-made factors such as flood protection schemes, and the data behind the report are purely geological.

Distance	Direction	Description
0.0	On Site	Higher flood potential from rivers: the first areas to experience the effects of inland flooding in a river catchment.
0.0	On Site	Higher flood potential from rivers: the first areas to experience the effects of inland flooding in a river catchment.

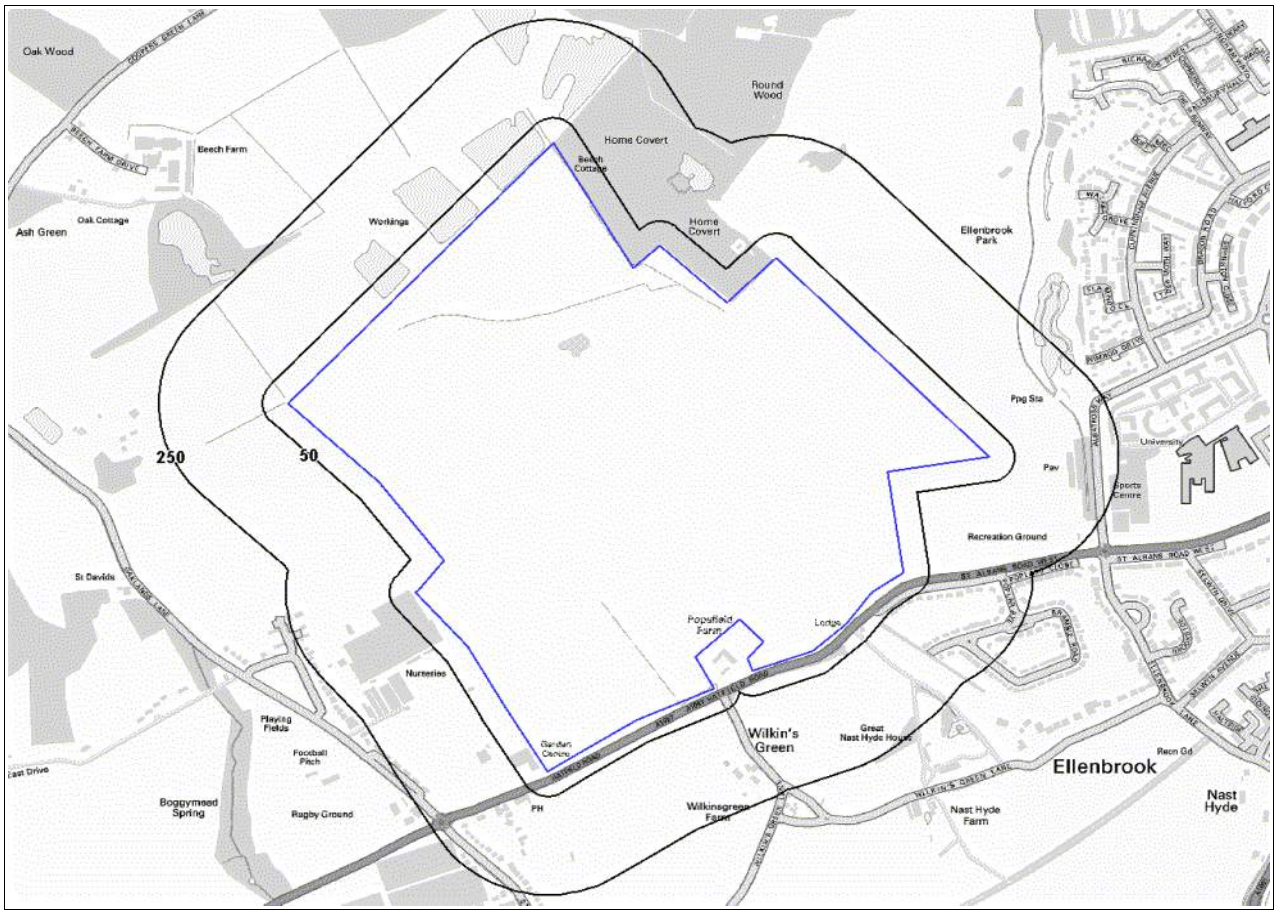
Notes on BGS Geological Indicators of Flooding data:

The BGS Geological Indicators of Flooding (GIF) data set is a digital map based on the BGS Digital Geological Map of Great Britain at the 1:50,000 scale (DiGMapGB-50). It was produced by characterising Superficial (Drift) Deposits on DiGMapGB-50 in terms of their likely vulnerability to flooding, either from coastal or inland water flow. These Superficial Deposits are considered 'recent' in geological terms, most having been formed in the later parts of the Quaternary geological period (i.e. within the last few tens of thousands of years). Observations made during recent major inland and coastal flooding events have demonstrated that the erosion and deposition of these recent geological sediments have produced subtle topographical variations, resulting in landforms such as fluvial and coastal floodplains. The mapping of these landforms, in conjunction with the fluvial and/or coastal deposits that underlie them, has in turn determined the extent of previous coastal and inland flooding.

On this basis, the floodplains which are at greatest risk from flooding can be both visualised and defined by Superficial Deposits as depicted on geological maps. These include deposits such as river alluvium and lacustrine (lake) alluvium, as well as the First River Terrace or 'Floodplain terrace' (raised flat areas adjacent to or within floodplains, which represent the level of the floodplain prior to the most recent episode of down-cutting). Older and higher river terraces have been excluded as they lie outside the geologically defined floodplain. Areas at risk from coastal inundation are similarly characterised by a range of estuarine or marine deposits that include, for example, tidal flats.

8. JBA Canal Break map

NW N NE



W E

SW S SE

JBA Canal Break legend

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Site Outline

50
250
Search Buffers (m)

Areas at risk from Canal Breach

8. JBA Reservoir and Canal Data

8.1 JBA Reservoir Failure Impact Modelling

Is the property located in an area identified as being at potential risk in the event of a reservoir failure? No

JBA consulting have modelled the flooding impact from 1,700 reservoirs in England and Wales, should there be a catastrophic failure of a reservoir wall or embankment. This data is not displayed on mapping.

Guidance: None required

Notes on Reservoir Failure Impact data:

This dataset identified areas that are most likely to flood following the sudden catastrophic failure of a reservoir and is provided by JBA Consulting. JBA has identified over 1,700 reservoirs that pose a risk to people and property. These maps identify properties that would flood in the unlikely event of the failure of the reservoir's dam or embankment. Empirical methods were used to predict the flow that would result from the failure which was then modelled onto high resolution Digital Terrain Models (DTM) using JBA's advanced 2D hydraulic modelling techniques. The model provides the maximum depth of flooding in each cell of the DTM.

8.2 JBA Canal Break Modelling

Is the property located within 500m of an area identified as being at potential risk in the event of a canal break? No

Database searched and no data found.

Notes on Canal Break modelling data

Canal failure mapping includes two types of failure:

- Breach of raised canal embankments - failure of the embankment due to weaknesses; these are typically caused by erosion or animal burrowing but can also arise from poor maintenance.
- Aqueduct failure - an aqueduct is where the canal passes over infrastructure such as roads, railways and subways, or over other canals and rivers. Failures of these are typically caused by the collapse of the underlying culvert.

A length of over 1,700km of canal covering England, Wales and Scotland was modelled. The canal modelling is restricted to the areas where LIDAR is available as the raised embankments are more defined in the LIDAR than in the Photogrammetry data. Each canal is categorised as part of the Merchant Shipping Notice (MSN 1776 (M)). The majority of the modelled canals are categorised as A, with a few exceptions, which fell under category B.

- Category A: narrow rivers and canals where the depth of water is generally less than 1.5m.
- Category B: wider rivers and canals where the depth of water is generally 1.5m or more and where the significant wave height could not be expected to exceed 0.6m at any time.
- Category C: tidal rivers and estuaries and large, deep lakes and lochs where the significant wave height could not be expected to exceed 1.2m at any time.
- Category D: tidal rivers and estuaries where the significant wave height could not be expected to exceed 2m at any time.

The canal map provides flood extent data only and show flooded areas with a depth greater than 0.1m.

Contact Details

EmapSite

Telephone: 0118 9736883
sales@emapsite.com

British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:**enquiries@bgs.ac.uk**
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries

Environment Agency

Floodline tel: 0845 988 1188
General enquiry tel: 08708 506 506
Web: www.environment-agency.gov.uk
Email: enquiries@environment-agency.gov.uk

JBA Risk Management

South Barn
Broughton Hall
Skipton
BD23 3AE
Tel: 01756 799919

Ordnance Survey

Adanac Drive, Southampton
SO16 0AS

Tel: 08456 050505
Website: http://www.ordnancesurvey.co.uk/

Local Authority

Authority: Welwyn Hatfield Council
Phone: 01707 357 000
Web: http://www.welhat.gov.uk/
Address: Council Offices, The Campus, Welwyn Garden City, Hertfordshire, AL8 6AE

Getmapping PLC

Virginia Villas, High Street, Hartley Witney
Hampshire RG27 8NW
Tel: 01252 845444
Website: http://www1.getmapping.com/

Acknowledgements: Ordnance Survey © Crown Copyright and/or Database Right. All Rights Reserved. Licence Number [03421028]. This report has been prepared in accordance with the Groundsure Ltd standard Terms and Conditions of business for work of this nature.

Standard Terms and Conditions

1 Definitions

I**n these terms and conditions unless the context otherwise requires:**
"Beneficiary" means the person or entity for whose benefit the Client has obtained the Services.
"Client" means the party or parties entering into a Contract with Groundsure.
"Commercial" means any building or property which is not Residential.
"Confidential Information" means the contents of this Contract and all information received from the Client as a result of, or in connection with, this Contract other than
(i) information which the Client can prove was rightfully in its possession prior to disclosure by Groundsure and
(ii) any information which is in the public domain (other than by virtue of a breach of this Contract).
"Support Services" means Support Services provided by Groundsure including, without limitation, interpreting third party and in-house environmental data, providing environmental support advice, undertaking environmental audits and assessments, Site investigation, Site monitoring and related items.
"Contract" means the contract between Groundsure and the Client for the provision of the Services, and which shall incorporate these terms and conditions, the Order, and the relevant User Guide.
"Third Party Data Provider" means any third party providing Third Party Content to Groundsure.
"Data Reports" means reports comprising factual data with no accompanying interpretation.
"Fees" has the meaning set out in clause 5.1.
"Groundsure" means Groundsure Limited, a company registered in England and Wales under number 03421028.
"Groundsure Materials" means all materials prepared by Groundsure and provided as part of the Services, including but not limited to Third Party Content, Data Reports, Mapping, and Risk Screening Reports.
"Intellectual Property" means any patent, copyright, design rights, trade or service mark, moral rights, data protection rights, know-how or trade mark in each case whether registered or not and including applications for the same or any other rights of a similar nature anywhere in the world.
"Mapping" means a map, map data or a combination of historical maps of various ages, time periods and scales.
"Order" means an electronic, written or other order form submitted by the Client requesting Services from Groundsure in respect of a specified Site.
"Ordnance Survey" means the Secretary of State for Business, Innovation and Skills, acting through Ordnance Survey, Adanac Drive, Southampton, SO16 0AS, UK.
"Order Website" means the online platform through which Orders may be placed by the Client and accepted by Groundsure.
"Report" means a Risk Screening Report or Data Report for Commercial or Residential property.
"Residential" means any building or property used as or intended to be used as a single dwelling.
"Risk Screening Report" means a risk screening report comprising factual data with an accompanying interpretation by Groundsure.
"Services" means any Report, Mapping and/or Support Services which Groundsure has agreed to provide by accepting an Order pursuant to clause 2.6.
"Site" means the area of land in respect of which the Client has requested Groundsure to provide the Services.
"Third Party Content" means data, database information or other information which is provided to Groundsure by a Third Party Data Provider.
"User Guide" means the user guide, as amended from time to time, available upon request from Groundsure and on the website (www.Groundsure.com) and forming part of this Contract.

2 Scope of Services, terms and conditions, requests for insurance and quotations

2.1 Groundsure agrees to provide the Services in accordance with the Contract.
2.2 Groundsure shall exercise reasonable skill and care in the provision of the Services.
2.3 Subject to clause 7.3 the Client acknowledges that it has not relied on any statement or representation made by or on behalf of Groundsure which is not set out and expressly agreed in writing in the Contract and all such statements and representations are hereby excluded to the fullest extent permitted by law.
2.4 The Client acknowledges that terms and conditions appearing on a Client's order form, printed stationery or other communication, or any terms or conditions implied by custom, practice or course of dealing shall be of no effect, and that this Contract shall prevail over all others in relation to the Order.
2.5 If the Client or Beneficiary requests insurance in conjunction with or as a result of the Services, Groundsure shall use reasonable endeavours to recommend such insurance, but makes no warranty that such insurance shall be available from insurers or that it will be offered on reasonable terms. Any insurance purchased by the Client or Beneficiary shall be subject solely to the terms of the policy issued by insurers and Groundsure will have no liability therefor. In addition you acknowledge and agree that Groundsure does not act as an agent or broker for any insurance providers. The Client should take (and ensure that the Beneficiary takes) independent advice to ensure that the insurance policy requested or offered is suitable for its requirements.
2.6 Groundsure's quotations or proposals are valid for a period of 30 days only unless an alternative period of time is explicitly stipulated by Groundsure. Groundsure reserves the right to withdraw any quotation or proposal at any time before an Order is accepted by Groundsure. Groundsure's acceptance of an Order shall be binding only when made in writing and signed by Groundsure's authorised representative or when accepted through the Order Website.

3 The Client's obligations

3.1The Client shall comply with the terms of this Contract and
(i) procure that the Beneficiary or any third party relying on the Services complies with and acts as if it is bound by the Contract and
(ii) be liable to Groundsure for the acts and omissions of the Beneficiary or any third party relying on the Services as if such acts and omissions were those of the Client.
3.2 The Client shall be solely responsible for ensuring that the Services are appropriate and suitable for its and/or the Beneficiary's needs.
3.3 The Client shall supply to Groundsure as soon as practicable and without charge all requisite information (and the Client warrants that such information is accurate, complete and appropriate), including without limitation any environmental information relating to the Site and shall give such assistance as Groundsure shall reasonably require in the provision of the Services including, without limitation, access to the Site, facilities and equipment.
3.4 Where the Client's approval or decision is required to enable Groundsure to carry out work in order to provide the Services, such approval or decision shall be given or procured in reasonable time and so as not to delay or disrupt the performance of the Services.
3.5 Save as expressly permitted by this Contract the Client shall not, and shall procure that the Beneficiary shall not, re-sell, alter, add to, or amend the Groundsure Materials, or use the Groundsure Materials in a manner for which they were not intended. The Client may make the Groundsure Materials available to a third party who is considering acquiring some or all of, or providing funding in relation to, the Site, but such third party cannot rely on the same unless expressly permitted under clause 4.
3.6 The Client is responsible for maintaining the confidentiality of its user name and password if using the Order Website and the Client acknowledges that Groundsure accepts no liability of any kind for any loss or damage suffered by the Client as a consequence of using the Order Website.

4 Reliance

4.1The Client acknowledges that the Services provided by Groundsure consist of the presentation and analysis of Third Party Content and other content and that information obtained from a Third Party Data Provider cannot be guaranteed or warranted by Groundsure to be reliable.
4.2 In respect of Data Reports, Mapping and Risk Screening Reports, the following classes of person and no other are entitled to rely on their contents;
(i) the Beneficiary,
(ii) the Beneficiary's professional advisers, (iii) any person providing funding to the Beneficiary in relation to the Site (whether directly or as part of a lending syndicate),
(iv) the first purchaser or first tenant of the Site, and
(v) the professional advisers and lenders of the first purchaser or tenant of the Site.
4.3 In respect of Support Services, only the Client, Beneficiary and parties expressly named in a Report and no other parties are entitled to rely on its contents.
4.4 Save as set out in clauses 4.2 and 4.3 and unless otherwise expressly agreed in writing, no other person or entity of any kind is entitled to rely on any Services or Report issued or provided by Groundsure. Any party considering such Reports and Services does so at their own risk.

5 Fees and Disbursements

5.1Groundsure shall charge and the Client shall pay fees at the rate and frequency specified in the written proposal, Order Website or Order acknowledgement form, plus (in the case of Support Services) all proper disbursements incurred by Groundsure. The Client shall in addition pay all value added tax or other tax payable on such fees and disbursements in relation to the provision of the Services (together "Fees").
5.2 The Client shall pay all outstanding Fees to Groundsure in full without deduction, counterclaim or set off within 30 days of the date of Groundsure's invoice or such other period as may be agreed in writing between Groundsure and the Client ("Payment Date"). Interest on late payments will accrue on a daily basis from the Payment Date until the date of payment (whether before or after judgment) at the rate of 8% per annum.
5.3 The Client shall be deemed to have agreed the amount of any invoice unless an objection is made in writing within 28 days of the date of the invoice. As soon as reasonably practicable after being notified of an objection, without prejudice to clause 5.2 a member of Groundsure's management team will contact the Client and the parties shall then use all reasonable endeavours to resolve the dispute within 15 days.

6 Intellectual Property and Confidentiality

6.1 Subject to
(i) full payment of all relevant Fees and
(ii) compliance with this Contract, the Client is granted (and is permitted to sub-licence to the Beneficiary) a royalty-free, worldwide, non-assignable and (save to the extent set out in this Contract) non-transferable licence to make use of the Groundsure Materials.
6.2 All Intellectual Property in the Groundsure Materials are and shall remain owned by Groundsure or Groundsure's licensors (including without limitation the Third Party Data Providers) the Client acknowledges, and shall procure

acknowledgement by the Beneficiary of, such ownership. Nothing in this Contract purports to transfer or assign any rights to the Client or the Beneficiary in respect of such Intellectual Property.
6.3 Third Party Data Providers may enforce any breach of clauses 6.1 and 6.2 against the Client or Beneficiary.
6.4 The Client shall, and shall procure that any recipients of the Groundsure Materials shall:

(i) not remove, suppress or modify any trade mark, copyright or other proprietary marking belonging to Groundsure or any third party from the Services;

(ii) use the information obtained as part of the Services in respect of the subject Site only, and shall not store or reuse any information obtained as part of the Services provided in respect of adjacent or nearby sites;

(iii) not create any product or report which is derived directly or indirectly from the Services (save that those acting in a professional capacity to the Beneficiary may provide advice based upon the Services);

(iv) not combine the Services with or incorporate such Services into any other information data or service;

(v) not reformat or otherwise change (whether by modification, addition or enhancement), the Services (save that those acting for the Beneficiary in a professional capacity shall not be in breach of this clause 6.4(v) where such reformatting is in the normal course of providing advice based upon the Services);

(vi) where a Report and/or Mapping contains material belonging to Ordnance Survey, acknowledge and agree that such content is protected by Crown Copyright and shall not use such content for any purpose outside of receiving the Services; and

(vii) not copy in whole or in part by any means any map prints or run-on copies containing content belonging to Ordnance Survey (other than that contained within Ordnance Survey's OS Street Map) without first being in possession of a valid Paper Map Copying Licence from Ordnance Survey,

6.5 Notwithstanding clause 6.4, the Client may make reasonable use of the Groundsure Materials in order to advise the Beneficiary in a professional capacity. However, Groundsure shall have no liability in respect of any advice, opinion or report given or provided to Beneficiaries by the Client.
6.6 The Client shall procure that any person to whom the Services are made available shall notify Groundsure of any request or requirement to disclose, publish or disseminate any information contained in the Services in accordance with the Freedom of Information Act 2000, the Environmental Information Regulations 2004 or any associated legislation or regulations in force from time to time.

7.Liability: Particular Attention Should Be Paid To This Clause

7.1 This Clause 7 sets out the entire liability of Groundsure, including any liability for the acts or omissions of its employees, agents, consultants, subcontractors and Third Party Content, in respect of:

(i) any breach of contract, including any deliberate breach of the Contract by Groundsure or its employees, agents or subcontractors;

(ii) any use made of the Reports, Services, Materials or any part of them; and

(iii) any representation, statement or tortious act or omission (including negligence) arising under or in connection with the Contract.

7.2 All warranties, conditions and other terms implied by statute or common law are, to the fullest extent permitted by law, excluded from the Contract.
7.3 Nothing in the Contract limits or excludes the liability of the Supplier for death or personal injury resulting from negligence, or for any damage or liability incurred by the Client or Beneficiary as a result of fraud or fraudulent misrepresentation.
7.4 Groundsure shall not be liable for

(i) loss of profits;
(ii) loss of business;
(iii) depletion of goodwill and/or similar losses;
(iv) loss of anticipated savings;
(v) loss of goods;
(vi) loss of contract;
(vii) loss of use;
(viii) loss or corruption of data or information;
(ix) business interruption;
(x) any kind of special, indirect, consequential or pure economic loss, costs, damages, charges or expenses;
(xi) loss or damage that arise as a result of the use of all or part of the Groundsure Materials in breach of the Contract;
(xii) loss or damage arising as a result of any error, omission or inaccuracy in any part of the Groundsure Materials where such error, omission or inaccuracy is caused by any Third Party Content or any reasonable interpretation of Third Party Content;
(xiii) loss or damage to a computer, software, modem, telephone or other property; and
(xiv) loss or damage caused by a delay or loss of use of Groundsure's internet ordering service.

7.5 Groundsure's total liability in relation to or under the Contract shall be limited to £10 million for any claim or claims.
7.6 Groundsure shall procure that the Beneficiary shall be bound by limitations and exclusions of liability in favour of Groundsure which accord with those detailed in clauses 7.4 and 7.5 (subject to clause 7.3) in respect of all claims which the Beneficiary may bring against Groundsure in relation to the Services or other matters arising pursuant to the Contract.

8 Groundsure's right to suspend or terminate

8.1 If Groundsure reasonably believes that the Client or Beneficiary has not provided the information or assistance required to enable the proper provision of the Services, Groundsure shall be entitled to suspend all further performance of the Services until such time as any such deficiency has been made good.
8.2 Groundsure shall be entitled to terminate the Contract immediately on written notice in the event that:

(i) the Client fails to pay any sum due to Groundsure within 30 days of the Payment Date; or

(ii) the Client (being an individual) has a bankruptcy order made against him or (being a company) shall enter into liquidation whether compulsory or voluntary or have an administration order made against it or if a receiver shall be appointed over the whole or any part of its property assets or undertaking or if the Client is struck off the Register of Companies or dissolved; or

(iii) the Client being a company is unable to pay its debts within the meaning of Section 123 of the Insolvency Act 1986 or being an individual appears unable to pay his debts within the meaning of Section 268 of the Insolvency Act 1986 or if the Client shall enter into a composition or arrangement with the Client's creditors or shall suffer distress or execution to be levied on his goods; or

(iv) the Client or the Beneficiary breaches any term of the Contract (including, but not limited to, the obligations in clause 4) which is incapable of remedy or if remediable, is not remedied within five days of notice of the breach.

9. Client's Right to Terminate and Suspend

9.1 Subject to clause 10.1, the Client may at any time upon written notice terminate or suspend the provision of all or any of the Services.
9.2 In any event, where the Client is a consumer (and not a business) he/she hereby expressly acknowledges and agrees that:

(i) the supply of Services under this Contract (and therefore the performance of this Contract) commences immediately upon Groundsure's acceptance of the Order; and

(ii) the Reports and/or Mapping provided under this Contract are

(a) supplied to the Client's specification(s) and in any event
(b) by their nature cannot be returned.

10 Consequences of Withdrawal, Termination or Suspension

10.1 Upon termination of the Contract:

(i) Groundsure shall take steps to bring to an end the Services in an orderly manner, vacate any Site with all reasonable speed and shall deliver to the Client and/or Beneficiary any property of the Client and/or Beneficiary in Groundsure's possession or control; and

(ii) the Client shall pay to Groundsure all and any Fees payable in respect of the performance of the Services up to the date of termination or suspension. In respect of any Support Services provided, the Client shall also pay Groundsure any additional costs incurred in relation to the termination or suspension of the Contract.

11 Anti-Bribery

11.1 The Client warrants that it shall:

(i) comply with all applicable laws, statutes and regulations relating to anti-bribery and anti-corruption including but not limited to the Bribery Act 2010;

(ii) comply with such of Groundsure's anti-bribery and anti-corruption policies as are notified to the Client from time to time; and

(iii) promptly report to Groundsure any request or demand for any undue financial or other advantage of any kind received by or on behalf of the Client in connection with the performance of this Contract.

11.2 Breach of this Clause 11 shall be deemed a material breach of this Contract.

12 General

12.1 The Mapping contained in the Services is protected by Crown copyright and must not be used for any purpose other than as part of the Services or as specifically provided in the Contract.
12.2 The Client shall be permitted to make one copy only of each Report or Mapping Order. Thereafter the Client shall be entitled to make unlimited copies of the Report or Mapping Order only in accordance with an Ordnance Survey paper map copy license available through Groundsure.
12.3 Groundsure reserves the right to amend or vary this Contract. No amendment or variation to this Contract shall be valid unless signed by an authorised representative of Groundsure.
12.4 No failure on the part of Groundsure to exercise, and no delay in exercising, any right, power or provision under this Contract shall operate as a waiver thereof.
12.5 Save as expressly provided in this Contract, no person other than the persons set out therein shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of the Contract.
12.6 The Secretary of State for Business, Innovation and Skills ("BIS") or BIS' successor body, as the case may be, acting through Ordnance Survey may enforce a breach of clause 6.4(vi) and clause 6.4(vii) of these terms and conditions against the Client in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999.
12.7 Groundsure shall not be liable to the Client if the provision of the Services is delayed or prevented by one or more of the following circumstances:

(i) the Client or Beneficiary's failure to provide facilities, access or information;
(ii) fire, storm, flood, tempest or epidemic;
(iii) Acts of God or the public enemy;
(iv) riot, civil commotion or war;
(v) strikes, labour disputes or industrial action;
(vi) acts or regulations of any governmental or other agency;
(vii) suspension or delay of services at public registries by Third Party Data Providers;
(viii) changes in law; or
(ix) any other reason beyond Groundsure's reasonable control.

In the event that Groundsure is prevented from performing the Services (or any part thereof) in accordance with this clause 12.6 for a period of not less than 30 days then Groundsure shall be entitled to terminate this Contract immediately on written notice to the Client.

12.8 Any notice provided shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post, facsimile or by email to the address, facsimile number or email address of the relevant party as may have been notified by each party to the other for such purpose or in the absence of such notification the last known address.

12.9 Such notice shall be deemed to have been received on the day of delivery if delivered by hand, facsimile or email (save to the extent such day is not a working day where it shall be deemed to have been delivered on the next working day) and on the second working day after the day of posting if sent by first class post.

12.10 The Contract constitutes the entire agreement between the parties and shall supersede all previous arrangements between the parties relating to the subject matter hereof.

12.11 Each of the provisions of the Contract is severable and distinct from the others and if one or more provisions is or should become invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions shall not in any way be tainted or impaired.

12.12 This Contract shall be governed by and construed in accordance with English law and any proceedings arising out of or connected with this Contract shall be subject to the exclusive jurisdiction of the English courts.

12.13 Groundsure is an executive member of the Council of Property Search Organisation (CoPSO) and has signed up to the Search Code administered by the Property Codes Compliance Board (PCCB). All Risk Screening Reports shall be supplied in accordance with the provisions of the Search Code.

12.14 If the Client or Beneficiary has a complaint about the Services, written notice should be given to the Compliance Officer at Groundsure who will respond in a timely manner.

12.15 The Client agrees that it shall, and shall procure that each Beneficiary shall, treat in confidence all Confidential Information and shall not, and shall procure that each Beneficiary shall not (i) disclose any Confidential Information to any third party other than in accordance with the terms of this Contract; and (ii) use Confidential Information for a purpose other than the exercise of its rights and obligations under this Contract. Subject to clause 6.6, nothing shall prevent the Client or any Beneficiary from disclosing Confidential Information to the extent
required by law

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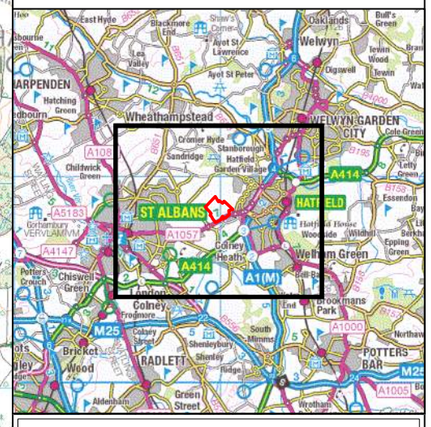
DRAWINGS

DRAWING 01: SITE LOCATION PLAN

LEGEND

SITE BOUNDARY

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

SITE LOCATION PLAN

001

Scale 1:30,000 @ A3

Date SEPT 2021

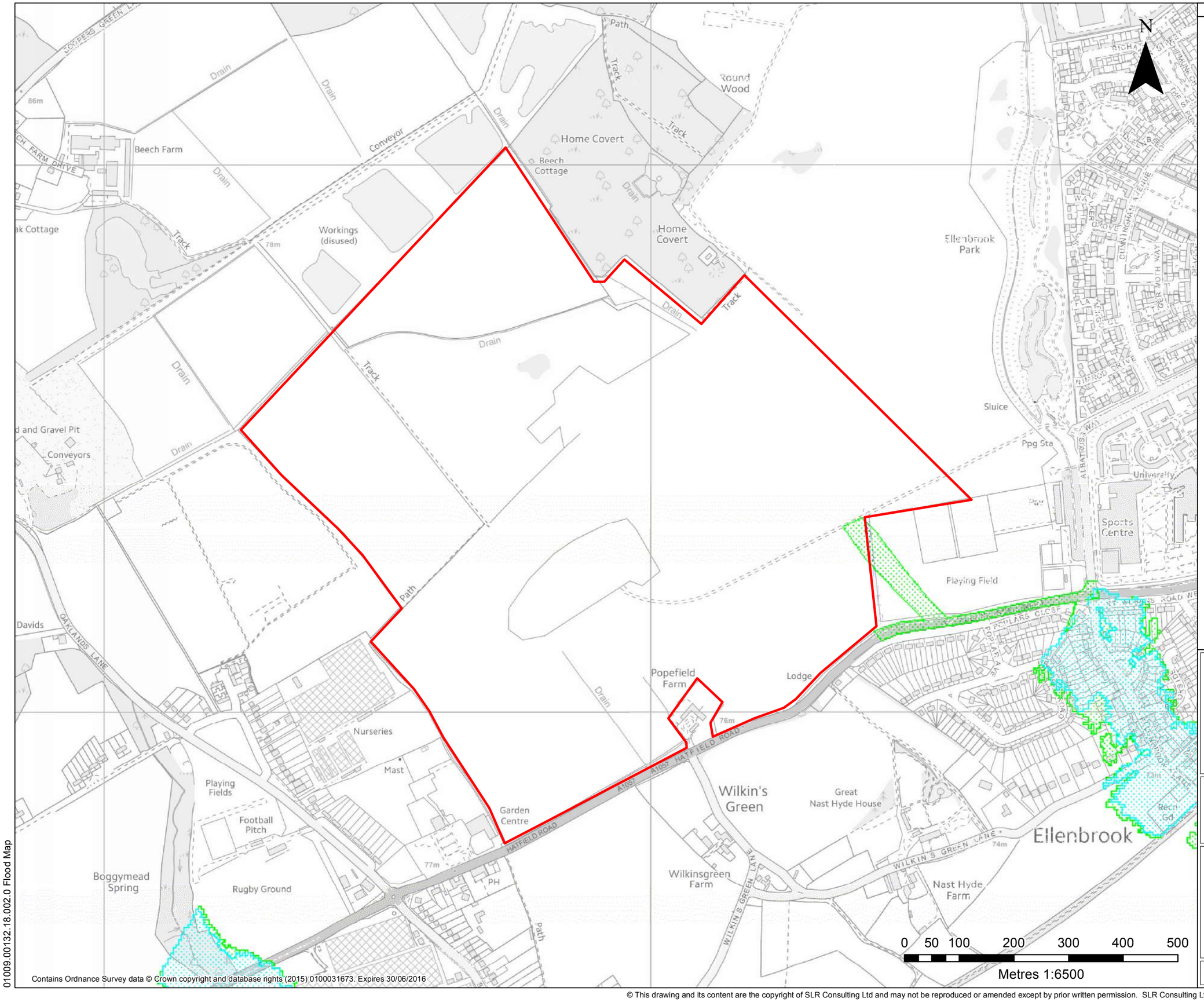
0 2 4 8 12 16 20 Kilometres 1:30000

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01009.00132.18.001.0 Site Location Plan

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DRAWING 02: EXTRACT OF ENVIRONMENT AGENCY FLOOD MAP



LEGEND

- SITE BOUNDARY
- FLOOD ZONE 2
- FLOOD ZONE 3

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HATFIELD AERODROME

FLOOD RISK ASSESSMENT

EXTRACT OF ENVIRONMENT AGENCY FLOOD MAP

002

Scale 1:6,500 @ A3

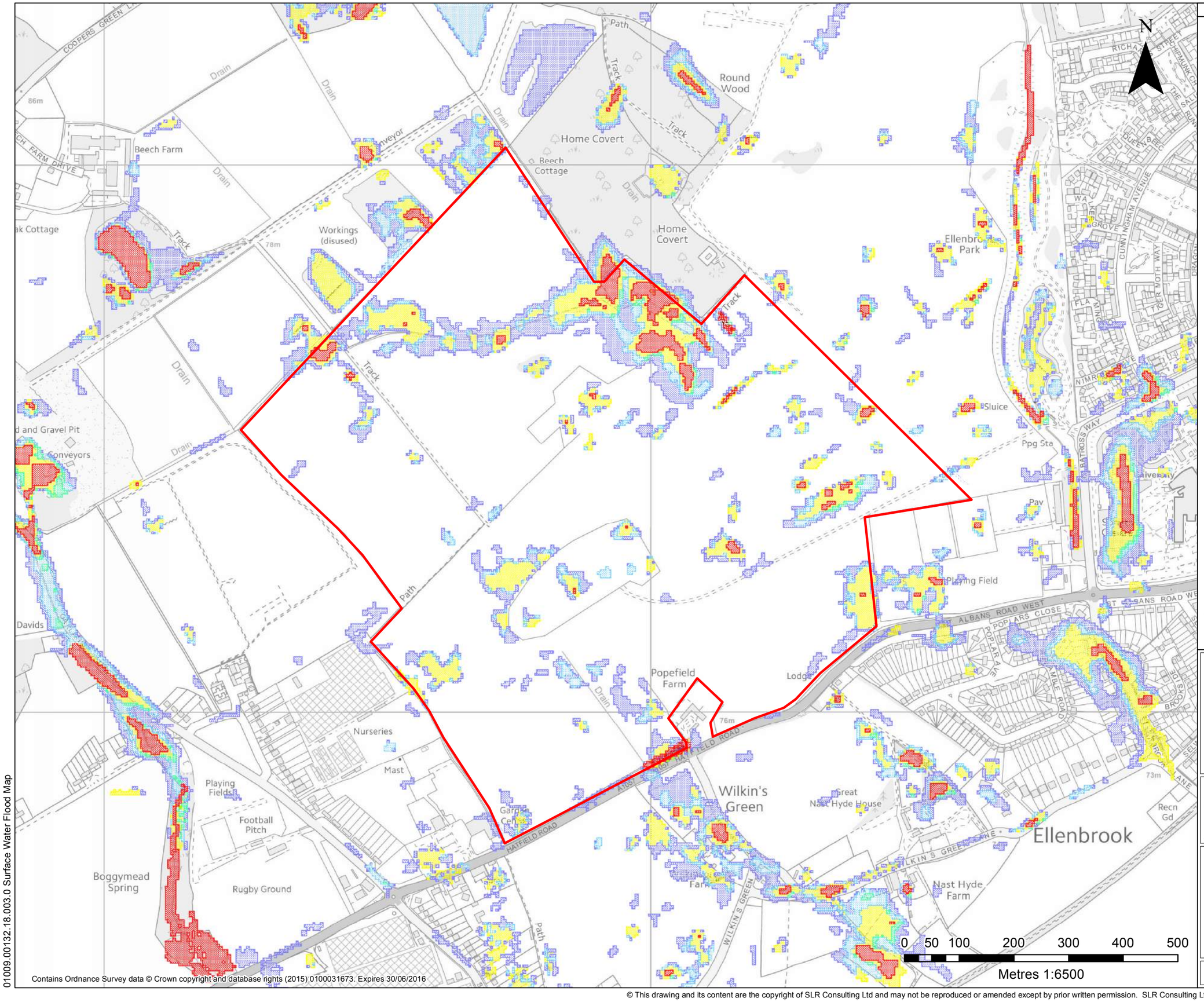
Date SEPT 2021

01009.00132.18.002.0 Flood Map

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DRAWING 03: EXTRACT OF ENVIRONMENT AGENCY SURFACE WATER FLOOD MAP



LEGEND

- SITE BOUNDARY
- HIGHLY SIGNIFICANT
- SIGNIFICANT
- HIGH
- MODERATE TO HIGH
- MODERATE
- LOW TO MODERATE
- LOW

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HATFIELD AERODROME

FLOOD RISK ASSESSMENT

EXTRACT OF ENVIRONMENT AGENCY SURFACE WATER FLOOD MAP

003

Scale 1:6,500 @ A3

Date SEPT 2021

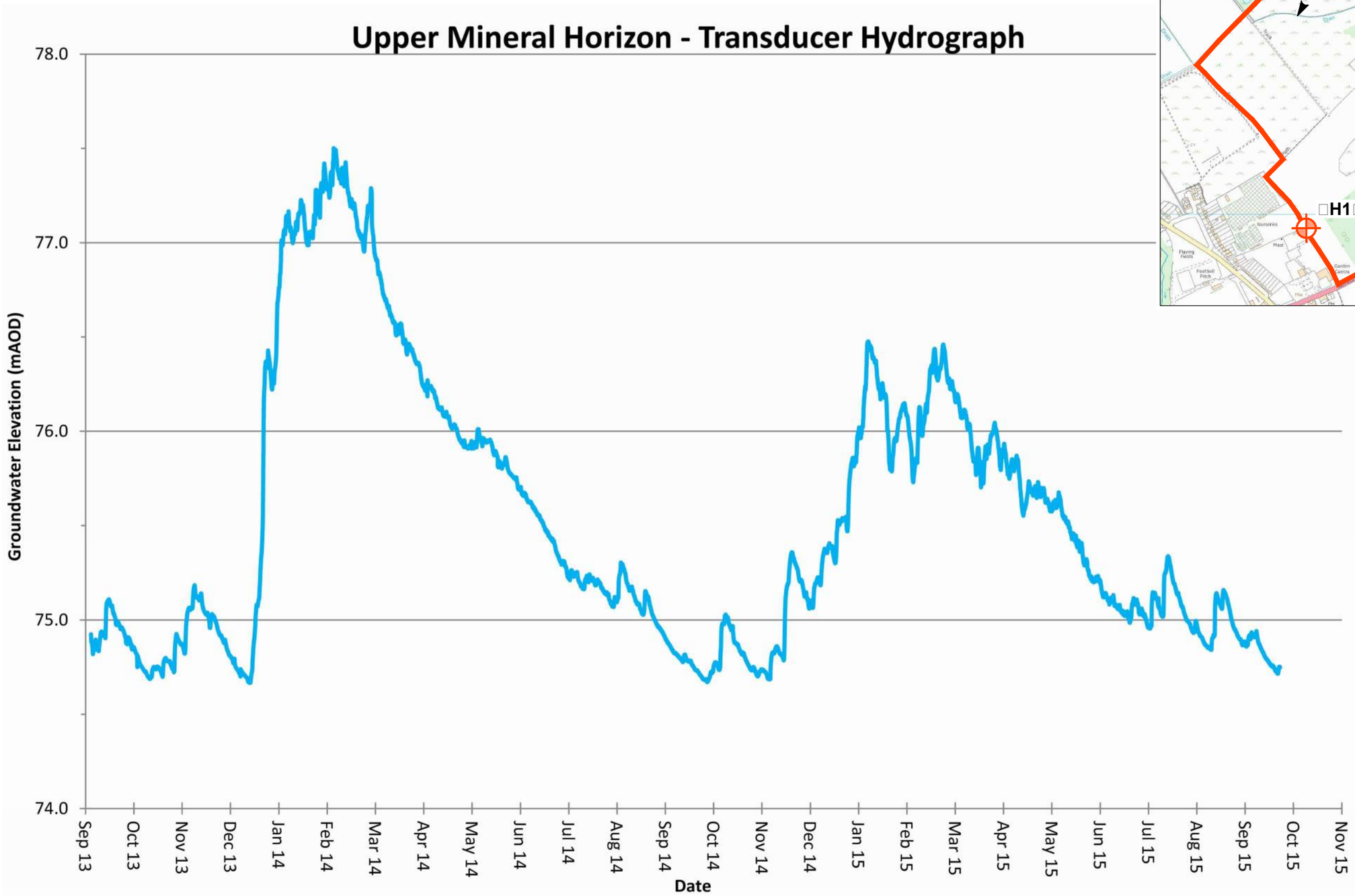
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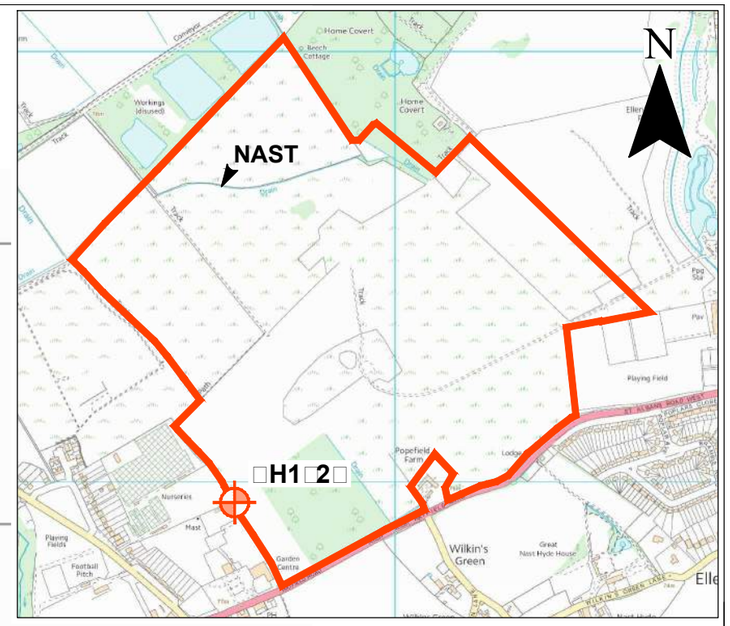
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DRAWING 04: GROUNDWATER MONITORING LOCATIONS

Upper Mineral Horizon - Transducer Hydrograph





SITE BOUNDARY

SLR BOREHOLE

□H1□2□ MONITORING WELL LOCATION

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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

GRO□NDWATER MONITORING □OREHOLE LOCATION

DWG N□□□□□

Scale 1:5000 @ A3

Date SEPTEMBER 2021

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HATFIELD ROAD QUARRY

Planning Permission [PL/0755/16]

Details required under Condition [26] and [30]

Groundwater and Water Management Plan

Final (Version 6)

Prepared for: Brett Aggregates Limited

SLR Ref: 403.01009.00190
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Appendix 05: QHEST management system
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ABBREVIATIONS

Agency – The Environment Agency

Affinity – Affinity Water plc

Brett – Brett Aggregates Limited

CQA – Construction Quality Assurance

IB - Interburden

UMA – Upper Mineral Aquifer

UMH – Upper Mineral Horizon

UML – Upper Mineral Lagoon

LMA – Lower Mineral Aquifer

LMH – Lower Mineral Horizon

LML – Lower Mineral Lagoon

mAOD – metres above ordnance datum

1.0 INTRODUCTION

1.1 Overview

Brett Aggregates Limited (Brett) has applied for planning permission for the establishment of Hatfield Road Quarry, a new quarry on land at the former Hatfield Aerodrome. The proposals will involve the winning and working, together with processing for sale, of approximately 8Mt of sand and gravel over a period of around 30 years. In parallel with the extraction of minerals there will be the importation of low permeability inert material to infill the shallow mineral workings to facilitate the restoration of the site to a beneficial after use, combining recreation and nature consideration.

The draft planning conditions issued by Hertfordshire County Council (**Reference PL/0755/16**) includes several conditions requiring the submission of further information relating to the management of water. This report is submitted in advance of the planning determination to satisfy the conditions listed below but also takes into consideration discussions with the Environment Agency (the Agency) and Affinity Water plc (Affinity) up to 2020 and has been updated to reflect changes in the operational method:

- Condition 26 - Groundwater Management Plan, and
- Condition 30 - A Water Management Plan.

1.2 Requirements

1.2.1 Condition 26 Groundwater Management Plan

Draft Condition 26 of the planning permission relates to the management of groundwater and provides that:

26. Groundwater Management Plan

The development hereby permitted shall not commence until a Water Monitoring & Management Plan, including a timetable of monitoring and submission of reports to the local planning authority, has been submitted to, and approved in writing by, the local planning authority. Reports as specified in the approved plan, including details of any necessary contingency action arising from the monitoring, shall be submitted to, and approved in writing by, the local planning authority.

i. No mineral is extracted from within the existing plume of bromate and bromide groundwater pollution
ii. any activities close to the plume must not change the existing hydrogeological flow regime
iii. any activities close to the plume must not interfere with the remediation of the bromate and bromide

The Water Monitoring and Management Plan shall include:

1. details of construction and water management during construction of the two infiltration lagoons.

2. clarification of the restored site discharge point for the UML back-drain.

3. a long-term groundwater monitoring plan to continue during and post the operational phase.

4. a mechanism for periodic review.

The plan should include monitoring and reporting programs, location of monitoring points including additional monitoring boreholes particularly in the vicinity of the infiltration lagoons, analytical suites, limits of detection and groundwater level monitoring. Details of contingency actions in the event of impact shall also be included.

The two infiltration lagoons and back drain shall be constructed in accordance with the approved Groundwater Management Plan prior to the commencement of mineral extraction.

Groundwater monitoring shall be conducted by the Mineral Operator in accordance with the long-term groundwater monitoring plan for the lifetime of the development. Prior to mineral extraction in each Phase, the Groundwater Management plan shall be reviewed, and an updated plan submitted and approved in writing by the Mineral Planning Authority.

The management of water shall be carried out in accordance with the approved Plan, or as otherwise agreed by the Mineral Planning Authority under the periodic review process, for the lifetime of the development.

Reasons:

To protect controlled waters throughout the mineral extraction phasing;

To ensure there is no deleterious impact to groundwater quality, in accordance with Policy 16 (Soil, Air and Water) of the Hertfordshire Waste Core Strategy 2012;

To prevent development that would have an unacceptable risk or adversely affect water pollution;

To minimise the risks associated the flow and quantity of surface and groundwater and migration of contamination from the site, in accordance with paragraph 143 of the NPPF.

1.2.2 Condition 30 A Water Management Plan

Draft Condition 30. requires that a water management plan is submitted and approved by the Mineral Planning Authority (Hertfordshire County Council, HCC). Details of Condition 30 and the reason for it are provided below.

30 Water Management Plan

Prior to the commencement of mineral extraction in each Phase, a water management plan shall be submitted and approved in writing by the Mineral Planning Authority. The water management plan shall detail measures to manage water from the lagoons, including an exceedance route for discharge of water from the lagoons as surface water under exceptional circumstances, and include a mechanism for periodic review. The management of water shall be carried out in accordance with the approved Plan, or as otherwise agreed by the Mineral Planning Authority under the periodic view process, for the lifetime of the development.

Reason:
To minimise the risk of surface water flooding and in the interests of water quality.

This is the initial water management plan and provides information relating to water management during development of the site. It is proposed that a phase specific water management plan will be prepared and submitted to the Mineral Planning Authority prior to the commencement of mineral extraction in each phase. This will allow specific conditions of each phase to be considered and for the management options to be revisited in the light of experience from previous phases and changes in background conditions.

1.3 Response Structure

We have amalgamated our response to the two draft conditions into a single response because the topics as stated are related and overlap and one response will avoid repetition and possible confusion.

We have used this document to answer the specific points being raised within the context of the Sites Operational Plan for mineral extraction which sets the framework for the water management requirements.

The specific conditions require the preparation of a Water Management Plan to include the following:

- Details of the construction of infiltration lagoons and water management during their construction (addressed in Section 2)
- Clarification of the restored site discharge point for the back-drain in the UMH (addressed in Section 2)

- A long-term groundwater monitoring plan to continue during and post the operational phase (addressed in Section 3)
- A mechanism for periodic review (addressed in Section 2)

The requests listed above have been inserted into the relevant sections of this report where the topic is specifically discussed.

1.4 Supporting Data

1.4.1 Groundwater Pumping Test and Groundwater Abstraction Licence

A groundwater pumping test has been carried out to support a licence application for groundwater abstraction for mineral washing and transfer from the Upper Mineral Aquifer (UMA) and to provide technical data for both the UMA and Lower Mineral Aquifer (LMA) to validate and refine previous assumptions and facilitate any future assessments. This pumping test has been reported separately (SLR report ref: 402.01009.00226.01_v2, Sept 2018) and forms Appendix 01 of this document.

An application for an abstraction licence was made following completion of the pumping test and an abstraction license obtained:

Brett Aggregates Ltd, Licence Serial No. TH039/0028/054 active from 02/11/2018 to 31/03/2026.

2.0 OPERATIONAL PLAN

2.1 Site Geology and Groundwater Occurrence

The site is located within superficial Lowestoft Formation which overlies the Lewes Nodular Chalk. The superficial deposits beneath the proposed working area comprise four units overlying the Chalk bedrock. There are groundwater aquifers in the two granular superficial horizons, as summarised in Table 2-1.

Table 2-1
Geology and Groundwater Occurrence

Geological Unit	Description	Thickness	Groundwater
Overburden	Predominantly clayey, silty sands	0m – 2m	Seasonally saturated by the underlying UMA
Upper Mineral Horizon (UMH)	Silty sands and gravels	4m – 6m	Upper Mineral Aquifer (LMA) (perched on aquitard below)
Interburden (IB)	Boulder Clay (Stiff glacial clay)	3m – 5m	Aquitard (Barrier to groundwater flow)
Lower Mineral Horizon (LMH)	Sands and gravels	5m – 7m	Lower Mineral Aquifer (LMA) (hydraulically connected with the underlying Chalk aquifer)
Chalk Bedrock (Lewes Nodular Chalk)	Weathered at its surface increasing competency with depth	Unproven thickness on site	Chalk Aquifer

2.2 Mineral Development Plan

The quarry will work the two main superficial deposit horizons (UMH and LMH), which will be extracted and backfilled in Phases (Phase A through Phase G), in a staged approach. The Phase A operational plan is shown on Drawing HA-PCC-C9 in Appendix 02.

2.2.1 Upper Mineral Horizon

The UMH is partially saturated and will be dewatered to allow the mineral to be worked dry. A 4m - 10m thick sidewall geological barrier will be keyed into the underlying IB surface and will form a clay buttress around the perimeter of each phase (Drawing 006 in Appendix 02). The engineered geological barrier will allow isolation of the UMA within each phase in order that it can be dewatered without drawing in water from the wider UMA thus allowing the UMH to be worked dry. The sidewall geological barrier / clay buttress will be constructed using standard engineering practice and will be subject to Construction Quality Assurance (i.e., specification, CQA Plan, independent supervision, and validation report).

Groundwater abstracted from the UMA during the construction of each Phase and its subsequent operation will be transferred to the silt lagoons in the processing plant area to provide mineral washing water (under licence issued by the Agency). Any water which is not required for mineral washing will be transferred into the Upper Mineral Lagoon (UML) where it will infiltrate back into the UMA outside of the mineral working area.

UMH Perimeter Buttress

Each phase will be constructed with a perimeter buttress as described above and illustrated on Drawing 006 in Appendix 02. The perimeter buttress forming the outside perimeter of the mineral development site will remain in place in perpetuity, whereas internal buttresses will be progressively removed as the phases are sequentially developed.

UMH Back Drain

The back drain will be constructed to manage the groundwater level and maintain the stability of the landfill perimeter buttress until site restoration. The drain as shown on drawing 'Infiltration Lagoons & Buttress Schematic Sections' comprises a collection pipe and a granular blanket across the cut face of the UMH and partially the Overburden.

The recorded UMA groundwater level will be reduced by c.1m by gravity flow and/or pumping and will be discharged to the mineral processing area silt lagoons to provide mineral washing water with any excess transferred, after settlement, to the UML for recharge back into the UMA. Section 2.3.3 presents estimates of water volumes calculated for the back-drain flow.

The drawing 'Infiltration Lagoons & Buttress Schematic Sections' does not at this stage refer to topographic levels in Ordnance Datum as they are intended only to show design principles and the proportions of the different features are not to scale. Detailed construction drawings which reference Ordnance Datum will be prepared following granting of planning permission as part of the Specification and CQA Plan for construction.

2.2.2 Lower Mineral Horizon

Access to the LMH will be progressed once the UMH in each phase has been dewatered, the mineral excavated under dry conditions and the IB surface is exposed.

The LMH is partially or fully saturated depending on the season and phase location and a methodology for mineral extraction has been devised for each of these scenarios which is described below. The extraction of the LMH will be undertaken on a 'wet' campaign basis during periods of the year when the LMA is at its seasonal low and in accordance with the three hydrogeological scenarios set out below. The purpose for this is to reduce the potential for, and safeguard LMA/Chalk groundwater mixing with UMA groundwater.

1. **Pre-Excavation Preparation**

- An assessment of the potential for basal heave was undertaken in association with the inert landfill permit application (Ref: EPR/EB3808HD/A001). Calculations proved an acceptable factor of safety against basal heave.
- IB mapping from borehole data, piezometric surface mapping of water levels from manual dips and transducers will be used to predict the piezometric surface relative to the top of the IB.
- The active phase will be subdivided according to three conditions, 1) LMH unconfined, 2) LMH confined with piezometric head lower than the upper surface of the IB, and 3) LMH confined with piezometric head higher than the upper surface of the IB.
- The piezometric surface of the LMA for each phase will be confirmed by drilling a small diameter borehole through the IB to prove the top of the LMH and to confirm the LMA piezometric surface.

2. **LMA is Unconfined – piezometric surface is within the LMH**
   - The clay IB will be removed from above the LMH in small operating cells of c.100m x 30m in area,
   - IB will be stored for re-use in backfilling / restoration,
   - The exposed mineral will be excavated 'wet' using the dry surface of the mineral as an operating platform,
   - At least 1m of LMH mineral will be left in place above the chalk surface,
   - This procedure is applicable to most of the phases and will not require pumping of groundwater from the LMA.

3. **LMA is Confined – piezometric surface rests within the Interburden horizon below the Interburden surface**
   - The IB above the piezometric surface will be excavated removed to stockpile for re-use in backfilling / restoration,
   - With the equipment working from the remaining IB bench the IB above the LMH will be removed in strips and placed to stockpile for re-use in backfilling / restoration,
   - Simultaneously, mineral from the LMH will be excavated and placed to form a raised working bench above the surface of the water which will be used as an operating platform for the wet extraction of the LMH.
   - At least 1m of LMH mineral will remain in place above the chalk surface,
   - The scenarios described will not require pumping of groundwater from the LMA.

4. **LMA is Confined – piezometric surface rests above the Interburden horizon.**
   - No removal of the IB or extraction of the LMH will take place when these conditions exist within an operational phase.

2.2.3 LMH Backfilling

Backfilling of the LMH void will be undertaken using site won overburden and IB material only. The LMH void will be filled concurrently with the mineral extraction process in small areas as defined above (c.100m x 30m) and will self-consolidate when placed beneath the water. LMH mineral will be left in place if there is insufficient site won overburden and IB to backfill all the phases of the LMH.

Site won backfill will be placed in the LMH void until it is a minimum of 1m above the groundwater level or at the base of the IB, at which point it will form the subgrade for construction of the basal geological barrier for the inert landfill.

As the filling proceeds and given the permeability of the LMA, it is expected that any resulting mounding of the groundwater surface created by the infilling process will be slight and short-lived and the groundwater equilibrium will quickly re-establish itself because of the hydraulic properties of the chalk/LMH aquifer.

2.2.4 Geological Barrier

The subgrade will be prepared, and the geological barrier constructed using standard engineering techniques and will be subject to Construction Quality Assurance (i.e., specification, CQA Plan, independent supervision, and validation report). The basal geological barrier will in essence reinstate the IB layer separating the UMH from the LMH, and together with the sidewall geological barrier will form a continuous engineered seal across the entire site.

Once each area is lined, inert waste can then be placed into the void above the basal geological barrier and adjacent to the sidewall geological barrier/UMH perimeter buttresses. The site will be restored with subsoil and topsoil to a similar level as the unworked site in accordance with the approved restoration plan.

2.3 Infiltration Lagoons

Two water infiltration lagoons will be constructed on the hydraulically down gradient, northeast perimeter of the site (Drawing HA-PCC-C9 in Appendix 01). The Upper Mineral Lagoon (UML) will only discharge water into the UMH, the Lower Mineral Lagoon (LML) will only discharge into the LMH, but both lagoons will only accept UMA groundwater. Both lagoon locations are sited hydraulically down gradient of the mineral works for the respective aquifers.

The UML is the primary location for the infiltration of water originating from the UMA during the process of bund construction, perimeter back drain flow and control of incident rainfall entering the operational phase.

Table 6-15 in ES Chapter 6 illustrates the range of UMA discharge volumes predicted for the various development stages of the site, together with predicted lagoon recharge capacity. Calculations indicate that there could be a shortfall in capacity that occurs during the periods of highest UMA groundwater levels, albeit for short periods and sometimes not at all. The theoretical shortfall is of the order of 150m3/d which is within the bounds of operational control (the site could temporarily stop operations, direct flow to mineral processing lagoons etc).

This situation is mitigated by the proposed LMH lagoon which will be constructed to accept an over-flow of UMA during such times and as the need arises.

Continuous monitoring of UMA groundwater levels has been carried out since 2013 to date and records across 8 seasonal water level cycles indicate that maximums vary but typically occur between November and March.

In Chapter 6 of the ES, it is described how UMA groundwater levels within and adjacent to Home Covert directly north of the UML are influenced by CEMEX operations to the north and the discharge of surface water from within their boundary. This water should discharge into the culvert beneath the former airfield but generally fails to do so for several possible reasons (blockage of the ditch/channel feeding the culvert, damage or collapse of the culvert over the years). This results in the ponding of surface water which is recorded on the hydrograph for BH104U as a local anomalous feature. This situation will be rectified as part of the proposed Nast drainage works and replacement culvert.

2.3.1 Lagoon Construction

Condition 26 (i) details of construction and water management during construction of the two infiltration lagoons.

Proposed excavation, engineering fill levels and schematic cross sections showing the construction of the infiltration lagoons are provided in Appendix 02. Precise details of the construction and water management are subject to the methodology provided by the successful contractor who will undertake the work, although the proposed sequence of construction and an outline of the management of surface water and groundwater are given below.

The infiltration lagoons will be constructed in a similar manner to the Upper Mineral phase buttresses i.e. using standard engineering practices and subject to CQA.

Lower Mineral Lagoon

The LML will be constructed first and will be isolated from the surrounding UMH by the construction of an engineered clay buttress anchored into the IB. This will involve local dewatering of the UMH to allow the clay buttress to be constructed in a dry excavation, with water being recharged back into the UMH in an adjacent temporary infiltration area on the location of the UML. The clay buttress will be constructed in relatively small sections to minimise the extent of dewatering of the UMA required to construct it and to manage the water volume being returned to the aquifer.

When the clay buttress is complete the UMH remaining within the perimeter of the clay buttress of the lagoon will be dewatered and the UMH extracted from the lagoon in a dry state.

The optimum seasonal period for working the UMH is June through November when natural UMA groundwater levels are at their lowest, which will further reduce the scale of dewatering work required during this commencement phase.

The IB will then be excavated down to its base where the excavation will stop. We do not intend to excavate the LMH in the LML, just expose its surface to facilitate infiltration. Based on groundwater monitoring data, water levels in the LMA at the location of the LML rarely rise above the base of the IB.

Upper Mineral Lagoon

The UMH lagoon will be constructed after the LMH Lagoon.

The UML will be isolated at its entire boundary by the construction of an engineered clay buttress anchored into the IB. This will involve local dewatering of the UMA to allow the clay buttress to be constructed in a dry excavation, with water being recharged back into the adjacent LMA. The clay buttress will be constructed in relatively small sections to minimise the extent of dewatering and to manage the water volume being returned to the LMA.

When the entire clay buttress is complete the UMA remaining within the perimeter of the clay buttress of the lagoon will be dewatered and the UMH extracted from the lagoon in a dry state. Some of the northern and all the eastern clay buttress will then be removed to allow lateral hydraulic connection of the lagoon and the UMA east of the lagoon. The western, southern, and part of the northern buttress will remain in place.

A shallow engineered buttress will be installed from ground level to a depth of approximately 2m (74.5mAOD) to prevent erosion of the overburden when the lagoon is operational.

The optimum seasonal period for working the UMH is June through November when natural UMA groundwater levels are at their lowest, which will further reduce the scale of dewatering work required during this commencement phase.

A plan showing the lagoon locations and cross sections showing the proposed construction of the infiltration lagoons are provided in Appendix 03.

2.3.2 Operational Water Management

Water Discharge Sources

The water sources to be managed on the site when the site is operational are listed in **Error! Reference source not found.**.

Table 2-2
Sources of Discharge

Source	Point of Discharge (UMA or LMA via lagoons)	
	UML	LML
1. Incident rainfall and runoff	Yes	Yes
2. Dewatering discharge from the UMH (if not used for mineral processing)	Yes	Yes
3. Discharge from back drain behind UMH clay buttresses (if not used for mineral processing)	Yes	Yes
4. River Nast (Existing and Proposed)	No	No

1. Incident rainfall and runoff

Rainfall and runoff from the mineral processing area will predominantly infiltrate into the ground in which case it will be incorporated into shallow UMA groundwater that could ultimately recharge the River Nast although not significantly. When diverted the River Nast will flow through the site via open ditch and culvert and will by-pass the lagoons ultimately discharging into the Ellenbrook, as existing (see points 5 and 6 below).

Rainfall and runoff within each individual UMH mineral development phase will be incorporated into the dewatering discharge from the UMA, which will be discharged to the UMA or via the UML into the LMA in accordance with conditions described in Section 2.3.4, Point 3.

2. Dewatering discharge from the UMH

Groundwater pumped from the UMA during dewatering in each phase will be transferred by overland pipeline and discharged to the silt lagoons in the mineral processing area to provide mineral washing water. Any excess to this requirement will instead be transferred to the UML.

3. Discharge from back drain behind clay buttresses in UMH

Groundwater captured by the perimeter back drain will be transferred from pumping stations by overland pipeline and discharged to the silt lagoons in the mineral processing area to provide mineral washing water; again, any excess to this requirement will instead be pumped to the UMA or the LMA via the UML and LML respectively.

4. Existing Nast

The Nast is an ephemeral stream which has been recorded to flow between approximately January and April although only four times in the last 7 years (2014, 15, 16 and 20 with no-flow in 2017, 18 and 19). It is approximately 1m wide and 0.4m deep and flow is only recorded when the UMA water table reaches the invert level of the ditch i.e., c. 0.4mbgl.

Flow in the ditch rises near the northwest site boundary with CEMEX Hatfield Quarry. When flow occurs, it connects to a network of local shallow ditches for storage and enhanced infiltration across the area reserved for Brett's processing plant. The Nast follows a straightened route towards Home Covert Wood where it joins with the Home Covert ditch which transmits surface water from CEMEX to the north, south along the western side of Home Covert.

The combined flow should enter a culvert that passes beneath the former Hatfield Aerodrome runway and the University playing fields, however, as described previously, a combination of issues results in surface water backing up near the confluence of the Nast and the Home Covert ditch, causing groundwater levels to locally rise in this area during some winter months.

5. Diverted River Nast

The current route of the Nast passes through the proposed mineral processing area for the site, so to facilitate plant construction it will be re-routed along the northern site boundary towards Home Covert Wood and then south along the western side of Home Covert wood.

The diverted Nast will flow in a culvert and discharge into the Home Covert ditch after which the combined flow will enter a replacement culvert constructed along the engineered buttress between the infiltration lagoons and operational Phase B and A. It then follows its existing route under the University playing fields to the road ditch on the Hatfield – St Albans Road as illustrated on Drawing HA-PCC-C9 in Appendix 02. This diverted route for the River Nast is not substantially different to that existing today and as experienced in the past, we expect flow in the Nast to be seasonal.

The infrastructure built for the Nast diversion will not be used for transfer of pumped UMA groundwater.

2.3.3 Estimated Water Discharge Volumes

Detailed design of the lagoons will ensure they have capacity to manage the predicted volumes of water and to recharge water back into the UMA. Details of the geology and the range of groundwater levels for each phase, and the estimated water discharge volume calculations are presented in Appendix 03. The estimated water volumes are the same as those presented in Appendix 6/10 of the Environmental Statement (ES). Steady state flow volume estimates are presented in Table 2-3.

Table 2-3
Summary of Predicted Water Volumes

Source of Water	Potential Volume (m3/day)	Discharge Location
Dewatering discharge for UMH clay buttress construction	Up to 350	Mineral Washing Lagoon or UMH Lagoon (LMH Lagoon if required)
Back drain flow	110 - 360	
UMH groundwater and rainfall in each phase	110 -150	
Back-drain discharge from restored site (open external ditch along Phase E and G)	Up to 450m	UMH Lagoon (enlarged to include footprint of LMH Lagoon)
Restored site runoff	41,000	UMH Lagoon (enlarged to include footprint of LMH Lagoon)
Total estimated discharge to Mineral Washing Lagoon or UMH Lagoon	1,100 – 1,800	Mineral Washing Lagoon or UMH Lagoon
UMH Lagoon Infiltration Capacity	725 – 1,400 m3/day	
LMH Lagoon Infiltration Capacity	6,000 – 9,500m3/day	
UMH Restoration Lagoon Storage Capacity	93,000 - 167,000m3	

2.3.4 Lagoon Discharge Management

Condition 30 The water management plan shall detail measures to manage water from the lagoons, including an exceedance route for discharge of water from the lagoons as surface water under exceptional circumstances, and include a mechanism for periodic review

As described in Section 2.3.2 the UML is designed to accept pumped groundwater from the UMH. The following principles (to be under constant review) will manage the lagoon discharge:

1. The three water discharge sources (Back drain, dewatering for buttress construction, UMH groundwater control in operational phase) are all manually controlled by pumps; there will be no automatic or uncontrolled discharges into the UML
2. Groundwater from the UMH will be discharged to the silt lagoons in the mineral processing area, and into the UML
3. In exceptional circumstances groundwater from the UMA may be discharged into the LML via the UML but only following appropriate water quality analysis, and discussion within the 6-monthly review meetings or through on-line discussion with the stakeholder representatives depending on urgency. Approval to discharge will be provided by the Brett Managing Director

4. A manually operated spillway will be installed between the UML and LML at an elevation of 75.5m AOD to allow water to discharge from the UML to the LML. The spillway will be locked in the closed position when not in use and will only be opened and used upon completion of the procedure described in item 3 above
5. Water levels will be continuously monitored in the UMA recharge lagoon using a pressure transducer and data logger system. The system will include telemetry and automatic alarms which will notify operational staff when pre-set maximum levels are reached
6. Water from the UML will only be released when the approvals described in Point 3 above are satisfied
7. If the pre-determined maximum water level in the LML is reached (72mAOD) all pumping will stop until water levels fall. Water levels in the lagoons will be recorded continuously using transducers, with an alarm set if the maximum level is reached
8. A comprehensive programme of water level monitoring and water quality sampling is being implemented at the site. Further details are presented in Section 3.0 of this document.

2.3.5 Performance Reviews and Progress Meetings

Careful management of any water discharge is fundamental to the successful operation of the site and will require the understanding and integration of many environmental and operational factors. Examples include:

- Developing a seasonally controlled operating plan that minimises as far as reasonably possible, the need to pump and discharge water
- Seasonal changes in groundwater levels and its impact on water discharge volumes from back drain flow and UMA dewatering requirements
- Third party influences such as Affinity pumping rates
- Lagoon performance with water level changes
- Operational factors such as siltation of lagoons and maintenance
- Water discharge changes due to product demand changes; and
- The results of monitoring for Bromate and Bromide.

For all these reasons and more, the water management plan is unlikely to be static and therefore will be under constant internal review.

There will be 6 monthly review meetings for the duration of the development to:

- Share operational statistics about the guiding principles listed above, and to
- Monitor system performance:
  - water level changes
  - volumes pumped and discharged
  - lagoon performance
  - flow in the Nast
  - flow from back drains
  - water quality data; and
  - any local concerns or other environmental issues.

It is proposed that these meetings are attended by Brett, the Agency, Herts CC, and Affinity. The frequency of these meetings will not be reduced unless all parties agree and additional meetings or sharing of data will occur

as and when required to discuss any issues that arise, significant changes in monitoring results, or proposed significant changes to operational practice.

2.3.6 Restoration Phase Water Management

Details of the restored landform are shown on Drawing HA-PCC-C55-REST in Appendix 04. The landform comprises a gentle easterly sloping surface with surface water ditch and pond features including the retained and enlarged UMH infiltration lagoon.

Water Discharge Sources

Once the site is restored no pumping of groundwater in the UMH will take place, the dewatering discharge from the UMH will stop and back drains on the outside of the clay buttresses will no longer be required although will remain in situ.

Water sources to be managed on the restored site include:

1. Shallow UMA groundwater from the west and northwest of the site which will be diverted around the site due to the nature of geological barrier and inert material used to fill the site
2. Incident rainfall and runoff
3. River Nast.

Western Back Drain

Condition 26 (ii) ***Clarification of the restored site discharge point for the UMA back-drain***

A back-drain comprising a 500mm deep open channel will be constructed on the western margin of the Phase E and G perimeter buttress (Drawing HA-PCC-C55-REST in Appendix 04). The function of the 'western back drain' is to intercept shallow groundwater during exceptionally wet periods when UMA groundwater levels have risen to near ground (level as shown historically for example February 2014, March 2020).

The western back drain will slope north and south from its mid-point directing any flow along the outside of the northern and southern perimeter buttress. The northern and southern perimeter parts of the western back drain will extend east to the location where the restored ground elevation is 76mAOD at which point the back-drain channels will direct flow into swales leading to the interior of the site and onward to the enlarged recharge lagoon in the UMH. Runoff will then be re-infiltrated into the UML.

Surface Water Runoff

The greatest increase in surface water runoff from the proposed development will be during the restored phase as this will comprise the largest area of less permeable surface due to the underlying fill and restoration soils. Runoff will be directed to a network of swales, ditches, and pond features towards the enlarged UMLs where the water will be re-infiltrated into the UMA.

The likely volume of runoff has been estimated with reference to the Flood Estimation Handbook Depth Duration Frequency model data. This is presented in the FRA included in Appendix 9 of the ES. A 1% AEP 1-hour storm duration results in a rainfall intensity of 48.89mm/hr, or 68.45mm/hr inclusive of climate change. A conservative approach was adopted that assumed all rainfall onto the proposed extraction and processing area of 53.4ha will result in approximately 36,550m^3 of surface water runoff.

This volume is greater than the daily infiltration volumes for both lagoons but is less than the storage capacity of the lagoons which indicates that they are adequate to manage the potential surface water flows from the restored site.

River Nast

The alignment of the River Nast will not fundamentally change around the mineral processing site following restoration. The Nast will remain in its diverted form and will continue to discharge to the Ellenbrook.

2.3.7 UMA Infiltration Lagoon

Surface water runoff generated by the western back drain and from incident rainfall will be directed to the existing onsite UML and a reconfigured LML where water will be re-infiltrated into the UMA. Water levels in the lagoons can be expected to rise and fall with seasonal fluctuations in the UMA groundwater level.

The perimeter buttresses which during the operational phase impeded free and continuous discharge of water into and from the UMLs will be removed to allow lateral migration into the UMA. These works will be subject to CQA.

River Nast Exceedance Outfall

An outfall will be provided from the enlarged and restored UMLs into the Nast at the southeast boundary of the site to allow for management of groundwater and surface water during an exceedance event i.e., an event greater than the design event of the 1 in 100 years plus climate change. The discharge occurs at an invert level of 75.5m AOD to a drain connecting to the diverted Nast culvert (see Appendix 04).

2.4 Phase Specific Water Management Plan

In addition to the specific questions raised and addressed in previous sections of this document, Condition 30 requires that a phase specific water management plan be produced in advance of the excavation of each phase. The wording of the requirement is presented below.

Condition 30 ***Prior to the commencement of mineral extraction in each Phase, a water management plan shall be submitted and approved in writing by the Mineral Planning Authority. The water management plan shall detail measures to manage water from the lagoons, including an exceedance route for discharge of water from the lagoons as surface water under exceptional circumstances, and include a mechanism for periodic review. The management of water shall be carried out in accordance with the approved Plan, or as otherwise agreed by the Mineral Planning Authority under the periodic view process, for the lifetime of the development.***

Planning a new phase of development will start at least 1 year in advance of the works and will be planned in a manner that takes advantage of seasonal conditions, changes created by the preceding phase of work, types and quantities of available stockpiled materials and the commercial objectives for the site. Fundamental differences in the approach between phases are not expected but physical conditions will change, and this will require planning and adapting the method to fit the new situation.

Each phase of the site will undergo a detailed evaluation of ground and groundwater conditions based on previous investigations and the most current hydrogeological data including that of water levels, water quality, and lagoon performance data gathered from preceding phase of work, plus the time taken to achieve certain milestones in the development of each phase in the past. The time taken to prepare a new phase will start while the previous phase is still being worked.

Brett will prepare a phase specific Water Management Plan for the MPA's review and would expect the Performance Review meetings described in Section 2.3.5 to be the forum for discussion and presenting the future development plans, followed by submission in writing.

3.0 MONITORING PLAN

This section describes the proposed groundwater and surface water monitoring plan for the site. This encompasses monitoring being proposed under Planning Conditions 26 and 30, itself reflecting the requirements of key stakeholders, but also

- the requirements associated with the Environmental Permit (EB3808HD) for inert landfilling in the UMH, and
- some additional monitoring, principally off site, volunteered by Brett in support of the wider Operational Plan

3.1 Monitoring Purpose and Objectives

The purpose of monitoring links to several statutory and planning requirements including:

- Protecting controlled waters throughout the mineral extraction and the landfilling phases to ensure there is no deleterious impact to groundwater quality in accordance with Policy 16 (Soil, Air and Water) of the Hertfordshire Waste Core Strategy 2012.
- Meeting requirements of the National Planning Policy Framework1 (NPPF, Paragraph 143) to ensure that the development will not have an unacceptable impact on flood risk or on the flow and quality of surface water and groundwater.
- Demonstrating that the site will be compliant with the Environmental Permitting Regulations 2016 which require that certain substances (Hazardous Substances) will not be discharged from the landfill to groundwater such that they are discernible, and that the discharge of other substances (Non-Hazardous Pollutants) is limited "so as to prevent pollution". A hydrogeological risk assessment (HRA) was undertaken to accompany the application for an environmental permit for the site which included 'requisite surveillance', i.e., proposals for the monitoring of groundwater and surface water level and quality.

It is also the objective of this plan to provide data to Affinity who are actively capturing the bromate plume by pumping from a scavenging well field.

This Monitoring Plan is based upon the monitoring proposals presented in the HRA, but the proposals have also been extended to include:

- Monitoring of impact during the extraction phase, including the construction and operation of the infiltration lagoons, and
- Monitoring of pre-existing contaminants including bromate, bromide and other compounds not related to the mineral development.

3.2 Monitoring Locations and Sampling Schedule

The locations of the monitoring points and their respective monitoring zones (UMA, LMA, Chalk, Surface Water, Lagoons) are shown on Drawings 01, 02, 03 and 04. The drawings show the April 2021 groundwater piezometric surface level contours for each respective aquifer unit so the reader can determine whether the monitoring location is up, -cross or down-gradient relative to the site and its operational areas.

[1] Department for Communities and Local Government 2012). National Planning Policy Framework.

Each monitoring well and geological zone, and surface water monitoring point is summarised in Table 3-1 together with the proposed laboratory analysis suite to be undertaken, the sampling frequency (monthly, quarterly, other) and the frequency and method of water level recording monthly or quarterly by the default manual dip method or hourly by dedicated logger.

Borehole logs for each of the monitoring wells are provided in Appendix 06. Boreholes BH303, BH304 and BH401 are due to be installed upon planning approval.

3.2.1 Water Level Monitoring

The method and frequency of water level monitoring depends on the location and purpose of the well. The default regime applicable to most boreholes is that water levels are dipped manually on a quarterly basis and the borehole base dipped annually.

Groundwater levels in monitoring wells being sampled monthly will also be dipped at the time of sampling.

Several boreholes are already fitted with data loggers set to record water levels on an hourly basis that is subsequently validated by manual monitoring. The data will be downloaded monthly.

The infiltration lagoons and other operations-critical monitoring wells will be equipped with water level loggers with telemetry links for real-time data analysis. It may be necessary to install a shallow stilling well within the LML because the water level is typically below the base of the IB.

The monitoring wells to be equipped with loggers are listed in Table 3-1 but the wells to be equipped with real-time telemetry systems will be decided in consultation with Affinity and the Agency. This data will also be reported quarterly in graphical form.

Table 3-1
Groundwater and Surface Water Monitoring Plan

MONITORING WELL	LANDFILL PERMIT	ADDITIONAL	LOCATION RELATIVE TO GROUNDWATER FLOW DIRECTION	WATER LEVEL MONITORING REGIME[2]					WATER SAMPLING & ANALYSIS					
				WATER	WATER	BASE	BASE	LOGGER	SUITE 1		SUITE 2	SUITE 3	SUITE 4	SUITE 5
				M	Q	A	M	H	M	Q	M	Q	Q	Q or 6M
UMA[1]														
BHA			Down gradient of lagoons and extraction area		✓	✓				✓		✓		✓ VOCs
BHE*[a]			Down gradient of extraction area		✓	✓						✓		
BHJ*[b]			Down gradient of extraction area		✓	✓						✓		
BH101U			Down gradient of extraction area	✓		✓					✓		✓	
BH102U			Up gradient of extraction area	✓		✓		✓			✓	✓		
BH103U			Cross-gradient of extraction area		✓	✓				✓		✓		
BH104U			Cross-gradient of extraction area		✓	✓		✓		✓		✓		
BH105UX			Cross gradient		✓	✓				✓				
BH106U			Down gradient of extraction area	✓		✓		✓			✓		✓	
BH108U			Cross gradient		✓	✓				✓				
BH306U			Cross gradient		✓	✓				✓				✓ VOCs
BH307U			Cross gradient		✓	✓				✓				
BH303U[3]			Down gradient of UML	✓		✓		✓	✓			✓		
BH304U[3]			Down gradient of UML	✓		✓			✓			✓		
BH401U[3]			Up gradient		✓	✓					✓		✓	
GMW102			Up gradient											
GMW103			Up gradient	✓		✓					✓		✓	
GMW103L			Up gradient		✓	✓							✓	✓ Metals
GMW104			Up gradient		✓	✓								
GMW105			Up gradient		✓	✓							✓	✓ Metals
GMW106			Up gradient											
GMW107			Up gradient		✓	✓							✓	✓ Metals
GMW108			Up gradient											
GMW109			Up gradient		✓	✓							✓	✓ Metals
UML			Infiltration lagoon					✓	✓			✓		

LMA[1]													
BHB			Down gradient of extraction area		✓	✓			✓				
BHG			Up gradient of extraction area		✓	✓				✓			
BH101L			Down gradient of extraction area	✓		✓		✓			✓	✓	
BH102L			Up gradient of extraction area	✓		✓		✓			✓		✓	
BH103L			Up gradient of extraction area		✓	✓				✓		✓	
BH104L			Up gradient of extraction area		✓	✓			✓			✓	
BH106L			Down gradient of extraction area	✓		✓		✓	✓			✓	
BH303L[5]			Down gradient of UM Lagoon	✓		✓			✓			✓	
BH304L[5]			Down gradient of LM Lagoon	✓		✓		✓	✓			✓	
BH105L			Off site		✓	✓			✓				
BH108L			Off site		✓	✓							
BH201L(u)[4]			Off site		✓	✓			✓				
BH201L(l)[4]			Off site		✓	✓							
BH301L			Up gradient of mineral processing area		✓	✓			✓			✓	✓ Metals
BH302L			Up gradient of mineral processing area	✓		✓		✓			✓	✓	
BH305L			Off site		✓	✓							✓ Bromate 6M
BH401L[3]			Up gradient	✓			✓	✓			✓	✓	
LML			Infiltration lagoon					✓	✓			✓	
CHALK[1]													
BH101C			Down gradient of extraction area	✓			✓	✓			✓	✓	
BH102C			Up gradient of extraction area	✓			✓	✓			✓	✓	
BH103C			Up gradient of extraction area		✓	✓				✓		✓	✓ Metals
BH104C			Up gradient of extraction area		✓	✓		✓	✓			✓	
BH106C			Down gradient of extraction area	✓			✓	✓			✓	✓	
BH105C			Off site		✓	✓			✓				
BH108C			Off site		✓	✓			✓				
BH301C			Up gradient of mineral processing area		✓	✓			✓			✓	✓ Metals
BH302C			Up gradient of mineral processing area	✓			✓	✓			✓	✓	
BH303C[3]			Side gradient of mineral extraction area	✓		✓			✓			✓	
BH304C[3]			Down gradient of LML	✓		✓		✓	✓			✓	
BH305C			Off site		✓	✓							✓Bromate 6M
BH401C[3]			Up gradient of extraction area	✓			✓	✓			✓	✓	
SURFACE WATERS													
SW1			R. Nast (up gradient)	✓		✓			✓			✓	
SW7a			R. Nast (down gradient) – Hatfield Road	✓		✓			✓			✓	
SW11			Discharge into site from Hatfield Quarry	✓		✓			✓			✓	

*a – BHE is in footprint of the perimeter bund and will be re-drilled to the south east by the site boundary – landfill permit to be varied to reflect this
*b – BHJ is in the footprint of the perimeter bund and will be replaced by existing BHA – landfill permit to be varied to reflect this
[1] Flow direction in the UMH is west/northwest to east/southeast, and in the LMH & chalk is northwest to southeast (See Drawings 01, 02, 03)
[2]Basic water level monitoring regimes: quarterly manual dip to water level plus annual dip to base of borehole.
[3] To be installed 2022
[4]BH201 has 2 well screens installed in the LMA, they are separated by a clay horizon, but the purpose of screening was to assess whether there is a vertical concentration gradient for bromate in the granular aquifer.

P – Permit
M – Monthly
Q – Quarterly
A – Annual
H – Hourly
6M – Semi Annual (some shallow monitoring wells contain no groundwater during late Spring and Summer, so the decision to sample alternative locations is made locally by the Brett environmental team)

Permit Wells/Surface Water
✓ Data logger installed since 2013
✓ Data Logger to be installed
Additional voluntary monitoring wells

3.3 Laboratory Analysis

Table 3-2 describes the proposed laboratory testing rationale that has been built around the specific analyses referenced in Permit EB3808HD, Planning Condition 26 and 30, site specific conditions such as the regional bromate plume and other local offsite issues. Five suites have been devised to simplify the implementation of the sampling programme.

Table 3-2
Groundwater and Surface Water Analysis Suites

Name	Description
SUITE 1	Watching brief on Bromate and Bromide undertaken on a monthly or quarterly basis depending on monitoring location
SUITE 2	Based on stakeholder consultation and to be undertaken monthly at key locations
SUITE 3	Comprehensive Permit testing suite, although excludes bromate and bromide (not associated with inert waste which the Permit regulates). As a minimum this suite of analysis will be undertaken on samples from the Permit wells.
SUITE 4	Subset of the Permit suite with the addition of bromate and bromide for general groundwater quality surveillance.
SUITE 5	Selected offsite wells northeast of the site where certain compounds have previously been detected

Table 3-3 lists the analyses proposed and indicates the testing proposed for each of the suites.

This sampling and testing pattern ensure a broad testing suite for Permit monitoring wells, as well as good site-wide testing outside of Permit requirements. There is complete cover for bromate and bromide in all LMA and Chalk aquifer monitoring wells, including offsite wells and a significant proportion of UMA monitoring wells. Any monitoring location where more than one suite is indicated means that the cumulative analysis is undertaken, however no parameter is duplicated.

Table 3-3
Groundwater and Surface Water Analysis Suites

PARAMETER	SUITE 1	SUITE 2	SUITE 3	SUITE 4	SUITE 5
Bromate & Bromide	✓	✓		✓	✓
Conductivity			✓	✓	
pH			✓	✓	
Ionic Balance			✓	✓	
Alkalinity			✓	✓	
Chloride			✓	✓	
Sulphate			✓	✓	
Nitrate			✓	✓	

PARAMETER	SUITE 1	SUITE 2	SUITE 3	SUITE 4	SUITE 5
Calcium			✓	✓	
Sodium			✓	✓	
Potassium			✓	✓	
Magnesium			✓	✓	
Fluoride			✓		
Ammoniacal Nitrogen			✓	✓	
TON			✓		
TOC			✓		
COD			✓		
BOD			✓		
Cadmium		✓	✓		✓[2]
Chromium		✓	✓		✓[2]
Copper		✓	✓		✓[2]
Iron		✓	✓		✓[2]
Lead		✓	✓		✓[2]
Manganese		✓	✓		✓[2]
Mercury		✓	✓		✓[2]
Nickel		✓	✓		✓[2]
Selenium		✓	✓		✓[2]
Zinc		✓	✓		✓[2]
Naphthalene			✓		
Phenol			✓		
TPH (DRO, GRO)		✓	✓[1]	✓	
VOCs					✓[2]
SS (Surface Water only)			✓	✓	

Notes

1 Not specified in Permit but suggested addition
2 May only be tested in selected monitoring wells based on previous results

Laboratory limits of detection for all quality parameters are given in Table 3-4.

Table 3-4
Water Quality Laboratory Limits of Detection

Determinant	Units	Limit of Detection
Bromate/Bromide	mg/l	0.0005 (Bromate) & 0.005 (Bromide)
TPH (GRO/DRO)	ug/l	10
Chloride	mg/l	0.3
Sulphate	mg/l	0.5
Ammoniacal Nitrogen	mg/l	0.03 (accredited) 0.01 (Low level)
Total Alkalinity	mg/l	1
Magnesium	mg/l	0.1
Manganese	ug/l	2 (1.5 Low level method)
Potassium	mg/l	0.1
Iron	ug/l	20 (4.7 Low level method)
Chromium	ug/l	1.5 (0.2 Low level method)
Calcium	mg/l	0.1
Sodium	mg/l	0.1
Electrical Conductivity	uS/cm	2
pH	pH Units	0.01
Fluoride	mg/l	0.3
Phenol	mg/l	0.01
TON	mg/l	0.2
TOC	mg/l	2
COD	mg/l	7
BOD	mg/l	1
Lead	ug/l	0.4
Zinc	ug/l	1.5
Copper	ug/l	3
Cadmium	ug/l	0.03
Mercury	ug/l	0.5
Nickel	ug/l	1.3
Selenium	ug/l	1.2
Nitrate	mg/l	0.2
Naphthalene	ug/l	0.1
VOCs (GC/MS)	ug/l	0.1 to 3 (compound specific)
Suspended Solids	mg/l	20

Note: Detection limits are those from laboratories currently used: Affinity Water for bromate and bromide and Element Laboratory for all other determinants.

3.4 Monitoring and Reporting Programme

The above programme of monitoring and analysis will continue throughout the operational life of the site and for at least 3 years post closure or until all parties are satisfied that it may cease e.g., surrender of the landfill permit.

The scope of monitoring will be reviewed periodically and is likely to be much simplified following formal closure of the landfill and restoration of the whole quarry site. However, provision is made to continue the approved monitoring (i.e., permit requirements and this GWMP) for a period of 10 years post closure.

A baseline monitoring report will be submitted to the Hertfordshire County Councils (HCC) after 12 months of sampling. This report will review the initial rounds of results and propose management control levels for bromate/bromide and TPH. Note, boreholes BH401, BH303 and BH304 will be installed once planning has been granted and therefore the 12 months of baseline monitoring will commence once they are installed with the baseline report available 3 months later.

In addition, an annual interpretive monitoring report as required under Planning Conditions 26 & 30 will be submitted to HCC. Both the baseline and annual reports will be copied to the Agency and Affinity.

In accordance with the landfill permit an annual report will be submitted to the Agency presenting the data required by the permit and assessing compliance with the permit.

Field, data logger and laboratory data arising from this monitoring programme will be submitted to HCC, the Agency and Affinity on a quarterly basis in line with the permit reporting timescales.

3.5 Contingency Actions

Any action required by the inert landfill permit e.g., in response to a breach of a permit compliance limit, will be undertaken in accordance with the permit. It is therefore proposed to only consider contingency actions as part of this monitoring plan for the non-landfill related determinants.

Given the setting and the proposed operations at the site, bromate and bromide will be the key compounds to monitor and track. TPH is included because it comprises a suite of compounds that relate to petroleum hydrocarbons and could therefore be traced to site operations (trucks, excavators, generators, pumps, fuel storage etc.).

- We propose setting management control levels for bromate/bromide and TPH. These are an internal management tool and are not used as regulatory compliance concentrations. The control levels will be borehole specific and will apply to key groundwater monitoring points of those listed in Table 3-1 and will be based on the results from previous rounds of sampling, plus 20% to account for natural variation (water level change, season etc.). Control levels will be reviewed in the annual monitoring reports to ensure they consider current background conditions.
- If following the start of the development results exceed the control levels, additional validation samples will be taken from the affected borehole and may be extended to adjacent locations to determine if the detections are localised or more widespread.
- A review of operations in the period prior to the exceedance will be made and an assessment of the likely cause identified, and if appropriate mitigation measures will be implemented. Notification of the exceedance will be provided to the Agency, HCC, and Affinity within one week of the exceedance being identified through receipt of laboratory data. Detailed analytical results, an assessment of the cause of the exceedance and mitigation measures implemented will be sent to the Agency, HCC, and Affinity within six weeks of the initial exceedance being recorded. Any changes to operational practice will be agreed with these parties should the nature and source of the contamination relate to on-site operations.

- If visible oils and grease are observed at any of the surface water monitoring locations an investigation will be undertaken immediately to identify the cause. If the cause is related to operations at the site corrective actions will be undertaken to stop the release. Measures will also be undertaken to contain the extent of the spill/leak using absorbent booms and similar equipment and to remove any free product from the surface water and dispose of it to a suitably permitted waste facility.
- The procedures outlined in the QHEST management system (Appendix 04) for the reporting accidents, incidents and complaints and taking corrective actions will be complied with.

DRAWINGS

Monitoring Well & Surface Water Sampling Plan and UMA, LMA, Chalk Aquifer Piezometric Surface

APPENDIX 01

2018 Groundwater Pumping Test Report

APPENDIX 02

Phase A Layout and Lagoon Construction Drawings

APPENDIX 03

Water Operating Plan

APPENDIX 04

Illustrative Restoration Concept

APPENDIX 05

QHEST Management System

APPENDIX 06

Borehole Logs and Monitoring Well Construction Details

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DRAWINGS

Monitoring Well & Surface Water Sampling Plan and UMA, LMA, Chalk Aquifer Piezometric Surface

N

BH305L&C

SW11

GMW109 76.50

GMW108 76.58

GMW107 75.26

BH301L&C

POND

SW8

HOME COVERT DITCH

BH307U 72.42

BH201L

BH306U 72.39

BH105L&C BH105U BH105UX 71.90

BH108L&C BH108U 72.18

Ellenbrook Fields

SW3

BHD U

ELLENBROOK

BH104L&C BH104U 73.87

SW14

GMW106 73.78

BHA U 72.75

BHJ U 72.58

SW2

BH303L&C BH303U

BHC U

BHB L

GMW105 74.99

SW1

NAST

SW12

BHK U 74.92

SW9

GMW104 75.09

BH302L&C

GMW103 75.07

BH103L&C BH103U 75.27

BHI L

BH304L&C BH304U

SW4

SW5

FT102 75.40

FT101 75.32

FT103 75.30

GMW102 74.7

BHE U 72.71

GMW101 76.25

BHH U 75.12

SW10

GMW110 72.33

BH401L&C

BHF U 75.76

BHG L

BH106L&C BH106U 72.88

SW7A & SW7B

ASSUMED ROUTE

ELLENBROOK

BH107L&C BH107U 75.26

GMW111 73.08

GMW114

GMW112 75.00

BH102L&C BH102U 75.46

BH101L&C BH101U 74.56

ROADSIDE LAGOON

GMW113 75.29

0 100 200 500

METERS

MONITORING WELL STAGE

PERMIT

ADDITIONAL (EXISTING)

ADDITIONAL (PROPOSED NEW WELLS)

NOTE

BH303ULC
BH304ULC
BAE U
BHA TO REPLACE BHJ
BHE (R) TO REPLACE BHE U
BH401C

PRE-COMMENCEMENT ACTIONS

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LEGEND

- SITE BOUNDARY
- EXISTING RIVER NAST CULVERT (TO BE RETAINED)
- EXISTING RIVER NAST CULVERT (TO BE ABANDONED)
- RIVER NAST CULVERT (PROPOSED ROUTE)
- NATIONAL GRID GAS PIPELINE (SURVEYED LOCATION)
- PROPOSED MINERAL DEVELOPMENT SITE
- PHASE BOUNDARY
- PROPOSED UPPER MINERAL LAGOON
- BHK U — PRE BRETT MONITORING WELLS

SLR BOREHOLES

- BH104L&C — DUAL MONITORING WELLS (LOWER MINERAL HORIZON AND CHALK)
- BH104U — SHALLOW MONITORING WELL (UPPER MINERAL HORIZON)
- SW2 — SURFACE WATER MONITORING POINT
- FT101 — FIRE TRAINING AREA MONITORING WELL
- GMW106 — GAS AND UPPER MINERAL AQUIFER MONITORING WELLS

PIEZOMETRIC SURFACE

- 65 — PIEZOMETRIC SURFACE ELEVATION (mAOD) - SLR (APRIL 2021)

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HATFIELD AERODROME

GROUNDWATER MANAGEMENT PLAN

UPPER MINERAL HORIZON GROUNDWATER CONTOURS (APRIL 2021)

DRAWING 1

Scale: NTS (A3)

Date: AUGUST 2021

09885.00024.19.001.0d_UMH_GW_CONTOURS-0421.dwg

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N

BH305L&C

SW11

GMW109
76.34

GMW108
76.41

GMW107
75.43

BH301L&C

GMW106
70.69

GMW105
DRY

SW1

GMW104
73.2

BH302L&C

GMW103
71.73

GMW102
DRY

GMW101
DRY

BH401L&C

BHG L

BH107L&C
BH107U
73.19

GMW114
74.66

BH102L&C
BH102U
74.08

GMW113
73.76

BH103L&C
BH103U
72.71

FT102
73.31

FT103
73.38

FT101
73.3

BHH U

BHK U
73.5

SW12

NAST

HOME COVERT DITCH

POND

SW8

SW14

BH104L&C
BH104U
71.95

BH307U
71.53

BH201L

BH306U
71.41

BHA U
71.62

BHJ U
DRY

SW2

SW9

BH303L&C
BH303U

BH105L&C
BH105U
BH105UX

BH108L&C
BH108U
71.23

Ellenbrook Fields

BHD U
70.91

ELLENBROOK

BHB L

BH304L&C
BH304U

SW3

SW4

SW5

BHE U
71.28

SW10

GMW110
71.25

BH106L&C
BH106U
71.6

SW7A & SW7B

ASSUMED ROUTE

ELLENBROOK

GMW111
71.83

GMW112
73.3

BH101L&C
BH101U
72.7

ROADSIDE LAGOON

76 75 74 73 72.5 72 71.5 71 73 74 75 76 72.5 73 74 72.5 73 72 72.5 73 73.5 74 74.5 74.5 74 73.5 72.5 73 72 71.5 71.5 72 73 74 73.5

0 100 200 500
METERS

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PIEZOMETRIC SURFACE

- 65 — PIEZOMETRIC SURFACE ELEVATION (mAOD) - SLR (AUGUST 2019)

MONITORING WELL STAGE

- PERMIT
- ADDITIONAL (EXISTING)
- ADDITIONAL (PROPOSED NEW WELLS)

NOTE

PRE-COMMENCEMENT ACTIONS:
- BH303ULC
- BH304ULC
- BAE U
- BHA TO REPLACE BHJ
- BHE (R) TO REPLACE BHE U
- BH401C

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HATFIELD AERODROME

GROUNDWATER MANAGEMENT PLAN

UPPER MINERAL HORIZON GROUNDWATER CONTOURS (AUGUST 2019)

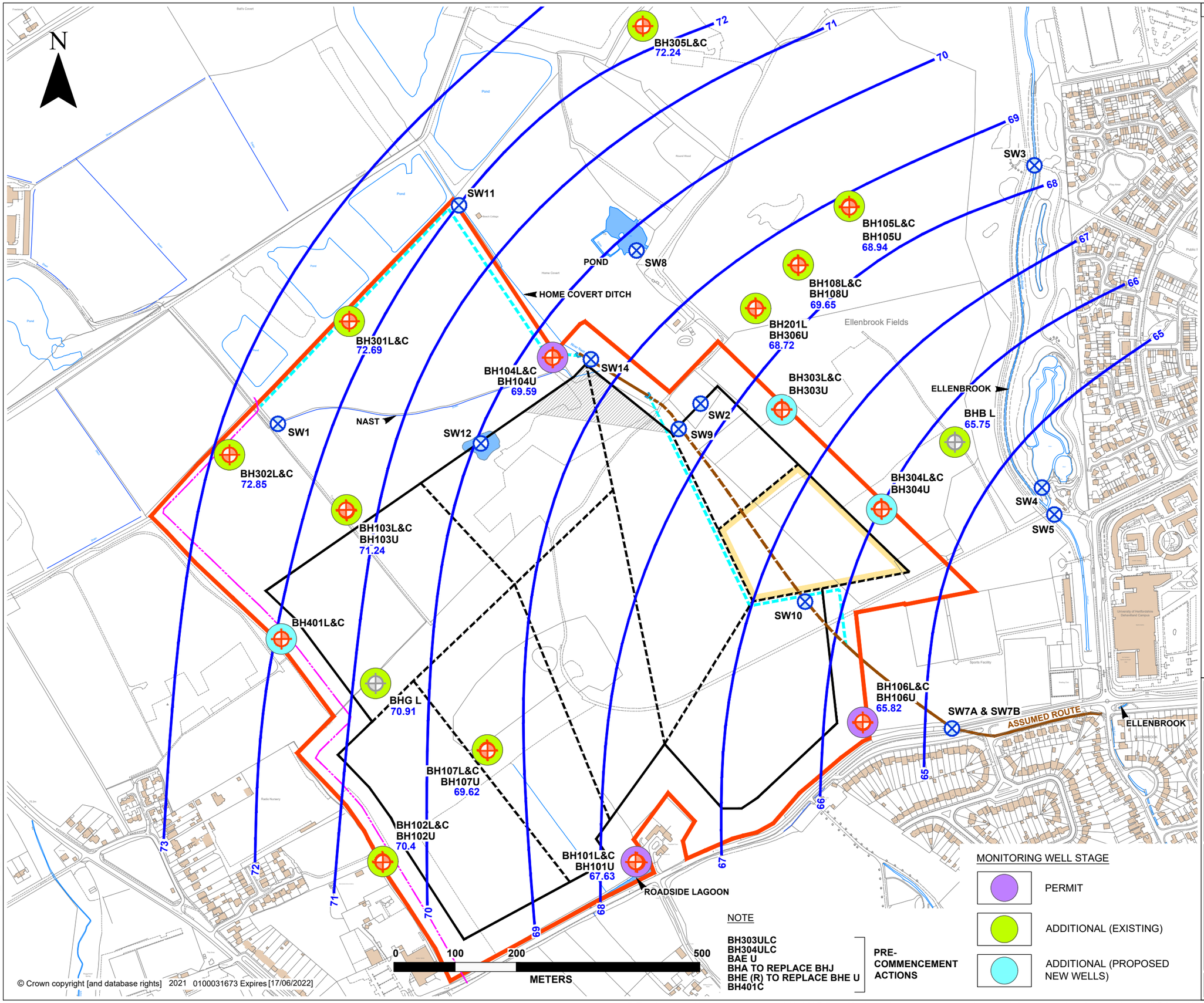
DRAWING 2

Scale: NTS (A3)

Date: SEPTEMBER 2021

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- PROPOSED MINERAL DEVELOPMENT SITE
- PHASE BOUNDARY
- PROPOSED LOWER MINERAL LAGOON
- 100m STANDARD OFFSET FROM BH104
- BHK U — PRE BRETT MONITORING WELLS

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LOWER MINERAL HORIZON GROUNDWATER CONTOURS (APRIL 2021)

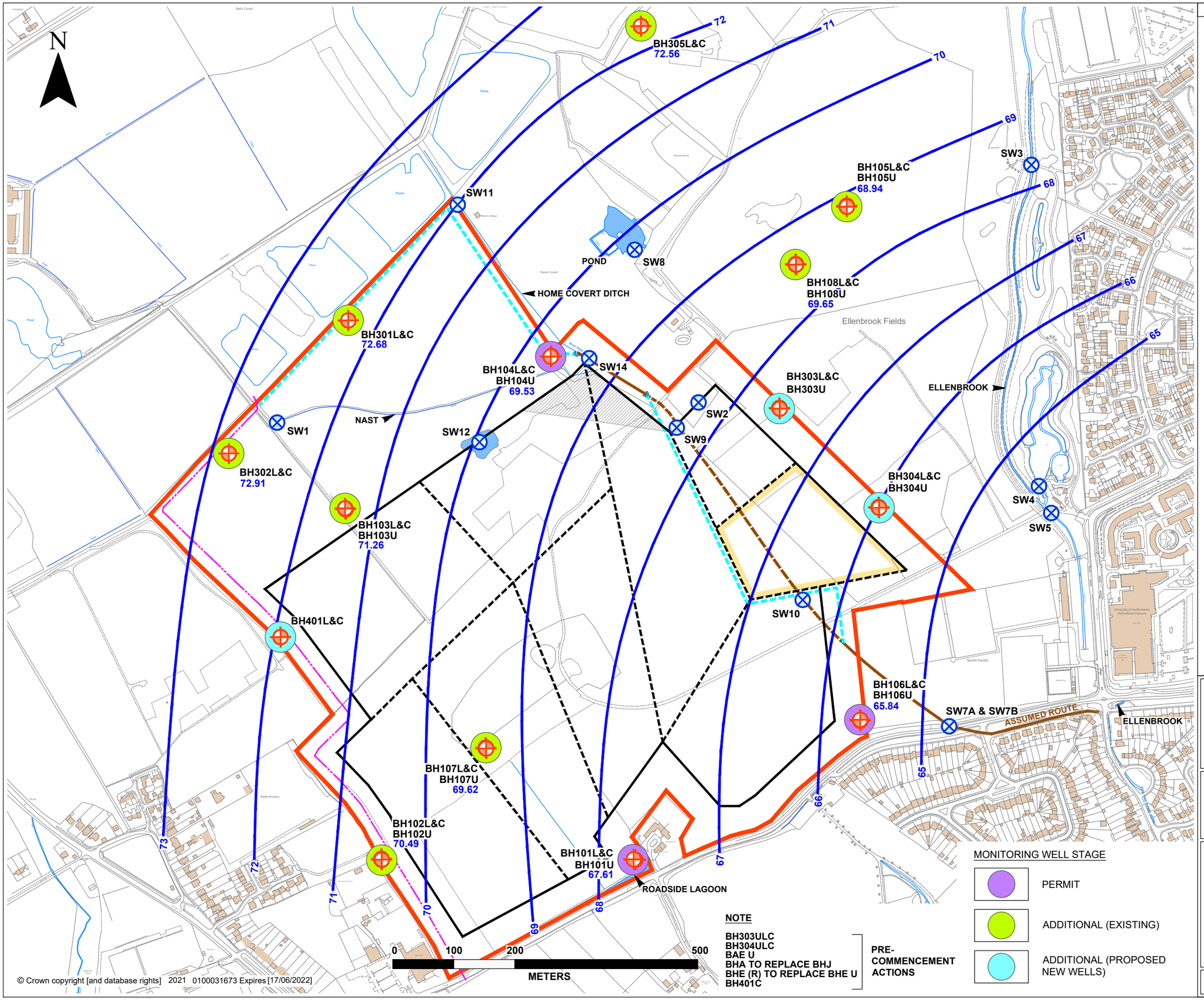
DRAWING 3

Scale: NTS (A3)

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LEGEND

- SITE BOUNDARY
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- NATIONAL GRID GAS PIPELINE (SURVEYED LOCATION)
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- PHASE BOUNDARY
- PROPOSED LOWER MINERAL LAGOON
- 100m STANDARD OFFSET FROM BH104
- BHK U — PRE BRETT MONITORING WELLS

SLR BOREHOLES

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- 65 — PIEZOMETRIC SURFACE ELEVATION (mAOD) - SLR (APRIL 2021)

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GROUNDWATER MANAGEMENT PLAN

CHALK GROUNDWATER CONTOURS (APRIL 2021)

DRAWING 4

Scale: NTS (A3)

Date: SEPTEMBER 2021

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APPENDIX 01

2018 Groundwater Pumping Test Report

HATFIELD ROAD QUARRY

Pumping Test Assessment Report

DRAFT

Prepared for: Robert Brett & Sons Ltd

Client Ref:402.01009.00226.01



SLR Ref:402.01009.00226.01
Version No:2 (DRAFT)
September / 2018

BASIS OF REPORT

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Appendix 03: Consent to Investigate a Groundwater Source
Appendix 04: Borehole Logs
Appendix 05: Test Hydrographs
Appendix 06: Pumping Test Analysis Files
Appendix 07: Certificates of Analysis

1.0 Introduction

SLR Consulting Ltd (SLR) was retained by Robert Brett & Sons Limited (Brett) to design, supervise and report on aquifer tests completed at the Hatfield Road Quarry (the "site"). The tests were required to inform future development planning and satisfy details required by the Environment Agency in support of an application for a Water Resources Abstraction Licence. Works were conducted in general accordance with the work plan submitted to Brett on March 15th, 2018 included in **Appendix 01**. The basic tasks included:

- Drilling of a shallow borehole (PW1) to 8.5m below ground level (bgl) and install a well screen and riser pipe in the upper mineral aquifer (UMA);
- Drilling of a deeper borehole (PW2) through the UMA and clay interburden (Anglian Till) to 19m bgl and install a well screen and riser in the lower mineral aquifer (LMA). A piezometer was also place in the annulus of the borehole across the UMA for water level monitoring;
- Development of both wells;
- Undertaking a series of pumping tests in each aquifer to assess well and aquifer performance.

WJ Groundwater Ltd (WJ) was awarded the contract to construct the wells and complete the aquifer tests in April 2018. WJ subcontracted the drilling and installation of the wells to BH Drilling Services (BH).

The boreholes were advanced and completed under the direction of SLR between 22nd and 25th of May 2018. The testing programme, including mobilisation and deployment of infrastructure (piping etc.), aquifer testing, and demobilisation was completed between May 26th and June 20th, 2018. A photolog documenting works is available in **Appendix 02**.

1.1 Location

PW1 and PW2 were installed adjacent to existing monitoring wells (BH107U, BH107D, BH107C) located near the centre of the proposed mineral site, as shown on DWG 1 included in the work plan (Appendix 01). The as-built well layout is shown Drawing 1**.**

1.2 Consent

Consent to Investigate a Groundwater Source (TP 18/005 & TP 18/006) was issued to Brett Group Limited by the Environment Agency on 10th May 2018 and are included in **Appendix 03.**

2.0 Methodology

2.1 Drilling

Drilling and installation was supervised by an SLR geologist who recorded a continuous, descriptive geological and hydrogeological log of all aquifer and aquitard materials in general accordance with BS 5930 a2 2010.

The boreholes were constructed using a Dando 3000 cable percussion rig operated by BH Drilling Services. This technique advances steel casing as the borehole proceeds to prevent collapse. Soils are removed using a "clay cutter" for cohesive soils and a bailer for gravels and other non-cohesive materials.

PW1 was advanced through the overburden and UMA using a nominal 10'' diameter steel casing and terminated 1m into the underlying interburden unit, a total depth of 8.5m bgl.

PW2 was advanced using a nominal 12'' casing which was terminated 1m into the top of the interburden unit. A 1m thick bentonite seal was placed in the interburden and nominal 10'' casing was then advanced through the 12" casing and through the LMA and 1.5m into the underlying chalk, a total depth of 19m bgl.

This aquifer protection methodology minimises the potential for hydraulic connection between the UMA and the LMA.

2.2 Well Installation

Upon completion of the boreholes the wells were constructed using Boode Select PVCTM well screen and casing with the following specifications:

- PW1 comprised of a 165 mm OD PVC plain pipe connected to a 165 mm OD vertically slotted screen (slot size 1mm) from 7.0m to 2m bgl;
- PW2 comprised of a 200 mm OD PVC plain pipe connected to a 200mm OD vertically slotted screen (slot size 2mm) from 17.3m to 10.3m bgl;
- PW2-A comprised a 19mm diameter slotted pipe installed from 7m to 2m bgl. PW2-A was installed to allow for another measuring point in the UMA.
- Each abstraction was constructed with a length of capped plain pipe below the well screen to act as sump in which pumps could be installed to increase available drawdown.

The sumps were backfilled with bentonite after which a clean graded silica sand pack was placed around each well screen to approximately 0.3 metres above the screened interval. A 1-2mm pack was placed around the screen in PW1 and a 2-3 mm sand pack around PW2. Slot size and sand pack grade were selected based on the grade of aquifer materials identified in each unit. Bentonite seals were then installed above each sand pack to surface.

In PW1 the bentonite seal extended to within 0.5m of grade after which it was backfilled with cuttings.

In PW2 the bentonite seal extended to the top of the interburden unit with a sand pack installed adjacent to PW1-A between 7m and 2.0m of ground surface. A surface bentonite seal was then installed to within 0.5m of grade.

The casing of each well was extended above ground approximately 0.5m with an appropriately sized steel security casing with padlock. The security casings were installed after the pumping tests were completed.

The borehole logs are included in **Appendix 04** and the borehole and monitoring well locations are illustrated on **Drawing 1**.

2.3 Well Development

PW1 and PW2 were 'developed' after installation to maximize well efficiency by removing fines introduced to the well after installation and remove/stabilise fines adjacent to the well bore. Development was conducted utilizing a dual pipe eductor system in which a column of air is injected into an air pipe within a 4'' diameter eductor pipe. This air then displaces water in the hollow centre of pipe thereby creating a vacuum for additional well water to enter the base of exterior eductor pipe. Continued introduction of air continues the process of displacement at the surface.

Development in each well continued for at least 3 hours and included several interruptions when the system was turned off to effectively "surge" the well and formation. The wells were considered developed when discharge water settled in an Imhoff Cone indicated the presence of < 15ppm of entrained fines. Drawdown within the well during development was also measured to gain initial estimates of potential yields.

2.4 Pumping Infrastructure

Pumped water was discharged into a historical 'lagoon-like' feature (approximately 50m x 20m x 4m deep) situated approximately 600m to the northeast of the pumping wells. This legacy lagoon feature originates from early investigations conducted by others around 2000-2001 and is presently heavily vegetated with trees and shrubs. Water was delivered to the lagoon during the testing through 100mm diameter Bauer® pipe deployed in 6m lengths and connected via closure ring couplings, with each coupling also secured with a zip fastener. The pipe was buried at two vehicle crossing points.

The discharge pipe was modified south of the lagoon to provide a discharge diversion for flow to the culverted River Nast in the event the lagoon reached capacity **(Drawing 1).**

Each abstraction well was equipped with a designated Grundfos® downhole pump capable of delivering yields up to 10 L/s. Flow rates were controlled via a geared gate valve and flow rates were measured in real-time via a Siemens® electromagnetic flow meter installed immediately up-flow of the controlling gate valve. The flow meter was wired into WJ's on site data logger unit. Backflow after well shutdown was prevented by inline ball valves.

The site data logging unit was remotely connected via a telecom link to WJ's office so that data could be uploaded in real time.

2.5 Equipment Test

After development, equipment tests were conducted to ensure all apparatus (pumps, flow meters, Data logger etc) was functioning correctly. The equipment tests involved pumping each well to a maximum predicted sustainable flow rate attained from development. The tests were conducted at 3L/s in PW1 and 8 L/s in PW2 for a short time period.

2.6 Water Level Monitoring

The following wells were monitored for the durations of field works:

- PW1 (UMA)
- PW2 (LMA)
- PW2A (UMA)
- BH101-U, BH101-L, BH101-C (UMA, LMA, Chalk)
- BH102-U, BH102-L, BH102-C (UMA, LMA, Chalk)
- BH107-U, BH107-L, BH107-C (UMA, LMA, Chalk)
- GMW112 (UMA)
- GMW113 (UMA)
- GMW114 (UMA)
- BHF (UMA)
- BHU (UMA)
- BHG (LMA)
- Discharge Lagoon and adjacent BHA (UMA)

Water levels in the PW1, PW2, BH107-U, BH107-L and BH107-C were recorded by Geosense ® VWP, vibrating wire loggers which were also wired directly into the on-site data logging unit.

Recording intervals varied depending on the interval of the well test. During the first 5 minutes of a test water levels were recorded every 30 seconds. During advanced periods of the tests, water levels were recorded every 5 minutes.

Additional monitoring wells were equipped with a Solinst Levelogger® which recorded water levels which were later compensated for barometric changes with an onsite Barologger®. Each of the wells was also manually dipped at least twice daily to confirm logger accuracy and calibration points.

2.7 Bromate/Bromide Sampling

Water samples were obtained from the PW1 and PW2 well heads twice daily during the constant rate tests. Samples were submitted to Affinity Water (Affinity) for bromate and bromide on a 24-hour turnaround basis.

2.8 Step-Drawdown Tests

Step-drawdown tests were conducted in each well prior to the constant rate tests to investigate well performance (Efficiency and Specific Capacity) under variable discharge conditions. The results were also used to finalise the rate used during the constant discharge tests.

During the step-drawdown tests, the discharge rate was incrementally increased from an initial low rate through a sequence of 4 pumping intervals (steps) of progressively higher constant rates (0.25_{max}, 0.5_{max}, 0.75_{max}, Q_{max}). Each step lasted 100 minutes after which the pump was stopped and well recovery monitored.

A second step-drawdown test was undertaken in PW2 after the constant rate test was concluded. This was due to sand ingress into PW2 at the highest flow rate which interfered with accurate water level measurement, plus an electronics malfunction with the central data logging unit resulted in some data loss. It was therefore determined by SLR and WJ that the test should be repeated. The flow rates are shown in Table 2-1 below.

Table 2-1
Step- Drawdown Test Flow Rates (Litres/Second)

	PW1 (UMA)	PW2 (LMA)	PW2 (Test 2) (LMA)
Step 1	0.6	2.2	2
Step 2	1.2	4.4	4
Step 3	1.8	6.6	6
Step 4	2.4	8.8	8

2.9 Constant Rate Tests

Constant rate tests were conducted in each well on the day following their respective step tests. During each test the aquifer was pumped for a 72-hour period at a constant rate determined to be sustainable for the duration of the test. The target rate for PW1 was set at 1.6 L/s and PW2 at 6.0 L/s. Upon completion of the pumping period the pumps were stopped, and the recovery phase monitored.

All water pumped from the wells was discharged into the infiltration lagoon except for water pumped during the second PW2 step test which was discharged into the River Nast culvert.

Appendix 05 contains hydrographs for the PW1 and PW2 pumping tests illustrating the complete testing period (step test and constant rate tests), including the pumping rates on the second graph axis.

3.0 Geology and Groundwater Occurrence

3.1 Geology

Both aquifers at the investigation location were similar in character to those observed elsewhere across the site. The geological sequence encountered in PW1 and PW2 is set out in Table 3-1.

Table 3-1
Geological Sequence

Depth (m bgl)	Lithology	Thickness (m)	Base Elevation (m AOD)
0 - 0.3	**Top Soil** - Brown silty SAND with frequent organics, loose, dry.	0.3	77.0
0.3 - 1.2	**Made Ground & Overburden**: Brown clayey SILT with some sand and gravel. Gravel consists of chalk and asphalt, dense, moist.	0.9	76.1
1.2 - 6.9	**Upper Mineral Horizon**: sandy GRAVEL from 1.2 to 3.0m changing to a 0.5m thick clay SILT bed from 3.0-3.5mbg. Fine to medium SAND from 3.5 to 6.9 m. Saturated at 2.8m.	5.7	70.4
6.9 - 9.0	**Interburden**- grey CLAY and SILT with some gravel, very stiff, moist.	2.1	68.3
9.0 - 18.05	**Lower Mineral Horizon**- sandy GRAVEL, with rare cobbles. Brown sandy gravel with clay from 9.0-9.8m. Silty SAND with clay layer from 11.9-12.3m. Medium to coarse sand layer from 13.9-14.5m.	9.05	59.25
18.05	**CHALK**- Recovered as grade Dc chalk cobbles.	Unproven	Unproven

3.2 Groundwater Occurrence

A groundwater strike was recorded in the UMH at a depth of 2.4m. This represents the piezometric surface of the UMA. Saturated conditions continued to the base of the UMH at the interface with the interburden (6.9m bgl) being the UMA perching layer. The saturated thickness of the UMA was therefore 4.5m.

The UMA is an unconfined aquifer (atmospheric pressure exists at the water table surface) that is perched upon a regional aquitard consisting of stiff clay and silt (the interburden) also referred in literature as the Anglian Till. The surface of the interburden dips to the north-east and along with locations of aquifer recharge and discharge the dipping surface of the interburden influences the aquifers lateral flow direction.

In June 2018 the water level in the UMA was at a depth of 2.48m bgl but has previously been recorded at 1.058m bgl in BH107U (March 2014), meaning the saturated thickness of the aquifer can vary quite significantly between 4.5m (currently) and approximately 6m (March 2014).

A groundwater strike was also recorded in the LMH at a depth of 9.9m, which is 0.9m below the base of the interburden. This water strike represents the unconfined piezometric surface of the LMA. Saturated conditions

continued to the base of the LMH and into the chalk bedrock underlying the LMH. The saturated thickness of the LMA was therefore 8.15m but is far greater if the underlying chalk aquifer is included.

In June 2018 the water level in BH107L was at a depth of 9.9m bgl but has previously been recorded at 8.14m bgl (May 2014), meaning the saturated thickness of the aquifer can increase but also that the aquifer is then confined by the interburden at this site location. This feature of seasonal change in groundwater levels will be exploited by Brett in the future to avoid groundwater pumping.

4.0 Pumping Test Analysis

4.1 Step- Drawdown Tests and Well Performance

Step-Drawdown Tests were conducted prior to the constant rate test in both PW1 and PW2 to assess well performance (efficiency) and potential yield.

Well inefficiencies are a result of head losses arising because of turbulent flow close to and across the well screen that result in drawdown in the well which is unrepresentative of the head in the aquifer. Head loss reduces the amount of drawdown available and therefore yields but also increased drawdown requires larger pumping lifts which results in additional energy costs.

Under low flow conditions flows to the well are generally laminar (Darcy flow) and well losses are minimal, with inefficiencies increasing with pumping rate. Wells which perform over 80% are generally considered very efficient.

4.1.1 PW1 – Upper Mineral Aquifer

PW1 was determined to be very efficient (>90%) during the first three steps with a significant drop-off observed when pumped at 2.4 L/s. During the first three steps the Specific Capacity (Sc) was between 0.78 L/s/m and 0.85 L/s/m whereas the 4th step resulted in a reduction to 0.6 L/s/m. This is because the drawdown in the 4th step resulted in less than 1m of saturated screen which was unable to efficiently transmit the volume of water being pumped. During higher aquifer periods with more available drawdown it is likely that PW1 will deliver 2.4 L/s very efficiently. Step test results are shown in Table 4-1 and in **Appendix 06 (Figure 1)**.

Table 4-1
PW1 - Step Test Results and Analysis

PW1	Flow Rate (L/s)	Observed Total Drawdown (m)	Calculated Drawdown at 100% Efficiency (m)	Actual Efficiency %	Specific Capacity (Sc) (L/s/m)
Step 1	0.6	0.7	0.7	100.0	0.83
Step 2	1.2	1.4	1.4	100.0	0.85
Step 3	1.8	2.3	2.2	94.4	0.78
Step 4	2.4	4.0	2.9	72.2	0.60

4.1.2 PW2 – Lower Mineral Aquifer

Considerably more drawdown was available in PW2 than in PW1 so the inefficiencies which affected PW1 at higher rates were not observed. The well was found to be very efficient (>85%) at all pumped rates and the well delivered between 2.16 L/s/m and 2.53 L/s/m. Given the drawdown available the well would likely remain very efficient at 10 L/s. Step test results are shown in

Table 4-2 and Appendix 06 (Figure 2).

Table 4-2
PW2 Step Test Results and Analysis

PW2	Flow Rate (L/s)	Observed Total Drawdown (m)	Calculated Drawdown at 100% Efficiency (m)	Actual Efficiency %	Specific Capacity (Sc) (L/s/m)
Step 1	2.0	0.8	0.8	100.0	2.53

PW2	Flow Rate (L/s)	Observed Total Drawdown (m)	Calculated Drawdown at 100% Efficiency (m)	Actual Efficiency %	Specific Capacity (Sc) (L/s/m)
Step 2	4.0	1.7	1.6	92.5	2.34
Step 3	6.0	2.7	2.4	89.0	2.25
Step 4	8.0	3.7	3.2	85.4	2.16

4.2 Aquifer Properties

Estimations of the aquifer's hydraulic properties (Transmissivity (T), Storativity (S) and Hydraulic Conductivity (K)) have been calculated using a variety of analytical solutions that typically comprise matching time-drawdown measurements with curves created by an in analytical model. The hydraulic parameters (T, S) controlling the matching curves are varied within the model (AQTESOLV®) to result in a best fit with the field data. The model curves also differ for a variety of hydrogeological conditions (unconfined, confined, leaky, partial penetration and more).

It is worth noting that both aquifers contain interbeds of clays and silts (some around 0.5m thick) which serve to semi-confine each unit, and which we believe could be influencing the analysis of the tests.

4.2.1 Upper Mineral Aquifer (UMA)

The response of the UMA to pumping in PW1 was monitored at three locations: PW1, PW2-A and BH107-U. PW2A and BH 107 are located 5m and 15m away from PW1 respectively (DWG 1). Pumping at a constant rate of 1.6 L/s induced a total drawdown of 2.51m over 72 hours after which near equilibrium conditions were attained. Drawdowns of 1.25m and 0.91m were recorded in PW2-A and 107-L respectively (see hydrograph in **Appendix 05**).

Some limited drawdown was also observed in the more distant monitoring wells BHF, BHH, BH101, GMW112 and GMW113 located between 225m and 330m from PW1. The observed maximum drawdowns in all monitored wells in the UMA are shown in Table 4-3.

Table 4-3
Observed Drawdowns during PW1 Constant Discharge Rate Test

Wall/ Piezometer	Distance from PW1 (m)	Water level 09:00 05/06/18 (mAOD)	Water level 09:00 08/06/18 (mAOD)	Drawdown (m)
PW1	0	74.28	71.77	2.52
PW2A	5.1	74.29	73.04	1.25
BH107S	15	74.45	73.52	0.93
BHFU	225	73.45	73.26	0.19
BHHU	254	73.67	73.44	0.22
BH101U	288	74.93	74.72	0.20
GMW113	317	74.76	74.67	0.10
GMW112	329	74.26	74.17	0.09

Transmissivity (T) and Storativity (S)

Step Test

Transmissivity has been calculated using the Theis solution for the step test data (drawdown and recovery) recorded from PW1 and from BH107S. Both time-drawdown cures are plotted on a log-log graph (**Appendix 06, Figure 3**) with model curves matched to the field data. The upper curve is PW1 and the lower is BH107S.

A very good curve match to the recorded drawdown data can be seen (the blue lines) which equates to:

Transmissivity (T) = 78m^2/d

Storativity (S) = 0.002

Hydraulic Conductivity (k) = 18.8m/d[1]

Appendix 06, Figure 4 represents the drawdown and recovery during the constant discharge test for PW1, PW2-a and BH107S calculated using the Neuman (1973) unconfined aquifer equation. A good curve match has been produced with the following results:

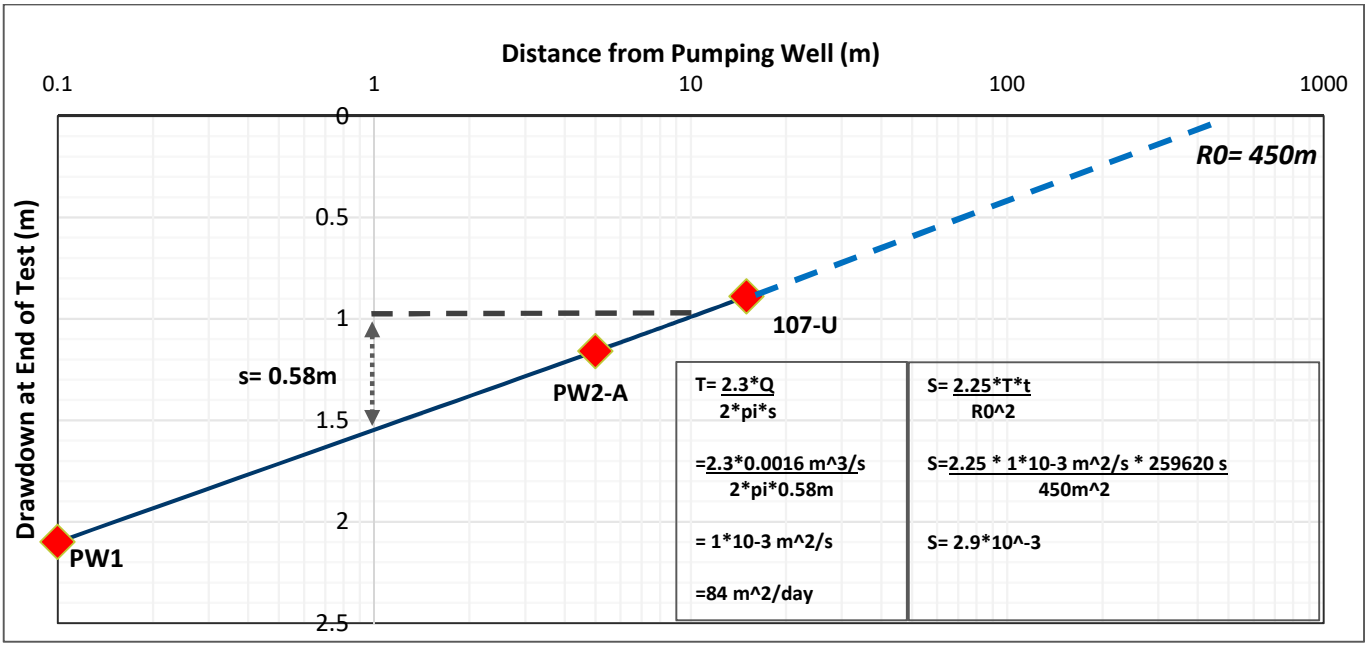
Transmissivity (T) = 79m^2/d

Storativity (S) = 0.002

Hydraulic Conductivity (k) = 19.0m/d

The results were also analysed graphically using the Cooper-Jacob Distance-Drawdown method illustrated on Figure 4-1. The calculated T and S agreed with the AQTESOLV solutions at 84m^2/day and 2.9x10^{-3} m^3/ m^2/ m, respectively. These numbers are typical of fine to medium sands.

Figure 4-1
Cooper-Jacob Distance-Drawdown plot for Constant Rate Test in PW1



Using a variety of unconfined and confined solutions a Storage coefficient (S) of between 2x10^{-3} m^3/ m^2/ m and 2.9x10^{-3} m^3/ m^2/ m was attained. In an unconfined aquifer (like the UMA) it would be expected that the storage

[1] K = T/b (where b = saturated thickness of the aquifer, which is 4.15m)

value would be considerably higher and approximate the aquifer's Specific Yield (Sy) and effective porosity (generally between 0.1 and 0.3).

The calculated low S value is possibly because of the semi confining influence of the fine-grained beds within the unit which are inducing an elastic storage release response over at least some of the drawdown interval.

Radius of Influence (R_0)

R_0 is a measurement of the theoretical radius of influence induced by the pumping test. An R_0 value of 450m was obtained using the Cooper-Jacob method (Figure 4-1), but there is a lack of data points between 10m and 200m which reduces the confidence in this R_0 value.

Limited drawdown was observed in BHFU, BHU and BH101 (225m, 254m and 288m distant) at 0.19m, 0.22m and 0.20m respectively, which may represent a mixture of induced drawdown and the regional fall of UMA water levels. Based on a measured fall of 0.09m in GMW112 located 329m SE (down gradient) of PW2 we might expect at least 50% of the water level change in BHF and BHU to be due to regional falls in the aquifer. This means that although the calculated R_0 value is 450m this represents the absolute upper distance that any drawdown effect should be anticipated and is likely to be much less, closer to 300m – 350m.

4.2.2 Lower Mineral Aquifer (LMA)

Aquifer response to pumping adjacent to PW2 was measured at two locations within the LMA (PW2 and 107-L) and at one location within the underlying chalk (107-C). Both 107-L and 107-C are situated 10.3 m from PW2 and installed as a nested pair of wells within the same borehole.

Pumping at a constant rate of 6.0 L/s induced a total drawdown of 3.1m over 72 hours in PW2. Over the same period 1.02m of drawdown was observed in 107-L and 0.42m in 107-C, with limited drawdown (0.15m) in BHG located 215m from PW2.

Some water level drop was observed in BH101 in both the LMA and the chalk but given there was no difference between the two monitored intervals it is possible this reflects a background fall in aquifer water levels, i.e., not related to the pumping test. In addition, very little recovery was observed after the test concluded. The maximum drawdown results for the PW2 constant rate test are presented in Table 4-4.

Table 4-4
Observed Drawdowns in during Constant Rate Test (PW2)

Wall/ Piezometer	Distance from PW1 (m)	Water level 09:00 05/06/18 (mAOD)	Water level 09:00 08/06/18 (AmOD)	Drawdown (m)
PW2	0	66.89	63.84	3.05
BH107L	10.3	67.28	66.31	0.97
BH107C (Chalk)	10.3	67.32	66.90	0.42
BHGL	215	66.97	66.81	0.15
BH101L	293	66.66	66.60	0.07*
BH101C (Chalk)	293	66.71	66.64	0.07*

*Interpreted to be background fluctuation.

Conceptual Model

The LMA differs to the UMA in that the aquifer comprises approximately 9m of saturated sand and gravel above approximately 100m of fully saturated Chalk. Although a slight vertical gradient is frequently recorded between water levels in the two geological intervals they fundamentally have a common piezometric surface implying they hydraulically behave as a single aquifer.

Although the geological unit is estimated at 100m thickness, based on conversations with Affinity Water, it is more likely that the 'contributing portion' of the chalk aquifer is less than the measured thickness of the chalk with most of the flow being contributed from the upper 50m-60m of the unit. We have therefore also analysed the data assuming a reduced aquifer thickness.

Partial Penetration

The pumping test was carried out in a well screened across the sand and gravel so from a hydraulic standpoint the well is partially penetrating the combined sand and gravel and chalk aquifer unit.

The pumping test induced a drawdown in the underlying chalk monitoring well (0.42m in BH107C), implying that upward vertical flow from the chalk into the overlying sand and gravel was occurring. This supports the concept that pumping test data may fit partially penetrating solutions better than confined or unconfined solutions.

Transmissivity (T) and Storativity (S)

Step Test

The confined aquifer Theis solution has been applied to the step test data as illustrated in **Appendix 06, Figure 5.** The drawdown curve match is good and derived:

$T = 264m^2/day$, k=33m/d (assumed that b = 8m, i.e., non-partial penetrating)

Constant Rate Test

The confined aquifer Theis solution has also been applied to the constant rate time-drawdown data using different approaches:

1. A defined aquifer thickness of 8m (fully penetrating solution),
2. Varying the total saturated thickness between 50m and 100m utilising a partially penetrating solution,
3. Cooper Jacob Distance-Drawdown,
4. Empirical analysis - Driscoll

1) Fully Penetrating Solution (Theis)

Figure 7 included in **Appendix 06** plots water level drawdown vs time at a log-log scale for the pumping well and the observation well (107-L).

The analytical solution assumes a fully penetrating well and a saturated thickness of 8m. BH107-C cannot be used in this analysis since it is screened in the underlying chalk and therefore the scenario assumptions are broken.

The blue lines represent the analytical match that are created by varying T and S in the model. An ideal solution would result in both analytical curves matching the actual drawdowns simultaneously but, in this case, the combined curve match is poor. The best fit results in:

$T = 226m^2/d$, k = 28m/d

$S = 1x10^{-4}$

2) Partially Penetrating Solution (Theis and Neuman)

Since the functional thickness of the chalk contributing to the test is unknown the aquifer thickness was varied between 50m and 100m using a partially penetrating solution. BH107-C is included in these solutions.

The 100m saturated thickness, partial penetration solution (**Appendix 06, Figure 8**) provides a more convincing curve match across all 3 wells, and results in:

$T = 1{,}545m^2/d$, k = 15.45 m/d (assumes 100m aquifer thickness)

$S = 1.1x10^{-2}$

Assuming an aquifer thickness of 50m the predicted Transmissivity necessarily drops and a reasonable fit (**Appendix 06, Figure 9**) results in:

T=729 m2/d, k=14.6 m/d

S = 5.7x10^{-3}

The data was also analysed using the unconfined aquifer Neuman solution (**Appendix 06, Figure 10**) using the partial penetration assumptions. The following hydraulic parameters were derived:

T =777 m^2/d, k = 13.0m/d (assumes 60m aquifer thickness)

S = 8.3x10^{-3}

3) Cooper Jacob Distance-Drawdown Technique

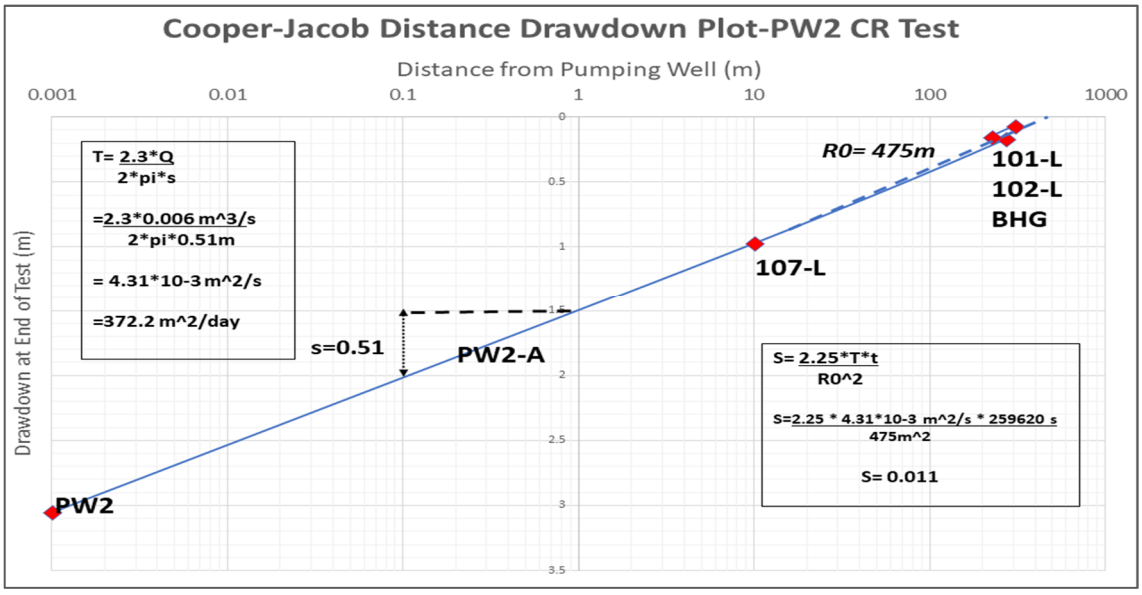
The data was also analysed graphically using the Cooper-Jacob Distance-Drawdown method illustrated on Figure 4-2. The analysis is strictly more applicable for fully penetrating test, so it is not surprising that the value for T is like that derived using the non-partial penetrating solution presented in analysis technique 1 in this report section and for the step test analysis.

The calculated T and S values were:

T = 372m^2/day, k = 47m/d

S = 2.9x10^{-3}

Figure 4-2
Cooper-Jacob Distance-Drawdown plot for Constant Rate Test in PW2



4) Empirical Analysis

There are many specific capacity approximations for estimating transmissivity, perhaps the most widely used being Driscoll (1986) which uses the observed drawdown in the pumped well after a day of pumping modified by a coefficient (confined aquifer):

T = 1.385(Q/sw) *where Q= 6L/s = 518.4m^3/day, and Sw=2.8m*

= 256m^2/d

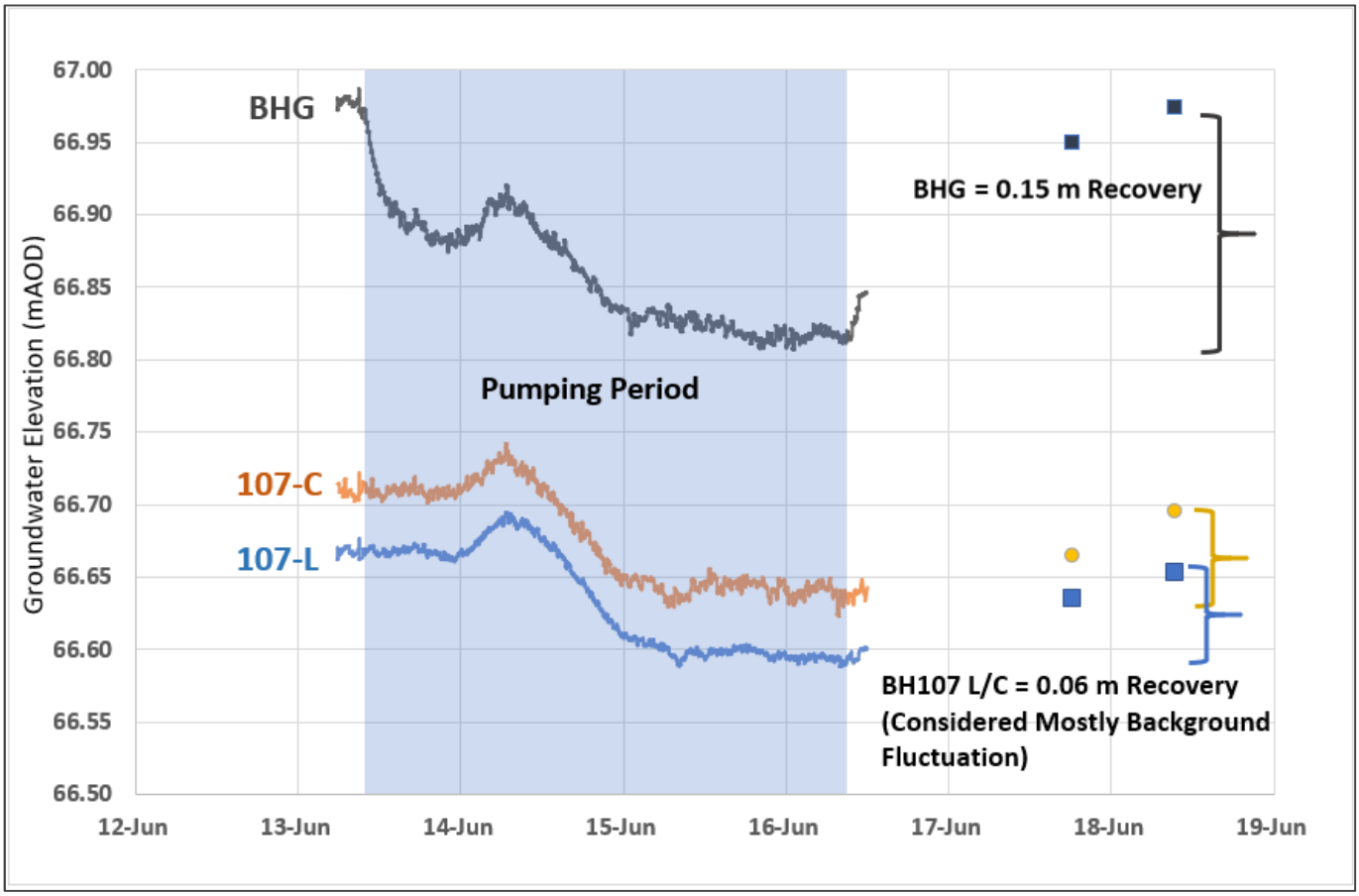
Boundary Affects

Approximately 18 hours into the test a slight increase in the rate of water level drawdown was observed in PW2, 107-L and 107-C (Appendix 06, Figure 6), which is indicative of the drawdown reaching a low flow boundary. The nature of this boundary is unknown although it could relate to an unconfined/confined aquifer boundary some distance from the pumping well

Radius of Influence (R_0)

A radius of influence (R_0) of 475m was estimated using the Cooper-Jacob distance-drawdown method (Figure 4-2). An important well in determining R_0 in this case is BHG located 215m from PW2 where 0.15m of drawdown was recorded, but also BH101L&C at 293m with a drawdown c.0.06m. The result in BHG is considered real whereas drawdown in BH101L&C is likely to be a response water levels falling regionally. This is best shown by the recovery of water levels in BHG and the lack of recovery in BH101L&C (Figure 4-3). On this basis, an R_0 between 250m and 350m is reasonable.

Figure 4-3
BHG, B101 L&C Pumping Test Hydrographs



4.2.3 Conclusions

Upper Mineral Aquifer

Analysis of the UMA pumping test data from the step test and the constant rate test provides a narrow range of T values (78m^2/d to 84m^2/d) equating to a K of approximately 20m/d. This value is realistic for a medium to coarse sand and a high degree of confidence can be given to this value for groundwater calculations.

The storage values calculated for the UMA ($2x10^{-3}$ to $3x10^{-3}$) are lower than expected for an unconfined aquifer and we have explained how this could be related to significant clay bands within the saturated aquifer unit which may be confining the aquifer close to the pumping well and would result in a lower storage value.

Lower Mineral Aquifer

Before discussing findings from the pumping test, it is worth revisiting the conceptual hydrogeological model for the site. If we consider the geology, we have relatively thin (8m) permeable granular sand and gravel overlying a comparatively thick (100m) dual porosity chalk with variable hydraulic properties that changes with depth.

Although we know there is a weathered low permeability chalk horizon at the interface with the granular horizon, water levels in the chalk and the LMA indicate we have a single water body that is saturated across both geological units. We have pumped the granular horizon at the top of the combined aquifer system.

We have analysed the pumping test data using 2 conceptual assumptions; a fully penetrating scenario assuming the LMA acts independently of the chalk, and a partially penetrating scenario whereby the aquifer is assumed to have a far greater thickness incorporating the chalk. We have also taken into consideration that only the upper 50m-60m of the chalk may be contributing to groundwater flow.

It is now clear that the fully penetrating analysis with the LMA acting as a single aquifer is an inadequate conceptual model of the system. This is based upon:

- a poor curve match to PW2 and BH107L (Figure 7, Appendix 06);
- an improved curve match with the partially penetrating aquifer solutions;
- Nearly 50% of the drawdown observed in the LMA (BH107L) was also observed in the underlying chalk (BH107C) indicating that the chalk is hydraulically connected to the overlying LMA.

Consequently, the system is best conceptualised as a single aquifer and any future pumping analysis should be considered within a partially penetrating conceptual model.

In an aquifer pumped by a partially penetrating well, vertical flow components are introduced which introduces the importance of an aquifer's vertical hydraulic conductivity (Kv). In general, Kv is typically significantly less than its horizontal hydraulic conductivity (Kh) and becomes dominant closer to a well. Consequently, drawdown in a well is greater than those observed in fully penetrating conditions which can result in underestimations of T if the system is treated as being pumped by a fully penetrating well. This underestimation is clear in the fully penetrating analysis reported in Section 4.2.2.

It remains unknown how thick the chalk aquifer is below the site or more importantly what thickness is contributing to flow in the overlying sand and gravels. However, reasonable type curve matches were attained by assuming that the contributing aquifer is in the range of 50m to 60m which is consistent with the thickness stated by Affinity.

The T values obtained using the partially penetrating solutions were significantly higher and represent a composite T for the modelled system. An average of the 3 partially penetrating solutions (100m, 60m & 50m thickness) results in a T of approximately 1,000m^2/d although we believe the reduced aquifer thickness model is a better representation so a conservative T of approximately 800m^2/day should be adopted for future operational planning purposes.

5.0 Lagoon Performance

All water pumped during the Step-Drawdown and Constant Rate tests were discharged into the infiltration lagoon except for the repeated Step-Drawdown test in PW2. Water levels in the lagoon and the underlying aquifer (BHA) were recorded with data loggers.

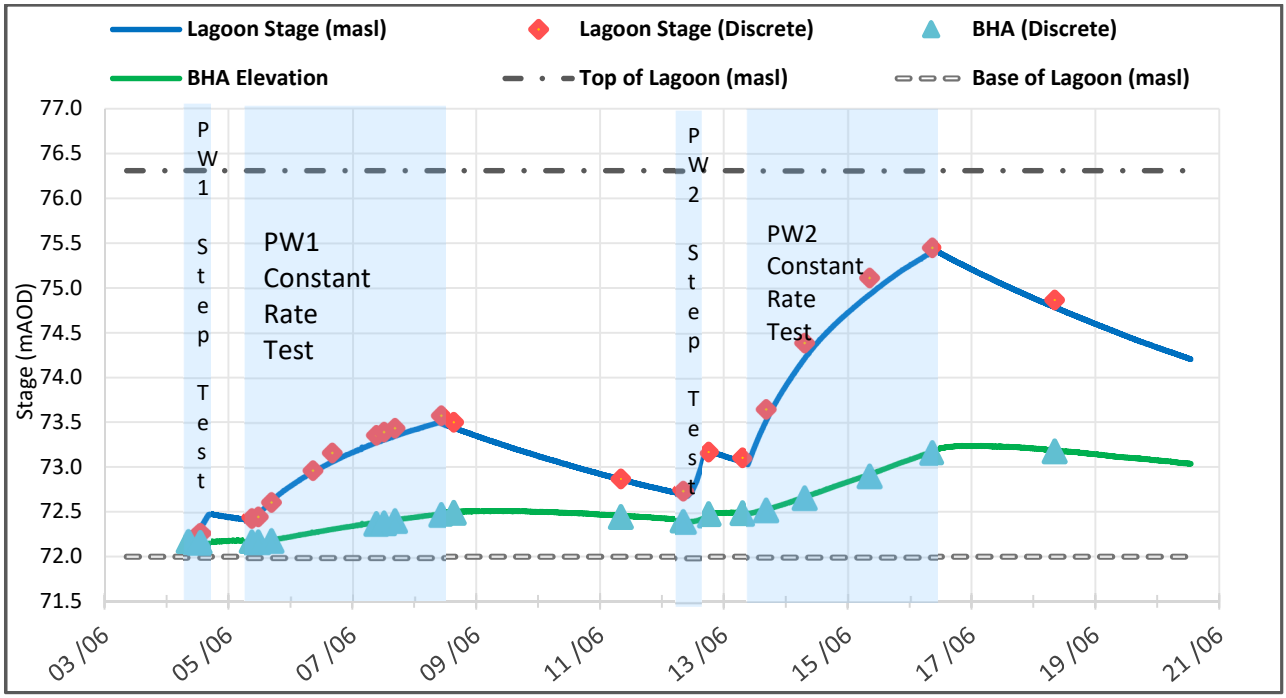
The storage capacity of the lagoon during the programme was approximately 1500m^3 which was slightly below its maximum capacity because of the presence of water at its base (the local UMA water table).

In total 2,200m^3 of water was discharged over four major intervals which allowed for intervening recovery periods. At its peak the lagoon was at approximately 65% capacity and contained 930m^3 of discharged water.

5.1 Infiltration Rates

Figure 5-1 illustrates the water level change in the lagoon throughout the entire testing period comprising two Step-Drawdown and Constant Rate tests. Infiltrations rates were calculated from the four recovery periods which followed the end of each of the Step-Drawdown and Constant Rate tests.

Figure 5-1
Lagoon Stage during Pumping Programme



Infiltration rate was observed to increase with the stage in the lagoon (Table 5-1). This is mostly a result of increased applied head driving water into the unsaturated surrounding formation. Consequently, calculated infiltration rates ranged between 1.27x10^{-6} m/s and 3.38 x10^{-6} m/s. It should be considered that the lagoon was heavily vegetated during the programme which likely reduced the infiltration capacity in comparison to an open formation.

Figure 5-2 Lagoon Performance during Pumping Programme

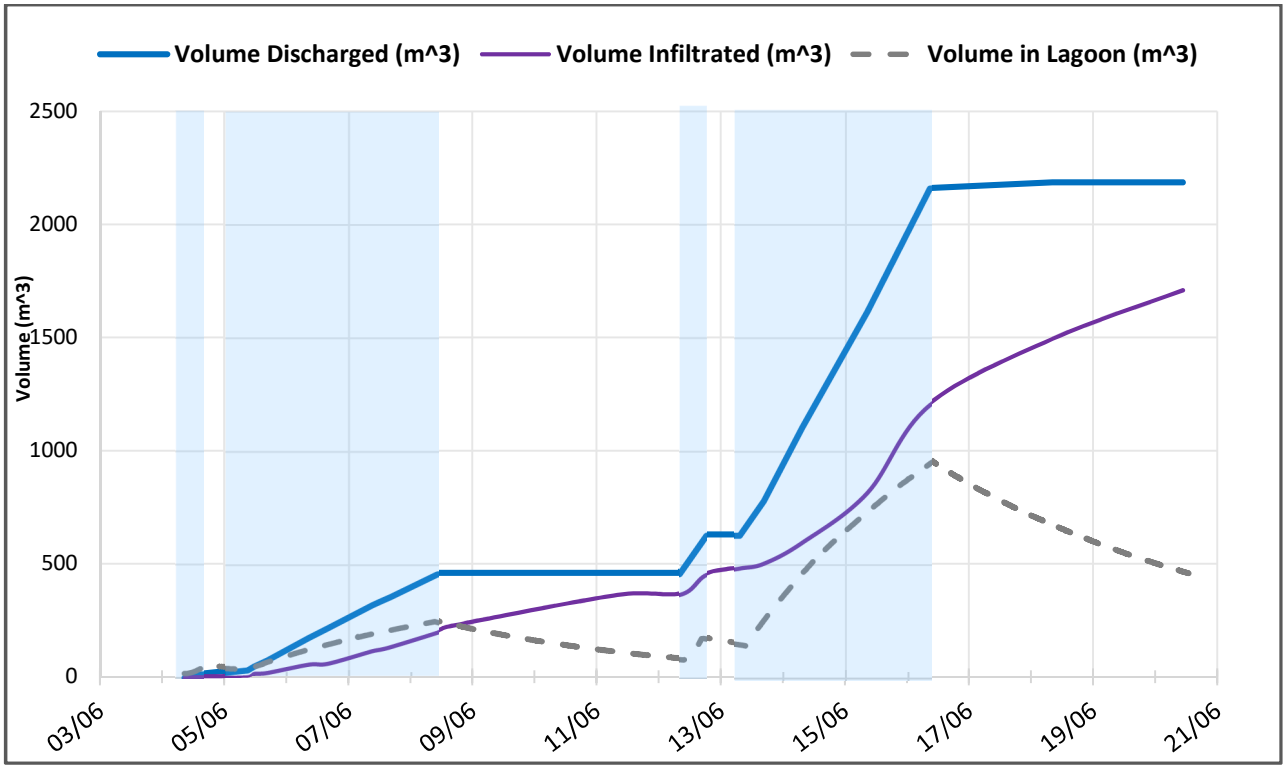


Table 5-1
Lagoon Infiltration Rates

Recovery Period	1	2	3	4
Infiltration rate (m^3/m^2 /s)	1.27x10-6	2.42x10-6	2.52x10-6	3.38x10-6
Recovery Interval (mAOD)	72.46-74.36	73.4-72.75	73.18-73.03	75.45-74.22
Volume Lost (m^3/day)	15	42	36	120

As discussed water generated during the second Step-Drawdown test was discharged into the River Nast culvert. The culvert is constructed of a buried 500mm concrete pipe and runs roughly south across the site and discharges to the drainage ditch which runs along the north side of Hatfield Road. Approximately 360m^3 was discharged directly into the open culvert over an approximately 6.5-hour period.

Initially the culvert appeared to convey the discharged water however within 4 hours it had backed up to the top elevation of the pipe and was back welling into the up-gradient ditch. A manhole 300m downgradient of the ditch was also investigated and no running water was observed. By the following morning the pipe was again dry. Based on these observations it is likely the pipe is blocked at some point before the manhole and the discharged water was lost to the surrounding formation. Brett plans to replace the drain as part of its water management strategy.

5.2 Bromate Results

Seven samples were taken from each well during their respective Constant Rate Test and submitted to Affinity Water laboratories for analysis of Bromate and Bromide. Bromate was not detected at concentrations above method detection limits in any of the samples.

Bromide concentrations were lower in the UMA than the LMA which is consistent with historical findings in groundwater concentrations elsewhere on site. Results are available in Table 5-2 and Table 5-3. Certificates of analysis are included in **Appendix 07**.

Table 5-2
Bromate and Bromide Results PW1

Well	DWS	(mg/L)	05/06/2018		06/06/2018		07/06/2018		08/06/2018
PW1	-	**Bromide**	0.093	0.088	0.088	0.091	0.092	0.092	0.092
	0.01	**Bromate**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Table 5-3
Bromate and Bromide Results PW2

Well	DWS	(mg/L)	13/06/2018		14/06/2018		15/06/2018		16/06/2018
PW2	-	**Bromide**	0.191	0.206	0.204	0.183	0.205	0.117	0.106
	0.01	**Bromate**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

6.0 Conclusions

6.1 Upper Mineral Aquifer

The Transmissivity (T) of the aquifer at the time of the test is between 78m^2/d and 84m^2/d.

Transmissivity (T) = Hydraulic Conductivity (k) x Saturated Thickness (b), so the k of the aquifer based on a b of 4.15m is approximately 20m/d although there will be significant difference across the site due to localised changes in the UMH geology.

Storativity (S) is uncharacteristically low, between 2 x10^{-3} and 3x10^{-3} which could be related to low permeability horizons acting as semi-confining layers in the UMH. In an unconfined aquifer we would expect S to be like the effective porosity (0.1 to 0.3)

The theoretical Radius of Influence (R_0) has been estimated at 450m based on the distance-drawdown plot but as there is no data between 10m and 200m and only minor drawdown recorded in the background monitoring wells 200m to 300m from the pumping well, this it is considered . The calculated R_0 value is a function of the analysis and we expect that 450m would be the upper limit of any area of influence with the real number likely to be closer to 300m - 350m.

The specific capacity (Sc) of PW1 is calculated to be approximately 0.8 L/s/m of drawdown (for an efficiently operating well based on a maximum drawdown no greater than 60% of the available drawdown). This rate may increase if the water table rises and the thickness of saturated gravel increases. Therefore, if we assume an average saturated thickness of 4.5m (Phase F) then the yield would be 2.16 L/s (4.5 x 0.6 x 0.8). Clearly, if the aquifer thickness increases then the Sc will also increase and well yield increases.

Seven water samples were collected from PW1 during the constant rate pumping test. Bromate was not detected above the method detection limit in any of the samples.

6.2 Lower Mineral Aquifer

For the purposes of future planning, analysis of the pumping test data has indicated that the chalk and the LMH should be considered a single aquifer. This is not a new or unexpected finding, and nor does it have a significant impact on previous work given the assumptions that were made at that time. It does, however, confirm the situation.

Affinity Water plc has indicated that the 'contributing portion' of the chalk aquifer is less than the measured thickness of the chalk with most of the flow being contributed from the upper 50m-60m of the unit.

SLR has analysed the pumping test data under variable aquifer thickness assumptions (100m to 50m) and a better type curve fit is achieved with an aquifer thickness within the range stated by Affinity, which results in a T of approximately 800m^2/d, which should be considered appropriate for future operational planning purposes. The BGS website2 indicates the T of the chalk in the Chilterns region ranges from 276 (25th percentile) to 2,100 (75th percentile), with a median of 860m^2/d.

Transmissivity (T) = Hydraulic Conductivity (k) x Saturated Thickness (b), so the k of the aquifer based on assigned b values of 50 - 60m is approximately 15m/d although there will be significant difference across the site due to local changes in the chalk and LMH geology.

As with the UMA, the Storativity (S) is low (1x10^{-2} – 8x10^{-3}) for an unconfined aquifer but a comparison with BGS data provides a useful benchmark and indicates the site compares to the upper percentile value for the Chilterns – [8x10^{-4} (25thpercentile) to 2.8x10^{-2} (75th percentile), with a median of 2.9x10^{-3}].

[2] http://www.bgs.ac.uk/research/groundwater/waterResources/thames/chalk.html

The theoretical Radius of Influence (R_0) has been estimated at 475m based on the distance-drawdown plot. However, there was no convincing drawdown response in wells close to this radius (BH101, BH102) so this distance should be considered the upper theoretical limit of an area of influence. A value ranging between 250m and 350m is considered a reasonable estimate.

The specific capacity of PW2 is calculated to be approximately 2.3 L/s/m of drawdown (for an efficiently operating well based on a maximum drawdown no greater than 60% of the available drawdown). This rate may increase if the water table rises and the thickness of saturated gravel increases. Therefore, if we assume an average saturated thickness of 9m (Phase F) then the yield would be 12.4 L/s (9 x 0.6 x 2.3). Clearly, if the aquifer thickness increases then the Sc will also increase and well yield increases.

Seven water samples were collected from PW2 during the constant rate pumping test. Bromate was not detected above the method detection limit in any of the samples.

6.3 Infiltration Lagoon/ Nast Culvert Performance

Approximately 2,200m^3 of water was discharged into the lagoon during the pumping test programme. The lagoon had a total capacity of approximately 1,500 m^3 and was 65% full as a maximum. Water readily infiltrated from the lagoon and levels dropped between 0.1 and 0.3 m/day.

Infiltration volumes increased when the pond was at higher stages because of higher driving heads. Discharge rates varied over the four recovery stages between 15m^3/day and 127m^3/day. At the time of the programme the lagoon has developed a soil horizon and was heavily vegetated which is likely to have compromised the lagoon's infiltration potential.

Water discharged during the 2nd step test in PW2 was discharged into the Nast at the opening of the culvert. Water was observed to back-up in the culvert to the point of discharge and we can conclude that the Nast culvert is damaged and that it is unable to discharge water introduced into the drain at a rate greater than 1,500 m^3/day.

Brett plans to replace the Nast drain as part of its surface water management strategy at the site so capacity issues will be addressed at that time.

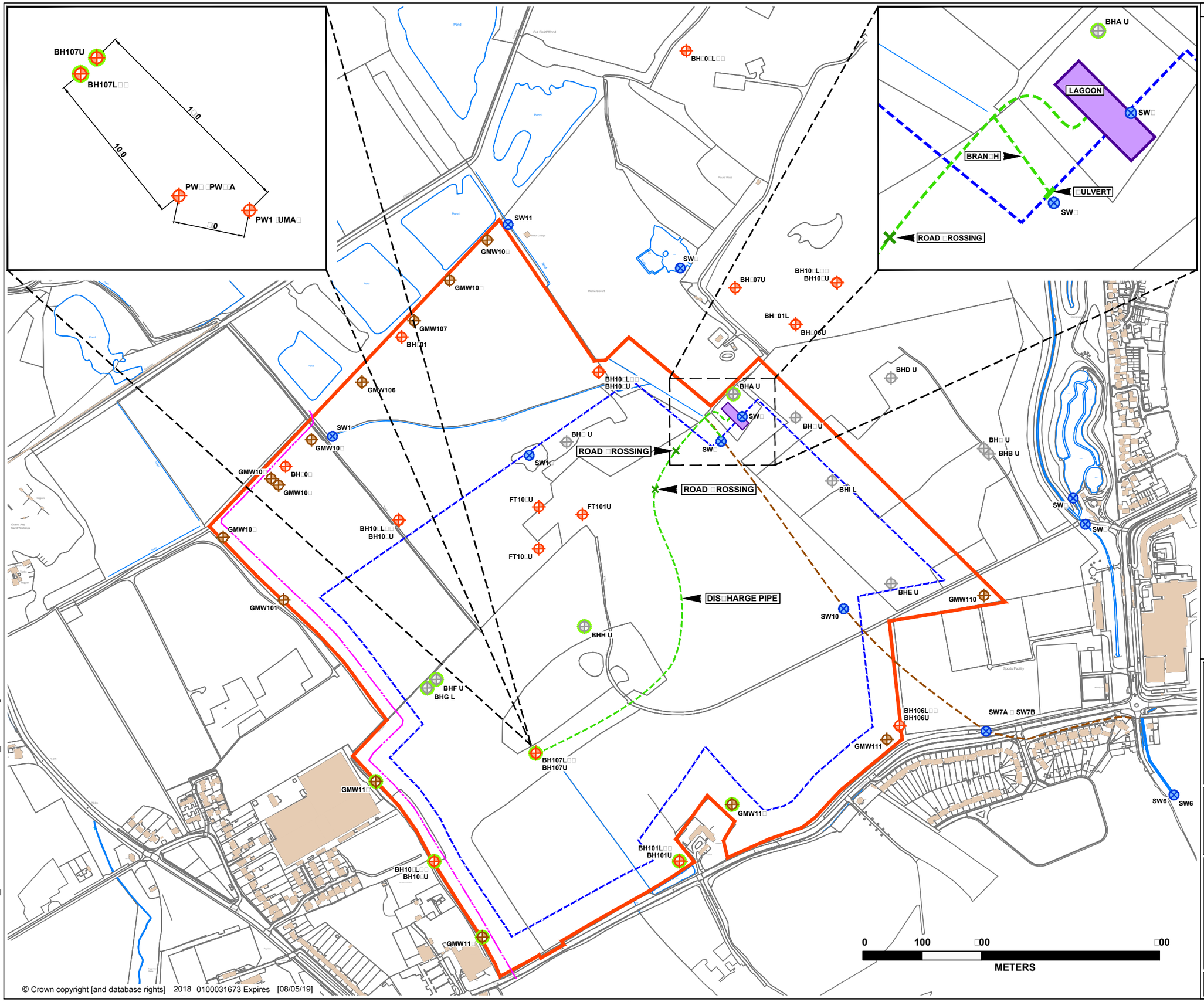
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Cooper, H.H. and C.E. Jacob, 1946. A generalized graphical method for evaluating formation constants and summarizing well field history, Am. Geophys. Union Trans., vol. 27, pp. 526-534

Driscoll, F.G., 1986. Groundwater and Wells (2nd ed.), Johnson Filtration Systems, Inc., St. Paul, Minnesota, 1089p.

Neuman, S.P., 1973. Supplementary comments on 'Theory of flow in unconfined aquifers considering delayed gravity response of the water table', Water Resources Research, vol. 9, no. 4, pp. 1102-1103.

Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524.



LEGEND

- SITE BOUNDARY
- PROPOSED MINERAL DEVELOPMENT SITE
- RIVER NAST CULVERT (ASSUMED ROUTE)
- NATIONAL GRID GAS PIPELINE (SURVEYED LOCATION)
- PRE BRETT WELLS

SLR BOREHOLES AND MONITORING POINTS

- SLR WELLS
- SURFACE WATER MONITORING POINT
- PERIMETER GAS MONITORING WELLS (2016)
- WELLS TO BE MONITORED DURING TEST

BH101 □BH10□□ FT □ SERIES 1 BOREHOLES (2013 & 2014)

BH□01 □ SERIES 2 BOREHOLES (2014)

BH□01 □BH□0□ BH□0□ □BH□07 □ SERIES 3 BOREHOLES (2016)

U □ MONITORING WELL SCREENED ACROSS THE UPPER MINERAL HORIZON

L □ MONITORING WELL SCREENED ACROSS THE LOWER MINERAL HORIZON

□ □ MONITORING WELL SCREENED ACROSS THE CHALK

FT □ FIRE TRAINING AREA (UPPER MINERAL HORIZON)

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HATFIELD AERODROME

PUMPING TEST

ABSTRA□TION AND DIS□HARGE LO□ATIONS

DWG N□□1

Scale	Date
NTS (A3)	JUNE 2018

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APPENDIX 01

SLR Work Plan

09 July 2018

Karen Myers
Robert Brett & Sons
Milton manor farm
Ashford Road
Canterbury, Kent CT4 7PP

Our Ref: 402.01009.00174.004

Dear Karen

RE: HATFIELD – PROPOSAL FOR DESIGN, SUPERVISION AND REPORTING OF PUMPING WELL INSTALLATIONS AND A PUMPING TEST

A pumping test of the Upper Mineral Aquifer (MNA) and the Lower Mineral Aquifer (LMA) is proposed at the Hatfield Mineral Site to gather hydraulic data required for the design and sizing of the proposed infiltration lagoons, the operational works in order to lower the water levels in the respective aquifers and to provide a future water supply for mineral workings at the site.

This proposal is for SLR Consulting Ltd (SLR) role as designer and for supervision, data analysis and reporting of the works. Design Works have been already completed and a tender document was prepared and competitively tendered in late April/early May. WJ Groundwater Ltd has been awarded the contract and will enter a contract directly with Robert Brett & Sons Ltd (Brett). The current starting date (mobilisation and drilling) is 23rd May 2018, to be followed by testing. We anticipate site works to take 4 to 5 weeks in total.

1. SCOPE OF WORK

The following bullet points provide an outline of work tasks that are to be completed, many of which are detailed in the contractor tender documentation (Appendix A).

1. Preliminary Work Tasks

a. Selection of suitable pumping well locations;
b. Selection of a suitable water discharge location;
c. Design of abstraction wells;
d. Design of Pumping test requirements;
e. Tender document preparation;
f. Tender issue to WJ Groundwater and Stuart Well Services and subsequent tender analysis.

2. Drilling and Well Installation

a. Management and liaison with Brett, coordination of field work with WJ Groundwater;
b. Health & Safety, Security, RAMS approval;
a. Mobilisation of field office with secure equipment storage;
b. Mobilisation of security fencing, drilling equipment, well materials;

c. Drilling one borehole into the UMA terminating 1.5m into the interburden unit and construction of an abstraction well;
d. Drilling one borehole into the LMA terminating 1.5m into the chalk unit and construction of an abstraction well. The installation will also include a monitoring well within the UMA;
e. Installation of a shallow piezometer (drive point) into the UMA at the point of water discharge into the existing lagoon located adjacent to Home Covert wood;
f. Development of the abstraction wells;
g. Demobilisation of the drilling rig and associated equipment.

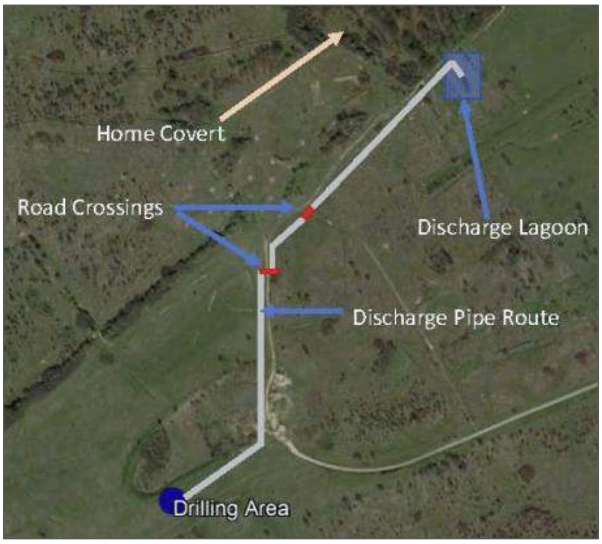
3. Pumping Tests

a. Mobilisation of field equipment required for the pumping test (pumps, riser pipe, discharge pipe, intermediate tank, generator, pump lifting equipment);
b. Completion of a 1 day, 5-stage step test in each well;
c. Completion of a 3-day constant discharge pumping test in each well at a suitable rate determined from the findings of the step-test;
d. 24-hour monitoring of water level drawdown in the pumping wells and adjacent wells using transducers and data loggers and by manual dips;
e. Monitoring of field parameters from the pumping well (temperature, conductivity, pH and REDOX) on a semi-continuous basis;
f. Collection of daily water samples from the pumping wells and monitoring wells for bromate and bromide analysis. Water discharge samples will be scheduled for fast turnaround analysis (24 hour). SLR will collect samples and be responsible for scheduling analysis, delivery of samples to Affinity Water laboratory;
g. Monitoring water level recovery after the conclusion of each constant discharge test;
h. Demobilisation of field equipment.

4. Data Analysis and Reporting

a. Data reduction and analysis;
b. Reporting.

Water Discharge



We propose discharging water from the tests to a suitably sized tank located adjacent to the pumping wells. A transfer pump will then lift water from the tank via a MDPE rigid pipe to an existing 4m deep lagoon excavated into the UMH and located adjacent to Home Covert wood, approximately 600m from the pumping wells.

Two 'road' crossings will comprise a shallow trench (0.3m x 0.3m) in which the pipe will be placed and covered with crushed concrete from the nearby stockpiles.

We also propose installing a drive point monitoring well into the base of the lagoon to

monitor any water level rise which will provide useful data on lagoon performance in the upper mineral horizon.

SLR Site Responsibilities

SLR will work closely with WJ Groundwater and be responsible for:

- Managing the works on behalf of Brett;
- Ensuring works are carried out in a safe manner in accordance with the agreed RAMS;

SLR will supervise and engage with the contractor during the:

- Drilling and logging of borehole materials;
- Collection of samples for possible PSD analysis;
- Installation of the pumping wells and any associated piezometers;
- Development of each well to the stated specification;
- Mobilisation and setup of the tests;
- The pumping tests;
- Collecting water samples and submitting them for bromate and bromide analysis;
- Daily progress reports (phone call) to Brett.

SLR will also be involved with the physical monitoring of water levels and carrying out field monitoring of water quality during the testing.

Water Quality

SLR will be collecting 2 water samples per day (8AM, 6PM) from the pumping wells and will submit them to Affinity Water's laboratory for 24-hour analysis of bromate and bromide.

Previous analysis of groundwater from the nearby BH107 has not detected bromate in the past 5 years and we do not expect detecting bromate in the water discharge. However, should bromate be detected at a concentration exceeding the UK DWS (10 ug/l), then SLR will direct the pumping test to be stopped and the water level recovery monitoring phase will be brought forward.

Data Collation and Analysis

Upon completion of field work, SLR will gather all electronic data from transducers/data loggers and from manual measurements in the field. Data will be collated and tabulated and analysed using traditional computer based pumping test analysis techniques (time-drawdown, distance-drawdown).

Data will be tabulated, graphed and plotted and should enable SLR to determine values for transmissivity (T), hydraulic conductivity (k) and Storage (S), well yield as well as an indication of individual pumping well efficiency.

Changes in water quality during the tests will be plotted against time, pumping rate, and total discharge to assess any data changes and samples from adjacent wells (in all 3 water bearing zones) will be assessed for change that may relate to the pumping tests being undertaken.

Reporting

The report will present the results of the test, including

- Objective and method;
- Borehole logs including geological descriptions, well installation details together with x.y.z coordinates at each.
- Findings will be discussed and areas of concern flagged up including data gaps, if any.
- Analytical data will be presented and interpreted together with values for T, k, S and well yield

We will not include in this report any further design and scaling of the proposed lagoons. This will be the subject of further analysis.

We look forward to hearing from you in due course.

Yours sincerely

SLR Consulting Limited



[My Name]
[My Position]

Cc Stuart Wood
Enc

Tender package issued to WJ Groundwater
SLR Brett Group Amended T&C's

APPENDIX 02

Photolog



Photo 1: Advancing PW1.



Photo 2: Advanving 10'' casing in PW2



Photo 3: Installing abstraction in PW2.



Photo 4: Saturated Upper Mineral Horizon Sands



Photo 5: Upper Mineral Horizon Sand and Gravel from PW2.



Photo 6: Representative material from Lower Mineral Horizon consisting od sandy gravels.

Notes:

402.01009.00174

Site: HATFIELD AERODROME

Project: HATFIELD PUMPING TEST

Date: July 2018

Drawing: **PHOTOS 1-6**

Appendix 02



Photo 7: Abstractions were constructed of a Boode® well systems pipe and screens

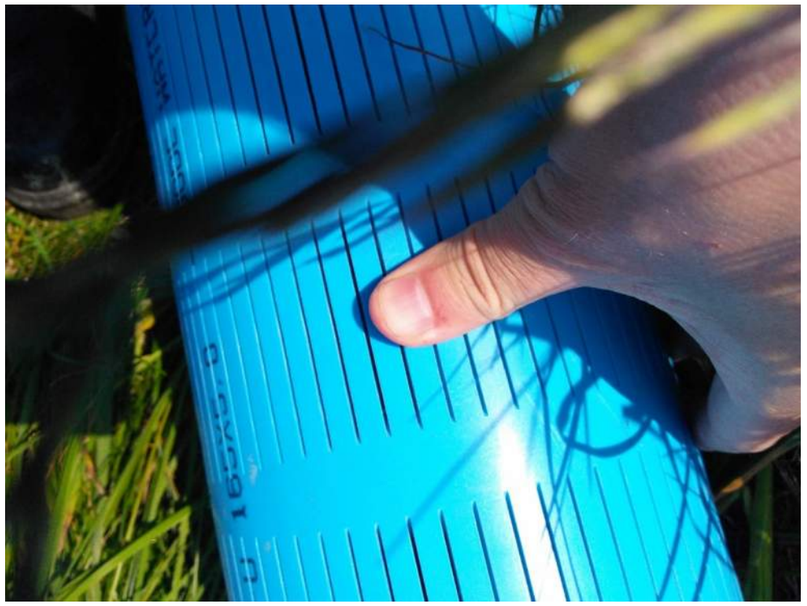


Photo 8: 1mm vertically slotted screen used in PW2

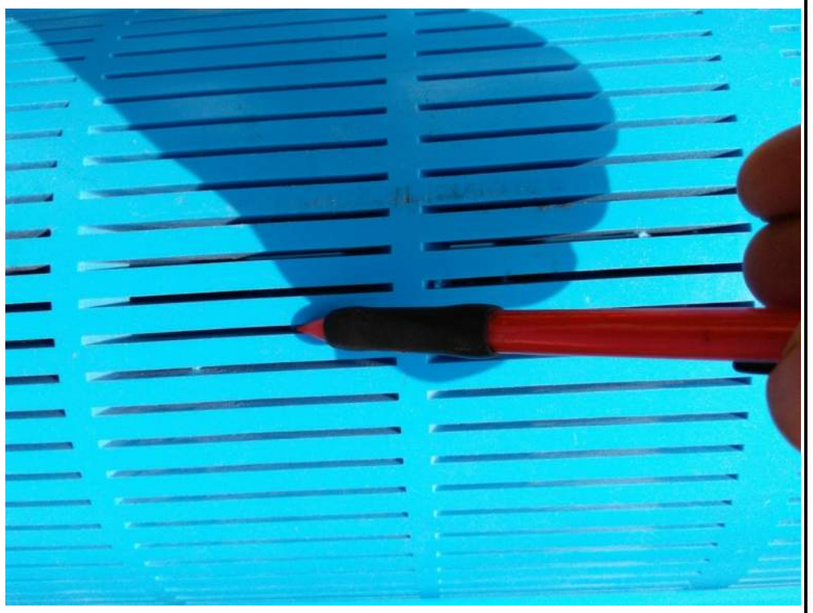


Photo 9: 2mm vertically slotted screen used in PW2



Photo 10: Developing PW1. Yellow airline in foreground.



Photo 11: Site photograph showing both wellheads and WJ's logging unit.



Photo 12: PW2 prior to pumping. Note PW2-A beside main well.

Notes:

402.01009.00174

Site: HATFIELD AERODROME

Project: HATFIELD PUMPING TEST

Date: July 2018

Drawing: **PHOTOS 6-12**

Appendix 02



Photo 13: Grundfos ® Pumps prior to installation.



Photo 14: Seimens ® electromagnetic flow-meter



Photo 15: Logging unit



Photo 16: Infiltration lagoon prior to pumping beginning.



Photo 17: Lagoon immediately after end of PW2 constant rate test.



Photo 18: Wellheads prior to demobilization.

Notes:			Site:	HATFIELD AERODROME
			Project:	HATFIELD PUMPING TEST
			Date:	July 2018
			Drawing:	**PHOTOS 13-18**
		402.01009.00174		**Appendix 02**

APPENDIX 03

Environment Agency Abstraction Consents

Consent No:	TP 18/005

CONSENT TO INVESTIGATE A GROUNDWATER SOURCE

Section 32(3) Water Resources Act 1991

This **CONSENT** is issued by the Environment Agency ("the Agency") to: Ms Karen Myers of the Brett Group, Robert Brett House, Ashford Road, Canterbury CT4 7PP ("the Consent Holder").

This consent authorises the Consent Holder to **construct and test pump a borehole** at Hatfield Road Quarry, Albatross Way, Hatfield, Hertfordshire, AL10 9LS at National Grid Reference TL 19801 08133 subject to the further details and conditions set out in the Schedules 1 and 2 to this consent.

This consent is effective from the date below and expires on the 10th of May 2019.

Signature	Print name Giuseppe Frapporti
Position Team Leader – Groundwater, Hydrology & Contaminated Land	Date: 10 May 2018

This consent is issued by the Environment Agency from its office at Alchemy, Bessemer Road, Welwyn Garden City, Hertfordshire, AL7 1HE. The person whom the Consent Holder should contact during the carrying out of the works and if he has any queries is Michael Leeson (Telephone: 020 302 59111).

Consent No:	TP 18/005

SCHEDULE 1 - General Conditions

1 INTERPRETATION

a) "The Consent Holder" means the person (whether an individual or organisation) to whom this consent is granted. Where the Consent Holder is two or more persons (e.g. a partnership) such persons shall be jointly and severally liable for the proper fulfilment of the conditions of this consent. In this consent the expression may also include, where the context so admits, a person who is the applicant for a consent i.e. before a consent is granted.

b) "The works" means the activities authorised or required by this consent, including the survey, construction of the well, borehole, well points, catchpit, or other work, and/or test pumping of the same, as the context so requires. The expression "the works" does not include activities for which this consent is unnecessary, such as construction of ancillary buildings, access roads, pits for drill cuttings, etc.

2 PURPOSE OF THIS CONSENT

This consent is granted only for the purpose of ascertaining the quantity and quality of groundwater available from a proposed source, and the effects that abstraction from that source would have on adjacent groundwater and inland waters.

This document is not a licence to abstract water, except for testing purposes. If it is desired to abstract water for other purposes, an application should be made to the Agency for an abstraction licence. **Even if the test pumping etc to which this consent relates is successful, THERE IS NO GUARANTEE THAT SUCH A LICENCE WILL BE GRANTED.**

3 CLEARANCE/DEVELOPMENT PUMPING

Clearance/development pumping to remove any products of the well drilling or well development treatment is permitted under this Consent for a period not exceeding 48 hours.

Clearance/development pumping that extends beyond 48 hours must be agreed with the Agency prior to the commencement of pumping. There must be a **full recovery** of water levels before a proper test pumping commences.

4 SURVEY

It is a pre-condition to the issue of this Consent that the Consent Holder has conducted a survey of water sources and other features which may be relevant to the works. The works shall not proceed unless and until the Agency has informed the Consent Holder in writing to the effect that (i) it considers the said survey has been carried out adequately and (ii) it appears unlikely that test pumping will significantly affect

other water users. The Agency will have specified the types of features and area to be covered by the survey. It will have supplied a form for the Consent Holder to complete and return to it with the required information. The Agency may also have provided the Consent Holder with such information as it had available, in order to help him with the survey.

5 WITHDRAWAL and MODIFICATION OF CONSENT

a) Contravention of this consent, in particular using it for abstraction other than for the purpose of investigating quality or quantity of groundwater, may result in its immediate withdrawal. If appropriate, further legal action may also be taken.

b) The Agency reserves the right at any stage of the works to withdraw this consent, or modify it by imposing further requirements or restrictions, if the works are having, or appear likely to have, an effect on sources of supply, or the quality or flow of any other waters, to an extent not anticipated at the time when consent was granted, or as otherwise may be reasonable in the light of the Agency's responsibilities for the management of water resources.

Modification may, for example, require the Consent Holder to provide alternative supplies to affected persons (subject to their agreement), and/or to conduct survey work in addition to that required by Condition 2 above before this consent was granted.

6 NOTICES etc TO THE AGENCY

Unless other periods are agreed in writing with the Agency, the Consent Holder shall give written notice to the Agency as follows:-

a) 5 days' notice before first commencing construction of the works

b) 5 days' notice before commencing acidisation or other treatment of the works

c) 10 days' notice before commencing test pumping.

Notice, and other information required by the Agency, shall be sent to the office at the address shown on the front of this consent for the attention of the person named there.

7 DISCHARGE OF WATER and POTENTIAL FOR POLLUTION/ PHYSICAL DISTURBANCE

a) The Consent Holder shall construct and finish the works so that water is prevented from running to waste. Any artesian flow must be securely capped.

b) The Consent Holder shall secure any completed works so as to prevent pollution or other hazard through those works, for example by

capping and locking a completed borehole.

c) The Consent Holder shall ensure that pollution of, interference with, or damage to inland freshwaters or groundwater does not occur, whether from abstracted water or from substances or materials used in connection with the works. If the Consent Holder is concerned about the possible effects of discharge, he should apply to the Agency for an appropriate discharge consent. **This document is not a discharge consent. It is also not a consent for the purposes of section 166 Water Industry Act 1991 nor section 164 Water Resources Act 1991 (discharge through large diameter pipes).**

d) The Consent Holder shall be responsible for obtaining necessary consents in relation to structures in, over or under watercourses.

e) The Consent Holder shall be responsible for the proper disposal of wastes from the works.

f) The Consent Holder shall notify neighbouring landowners who may be affected by discharge from the works and, if applicable, the Internal Drainage Board for the area, and shall take all necessary steps to prevent flooding.

g) The Consent Holder shall ensure that all persons engaged in the works are free from, and are not carriers of, waterborne diseases, and shall ensure that they operate to a high standard of hygiene.

8 EFFECTS ON OTHER WATER SOURCES

The Consent Holder shall immediately inform the Agency if any information or complaint is received by him about the consented operation, and shall immediately consult with the Agency as to the appropriate action to be taken.

9 RECORDS

The Consent Holder shall keep such records of strata encountered, construction of the works, results of any geophysical logging, water quality analyses, and test pumping data as may be required by the Agency. The information shall be given on forms provided by the Agency, and/or on compatible computer disk in a format agreed with the Agency. These records must be returned within one month of completion of the works or with any subsequent licence application (whichever is sooner).

10 RESPONSIBILITY and INDEMNITY

a) The works shall be carried out at the Consent Holder's expense. The Agency shall not be liable to pay for any of the works nor for any of the consequences that may arise from them.

b) The Consent Holder will be responsible for making good and

compensating for any loss or damage resulting from the works.

c) The Consent Holder shall be responsible for obtaining any other consents from other Sections of the Agency or from other bodies which may be necessary for carrying out the works or any ancillary work.

d) Nothing in this consent, or in any accompanying instructions, or in an communication by the Agency to the Consent Holder, shall make the Agency liable in respect of design or suitability of the proposed works. Nor will the Agency be liable for any loss, damage, or injury (whether to persons or property, including water resources generally or derogation from individual sources of supply) which may arise by reason of borehole development, abstraction of water, discharge of water, or any other steps in carrying out the works, or abstraction subsequently licensed on the basis of information gathered in the course of carrying out the works. The Consent Holder shall keep the Agency fully indemnified in respect of any and all such claims should the same be made against the Agency its servants or agents. This provision shall act without prejudice to any liability of the Consent Holder under section 206 Water Resources Act 1991 or otherwise in relation to misstatement.

11 INFORMATION TO THE BRITISH GEOLOGICAL SURVEY (BGS) ON BEHALF OF THE NATURAL ENVIRONMENT RESEARCH COUNCIL

a) Where the proposed works are intended to be more than 15 metres (50 feet) deep, the Consent Holder must notify BGS before starting the works. BGS' address for the purpose is the Hydrogeology Group, British Geological Survey, Maclean Building, Crowmarsh Gifford, Wallingford, Oxon OX10 8BB.

b) The Consent Holder shall send BGS stratigraphic and test pumping information as required by section 198 Water Resources Act 1991 within one month of completing the work. By arrangement with BGS, the Agency will do this on behalf of the Consent Holder unless the Consent Holder instructs otherwise.

c) Under “The Borehole Sites and Operations Regulations 1995” HSE must be notified when drilling boreholes more than 30 metres deep into used or disused mining areas. The regulations define “mining area” as land within one kilometre in a horizontal or other direction of workings in a mine, or where a licence to mine for minerals has been granted.

12 MEASUREMENT ACCESS

The Consent Holder shall provide an access tube of diameter adequate for measuring instruments to be lowered

safely into the borehole. In the case of lagoons, the consent holder shall install a gauge board, of a design approved by the Agency, in a position in the lagoon so that at all times the full range of water levels from normal top water level to the maximum drawdown level can be safely observed. The datum level on the gauge board shall be accordingly levelled to Ordnance Datum (Newlyn).

13 INFORMATION IN PUBLIC DOMAIN

Unless the Consent Holder claims, to the satisfaction of the Agency, that commercial or industrial confidentiality attaches to information which the Consent Holder supplies to the Agency (or BGS), the Agency (or BGS) may release such information to the public under the provisions of the Environmental Information Regulations 1992.

14 ENTRY BY THE AGENCY or BGS

The Consent Holder shall allow representatives of the Agency or BGS to enter the site at all reasonable hours, to inspect the works, to inspect and take copies or extracts of documents, and to take measurements and samples, as such representatives consider appropriate.

15 STANDARDS OF WORK

Unless otherwise specified in this consent or subsequently agreed with the Agency, the Consent Holder shall carry out the works and present data fully in accordance with British Standard ISO 14686 (2003) "Hydrometric determinations – pumping tests for water wells – considerations and guidelines for design, performance and use". Copies of this are available from BSI, 389 Chiswick High Road, London, W4 4AL. Tel: (020) 89969000.
http://www.bsi-global.com/. The Agency may require repetition of tests or other appropriate remedial activities should the required standards not be met.

16 ACCEPTANCE OF CONDITIONS

Commencement of the works shall be deemed to constitute acceptance by the Consent Holder of all the terms and conditions set out in this consent and an undertaking that he will abide by them.

Consent No:	TP 18/005

SCHEDULE 2 - Special Conditions

1. CONSTRUCTION DETAILS

When constructing the works:

a. The maximum depth of the borehole shall be 8 m below ground level.

b. The maximum diameter of the borehole shall be 254 mm.

2. PROGRAMME

The Consent Holder shall carry out test pumping and measurement of water levels in the works and at other points using a preliminary step test and constant rate test. Full details of your test requirements are given in section below.

a. Preliminary Step Tests

This Consent permits the holder to undertake stepped rate pump tests at the borehole. The tests shall comprise five consecutive steps, with the flow rate of each step greater than the last, up to the final step, provided this does not exceed the maximum permissible rate of 10.8 m^3/hr. The pump rate during each step shall be constant and all of equal duration of at least 60 minutes. The Consent Holder shall confirm the proposed step test schedule with the Agency prior to carrying out the test.

A rest period of at least 24 hours shall be permitted, or at least until 95% recovery has been achieved.

b. Constant Rate Tests

This Consent permits the continuous pumping of the borehole at a maximum sustainable rate, provided this does not exceed the permissible rate of 10.8 m^3/hr, for a duration of 72 hours, **or for a longer period if water level has not reached equilibrium**. The abstracted water shall be discharged to waste throughout this test.

A rest period of at least 24 hours shall be permitted, or until at least 95% recovery has been achieved, whichever is longer.

Recovery Test

Recovery levels shall be measured and time being measured from the cessation of pumping until such time as the water level reaches its original level.

NO FURTHER PUMPING IS TO TAKE PLACE FROM THE TEST SOURCE AFTER THE END OF THE PUMPING TEST WITHOUT THE CONSENT OF THE ENVIRONMENT AGENCY.

3. WATER LEVEL MONITORING

Before, during and after test pumping the Consent Holder is required to monitor the following specified water and wetland features.

3a. At the pumped source

a The Consent Holder shall measure and record water levels twice daily for at least 3 days **before** pumping commences. Thereafter the Consent Holder shall measure water levels as shown on the attached data sheets from the commencement and completion of each pumping session and, until full recovery. Discharge rates or meter readings must be recorded at the minimum frequency during pumping.

3b. Water Feature Monitoring Points

PW2-S. BH 107, BH 101 and BH 102 all at Hatfield Road Quarry A number of other monitoring wells in the vicinity will be monitored on a regular basis.

Further measurement, as detailed below, will be required at the above observation sites. Water levels at this sites shall be measured:-

- Once daily for at least three days before pumping and for three days after pumping or until full recovery is observed

- at least 4 times daily during pumping.

Submission of Data from Data Loggers

The Consent Holder shall submit monitoring data recovered from data loggers to the Agency on A CD or DVD or electronically mailed in either ASCII text or Windows EXCEL format. The Consent Holder shall submit to the Agency for the approval of the format and style prior to the commencement of monitoring.

4. DISCHARGE OF WATER

The Consent Holder shall discharge water from the test pumping into the Point A shallow lagoon at approximately TL 20136 08709.

The pumped water should be disposed of in such a way as to prevent re-circulation back to the aquifer.

5. CONSTRUCTION DETAILS AND PUMPING TEST RESULTS

The Consent Holder shall present results from the test pumping on forms WR-38 and WR-39, provided by the Environment Agency.

Results of test pumping shall be presented on form WR-39, **AND** interpreted in a report with format similar, or identical, to which was set out on form WR-43, both are available from the Environment Agency. It is important that the results are presented to the correct level of detail to avoid possible delays in Abstraction Licence application process. Please contact the Environment Agency if you have any questions about the contents of the report.

6. OTHER SPECIAL CONDITIONS

a. If after pumping for 72 hours groundwater levels within the abstraction source have not stabilised then the Consent Holder must continue pumping until these conditions are achieved.

b. The abstraction borehole shall be levelled by the consent holder to the Newlyn Ordance Datum.

NB. Any claim for derogation from the owner of a protected source within the specified radius, but not discovered during the survey may result in the test pumping programme, or a modified version of it, having to be repeated.

Consent No:	TP 18/006

CONSENT TO INVESTIGATE A GROUNDWATER SOURCE

Section 32(3) Water Resources Act 1991

This **CONSENT** is issued by the Environment Agency ("the Agency") to: Ms Karen Myers of the Brett Group, Robert Brett House, Ashford Road, Canterbury CT4 7PP ("the Consent Holder").

This consent authorises the Consent Holder to **construct and test pump a borehole** at Hatfield Road Quarry, Albatross Way, Hatfield, Hertfordshire, AL10 9LS at National Grid Reference TL 19806 08133 subject to the further details and conditions set out in the Schedules 1 and 2 to this consent.

This consent is effective from the date below and expires on the 10th of May 2019.

Signature	Print name Giuseppe Frapporti
Position Team Leader – Groundwater, Hydrology & Contaminated Land	Date: 10 May 2018

This consent is issued by the Environment Agency from its office at Alchemy, Bessemer Road, Welwyn Garden City, Hertfordshire, AL7 1HE. The person whom the Consent Holder should contact during the carrying out of the works and if he has any queries is Michael Leeson (Telephone: 020 302 59111).

Consent No:	TP 18/006

SCHEDULE 1 - General Conditions

1 INTERPRETATION

a) "The Consent Holder" means the person (whether an individual or organisation) to whom this consent is granted. Where the Consent Holder is two or more persons (e.g. a partnership) such persons shall be jointly and severally liable for the proper fulfilment of the conditions of this consent. In this consent the expression may also include, where the context so admits, a person who is the applicant for a consent i.e. before a consent is granted.

b) "The works" means the activities authorised or required by this consent, including the survey, construction of the well, borehole, well points, catchpit, or other work, and/or test pumping of the same, as the context so requires. The expression "the works" does not include activities for which this consent is unnecessary, such as construction of ancillary buildings, access roads, pits for drill cuttings, etc.

2 PURPOSE OF THIS CONSENT

This consent is granted only for the purpose of ascertaining the quantity and quality of groundwater available from a proposed source, and the effects that abstraction from that source would have on adjacent groundwater and inland waters.

This document is not a licence to abstract water, except for testing purposes. If it is desired to abstract water for other purposes, an application should be made to the Agency for an abstraction licence. **Even if the test pumping etc to which this consent relates is successful, THERE IS NO GUARANTEE THAT SUCH A LICENCE WILL BE GRANTED.**

3 CLEARANCE/DEVELOPMENT PUMPING

Clearance/development pumping to remove any products of the well drilling or well development treatment is permitted under this Consent for a period not exceeding 48 hours.

Clearance/development pumping that extends beyond 48 hours must be agreed with the Agency prior to the commencement of pumping. There must be a **full recovery** of water levels before a proper test pumping commences.

4 SURVEY

It is a pre-condition to the issue of this Consent that the Consent Holder has conducted a survey of water sources and other features which may be relevant to the works. The works shall not proceed unless and until the Agency has informed the Consent Holder in writing to the effect that (i) it considers the said survey has been carried out adequately and (ii) it appears unlikely that test pumping will significantly affect

other water users. The Agency will have specified the types of features and area to be covered by the survey. It will have supplied a form for the Consent Holder to complete and return to it with the required information. The Agency may also have provided the Consent Holder with such information as it had available, in order to help him with the survey.

5 WITHDRAWAL and MODIFICATION OF CONSENT

a) Contravention of this consent, in particular using it for abstraction other than for the purpose of investigating quality or quantity of groundwater, may result in its immediate withdrawal. If appropriate, further legal action may also be taken.

b) The Agency reserves the right at any stage of the works to withdraw this consent, or modify it by imposing further requirements or restrictions, if the works are having, or appear likely to have, an effect on sources of supply, or the quality or flow of any other waters, to an extent not anticipated at the time when consent was granted, or as otherwise may be reasonable in the light of the Agency's responsibilities for the management of water resources.

Modification may, for example, require the Consent Holder to provide alternative supplies to affected persons (subject to their agreement), and/or to conduct survey work in addition to that required by Condition 2 above before this consent was granted.

6 NOTICES etc TO THE AGENCY

Unless other periods are agreed in writing with the Agency, the Consent Holder shall give written notice to the Agency as follows:-

a) 5 days' notice before first commencing construction of the works

b) 5 days' notice before commencing acidisation or other treatment of the works

c) 10 days' notice before commencing test pumping.

Notice, and other information required by the Agency, shall be sent to the office at the address shown on the front of this consent for the attention of the person named there.

7 DISCHARGE OF WATER and POTENTIAL FOR POLLUTION/ PHYSICAL DISTURBANCE

a) The Consent Holder shall construct and finish the works so that water is prevented from running to waste. Any artesian flow must be securely capped.

b) The Consent Holder shall secure any completed works so as to prevent pollution or other hazard through those works, for example by

capping and locking a completed borehole.

c) The Consent Holder shall ensure that pollution of, interference with, or damage to inland freshwaters or groundwater does not occur, whether from abstracted water or from substances or materials used in connection with the works. If the Consent Holder is concerned about the possible effects of discharge, he should apply to the Agency for an appropriate discharge consent. **This document is not a discharge consent. It is also not a consent for the purposes of section 166 Water Industry Act 1991 nor section 164 Water Resources Act 1991 (discharge through large diameter pipes).**

d) The Consent Holder shall be responsible for obtaining necessary consents in relation to structures in, over or under watercourses.

e) The Consent Holder shall be responsible for the proper disposal of wastes from the works.

f) The Consent Holder shall notify neighbouring landowners who may be affected by discharge from the works and, if applicable, the Internal Drainage Board for the area, and shall take all necessary steps to prevent flooding.

g) The Consent Holder shall ensure that all persons engaged in the works are free from, and are not carriers of, waterborne diseases, and shall ensure that they operate to a high standard of hygiene.

8 EFFECTS ON OTHER WATER SOURCES

The Consent Holder shall immediately inform the Agency if any information or complaint is received by him about the consented operation, and shall immediately consult with the Agency as to the appropriate action to be taken.

9 RECORDS

The Consent Holder shall keep such records of strata encountered, construction of the works, results of any geophysical logging, water quality analyses, and test pumping data as may be required by the Agency. The information shall be given on forms provided by the Agency, and/or on compatible computer disk in a format agreed with the Agency. These records must be returned within one month of completion of the works or with any subsequent licence application (whichever is sooner).

10 RESPONSIBILITY and INDEMNITY

a) The works shall be carried out at the Consent Holder's expense. The Agency shall not be liable to pay for any of the works nor for any of the consequences that may arise from them.

b) The Consent Holder will be responsible for making good and

compensating for any loss or damage resulting from the works.

c) The Consent Holder shall be responsible for obtaining any other consents from other Sections of the Agency or from other bodies which may be necessary for carrying out the works or any ancillary work.

d) Nothing in this consent, or in any accompanying instructions, or in an communication by the Agency to the Consent Holder, shall make the Agency liable in respect of design or suitability of the proposed works. Nor will the Agency be liable for any loss, damage, or injury (whether to persons or property, including water resources generally or derogation from individual sources of supply) which may arise by reason of borehole development, abstraction of water, discharge of water, or any other steps in carrying out the works, or abstraction subsequently licensed on the basis of information gathered in the course of carrying out the works. The Consent Holder shall keep the Agency fully indemnified in respect of any and all such claims should the same be made against the Agency its servants or agents. This provision shall act without prejudice to any liability of the Consent Holder under section 206 Water Resources Act 1991 or otherwise in relation to misstatement.

11 INFORMATION TO THE BRITISH GEOLOGICAL SURVEY (BGS) ON BEHALF OF THE NATURAL ENVIRONMENT RESEARCH COUNCIL

a) Where the proposed works are intended to be more than 15 metres (50 feet) deep, the Consent Holder must notify BGS before starting the works. BGS' address for the purpose is the Hydrogeology Group, British Geological Survey, Maclean Building, Crowmarsh Gifford, Wallingford, Oxon OX10 8BB.

b) The Consent Holder shall send BGS stratigraphic and test pumping information as required by section 198 Water Resources Act 1991 within one month of completing the work. By arrangement with BGS, the Agency will do this on behalf of the Consent Holder unless the Consent Holder instructs otherwise.

c) Under “The Borehole Sites and Operations Regulations 1995” HSE must be notified when drilling boreholes more than 30 metres deep into used or disused mining areas. The regulations define “mining area” as land within one kilometre in a horizontal or other direction of workings in a mine, or where a licence to mine for minerals has been granted.

12 MEASUREMENT ACCESS

The Consent Holder shall provide an access tube of diameter adequate for measuring instruments to be lowered

safely into the borehole. In the case of lagoons, the consent holder shall install a gauge board, of a design approved by the Agency, in a position in the lagoon so that at all times the full range of water levels from normal top water level to the maximum drawdown level can be safely observed. The datum level on the gauge board shall be accordingly levelled to Ordnance Datum (Newlyn).

13 INFORMATION IN PUBLIC DOMAIN

Unless the Consent Holder claims, to the satisfaction of the Agency, that commercial or industrial confidentiality attaches to information which the Consent Holder supplies to the Agency (or BGS), the Agency (or BGS) may release such information to the public under the provisions of the Environmental Information Regulations 1992.

14 ENTRY BY THE AGENCY or BGS

The Consent Holder shall allow representatives of the Agency or BGS to enter the site at all reasonable hours, to inspect the works, to inspect and take copies or extracts of documents, and to take measurements and samples, as such representatives consider appropriate.

15 STANDARDS OF WORK

Unless otherwise specified in this consent or subsequently agreed with the Agency, the Consent Holder shall carry out the works and present data fully in accordance with British Standard ISO 14686 (2003) "Hydrometric determinations – pumping tests for water wells – considerations and guidelines for design, performance and use". Copies of this are available from BSI, 389 Chiswick High Road, London, W4 4AL. Tel: (020) 89969000.
http://www.bsi-global.com/. The Agency may require repetition of tests or other appropriate remedial activities should the required standards not be met.

16 ACCEPTANCE OF CONDITIONS

Commencement of the works shall be deemed to constitute acceptance by the Consent Holder of all the terms and conditions set out in this consent and an undertaking that he will abide by them.

Consent No:	TP 18/006

SCHEDULE 2 - Special Conditions

1. CONSTRUCTION DETAILS

When constructing the works:

a. The maximum depth of the borehole shall be 20 m below ground level.

b. The maximum diameter of the borehole shall be 305 mm.

c. The pumping borehole should be sealed to the top of the interburden clay as specified in the method statement to separate the Upper and Lower Mineral horizons..

2. PROGRAMME

The Consent Holder shall carry out test pumping and measurement of water levels in the works and at other points using a preliminary step test and constant rate test. Full details of your test requirements are given in section below.

a. Preliminary Step Tests

This Consent permits the holder to undertake stepped rate pump tests at the borehole. The tests shall comprise five consecutive steps, with the flow rate of each step greater than the last, up to the final step, provided this does not exceed the maximum permissible rate of 72 m^3/hr. The pump rate during each step shall be constant and all of equal duration of at least 60 minutes. The Consent Holder shall confirm the proposed step test schedule with the Agency prior to carrying out the test.

A rest period of at least 24 hours shall be permitted, or at least until 95% recovery has been achieved.

b. Constant Rate Tests

This Consent permits the continuous pumping of the borehole at a maximum sustainable rate, provided this does not exceed the permissible rate of 72

m^3/hr, for a duration of 72 hours, **or for a longer period if water level has not reached equilibrium**. The abstracted water shall be discharged to waste throughout this test.

A rest period of at least 24 hours shall be permitted, or until at least 95% recovery has been achieved, whichever is longer.

Recovery Test

Recovery levels shall be measured and time being measured from the cessation of pumping until such time as the water level reaches its original level.

NO FURTHER PUMPING IS TO TAKE PLACE FROM THE TEST SOURCE AFTER THE END OF THE PUMPING TEST WITHOUT THE CONSENT OF THE ENVIRONMENT AGENCY.

3. WATER LEVEL MONITORING

Before, during and after test pumping the Consent Holder is required to monitor the following specified water and wetland features.

3a. At the pumped source

The Consent Holder shall measure and record water levels twice daily for at least 3 days **before** pumping commences. Thereafter the Consent Holder shall measure water levels as shown on the attached data sheets from the commencement and completion of each pumping session and, until full recovery. Discharge rates or meter readings must be recorded at the minimum frequency during pumping.

3b. Water Feature Monitoring Points

BH 107, BH 101 and BH 102 all at Hatfield Road Quarry A number of other monitoring wells in the vicinity will be monitored on a regular basis.

Further measurement, as detailed below, will be required at the above observation sites. Water levels at this sites shall be measured:-

- Once daily for at least three days before pumping and for three days after pumping or until full recovery is observed
- at least 4 times daily during pumping.

Submission of Data from Data Loggers

The Consent Holder shall submit monitoring data recovered from data loggers to the Agency on A CD or DVD or electronically mailed in either ASCII text or Windows EXCEL format. The Consent Holder shall submit to the Agency for the approval of the format and style prior to the commencement of monitoring.

4. DISCHARGE OF WATER

The Consent Holder shall discharge water from the test pumping into the Point A shallow lagoon at approximately TL 20136 08709.

The pumped water should be disposed of in such a way as to prevent re-circulation back to the aquifer.

5. CONSTRUCTION DETAILS AND PUMPING TEST RESULTS

The Consent Holder shall present results from the test pumping on forms WR-38 and WR-39, provided by the Environment Agency.

Results of test pumping shall be presented on form WR-39, **AND** interpreted in a report with format similar, or identical, to which was set out on form WR-43, both are available from the Environment Agency. It is important that the results are presented to the correct level of detail to avoid possible delays in Abstraction Licence application process. Please contact the Environment Agency if you have any questions about the contents of the report.

6. OTHER SPECIAL CONDITIONS

a. If after pumping for 72 hours groundwater levels within the abstraction source have not stabilised then the Consent Holder must continue pumping until these conditions are achieved.

b. The abstraction borehole shall be levelled by the consent holder to the Newlyn Ordance Datum.

NB. Any claim for derogation from the owner of a protected source within the specified radius, but not discovered during the survey may result in the test pumping programme, or a modified version of it, having to be repeated.

APPENDIX 04

Borehole Logs

BOREHOLE LOG

BOREHOLE No. **PW1**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.000226	22/05/18	76.98maOD76.98mATBM	E688741.50 N5737799

Project: **HATFIELD PUMPING TEST**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							76.68		0.30	Brown silty SAND, frequent organics, loose, dry.	
							75.78	(0.90)	1.20	MADE GROUND: Brown clayey SILT with some sand and gravel. Gravel consists of fine to coarse andgular to rounded flint with rare chalk and asphalt. Increasingly gravelly after 0.9mbg. Dense, moist.	
						1	73.98	(1.80)	3.00	Brown sandy GRAVEL. Gravel consists of fine to coarse angular to subrounded, flint, chert and quartz. Dense and dry.	
							73.48	(0.50)	3.50	Brown to orange clayey SILT with sand and gravel. Frequent magnetite grains in matrix, gravels fine to coarse flint and chalk. Stiff, wet.	
							70.08	(3.40)	6.90	Brown to orange fine to medium SAND with some gravel. Gravel subangular to rounded flint and rare chalk. loose, saturated.	
							68.68	(1.40)	8.30	Grey, CLAY and SILT with some gravel. Gravel consists of fine to medium flint and chalk. Very stiff, moist.	
										Borehole complete at 8.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	
22-05-18	00.00	8.50		8.50	254				0	4	Hand dug starter pit to 1.2m. Well installed, screened 2m - 7m.

All dimensions in metres	Contractor : B.Hawes Drilling	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant:	Hole Size254mm	JG	

SLR Consulting Ltd, Treenwood House, Rowden lane, Bradford-on-Avon, BA152AU, Tel: 01225309400, Fax:

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930

BOREHOLE LOG

BOREHOLE No. **PW2**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.000226	24/05/18	77.31maOD77.31mATBM	E688737 N5737799

Project: **HATFIELD PUMPING TEST**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							77.01		0.30	Brown silty SAND, frequent organics, loose, dry.	
1							76.11		1.20	MADE GROUND: Brown clayey SILT with some sand and gravel. Gravel consists of fine to coarse angular to rounded flint with rare chalk and asphalt. Increasingly gravelly after 0.9mbg. Dense, moist.	
2								(1.80)		Brown sandy GRAVEL. Gravel consists of fine to coarse angular to subrounded, flint, chert and quartz. Dense and dry.	
3							74.31		3.00		
							73.81		3.50	Brown to orange clayey SILT with sand and gravel. Frequent magnetite grains in matrix, gravels fine to coarse flint and chalk. Stiff, wet.	
4										Brown to orange fine to medium SAND with some gravel. Gravel subangular to rounded flint and rare chalk. loose, saturated.	
5								(3.40)			
6											
							70.41		6.90		
7										Grey, CLAY and SILT with some gravel. Gravel consists of fine to medium flint and chalk. Very stiff, moist.	
8								(2.10)			
9							68.31		9.00		
						1	67.51		9.80	Brown sandy GRAVEL with sand and clay. Gravel is fine to medium flint and chalk. Firm to stiff, wet.	
10										Brown medium to coarse GRAVEL with sand and rare cobbles. Gravels and cobbles rounded to sub angular flint chalk and sandstone, saturated.	
11								(2.10)			
							65.41		11.90		
12							65.01		12.30	Brown silty SAND with some clay and gravel, medium dense, saturated.	
13								(1.60)		Brown medium to coarse GRAVEL with sand and rare cobbles. Gravels and cobbles rounded to sub angular flint chalk and sandstone, loose, saturated.	
							63.41		13.90		
14							62.81		14.50	Brown to orange medium to coarse SAND with some gravel. Gravel subangular to rounded flint and rare chalk. loose, saturated.	
15										Brown sandy GRAVEL and cobbles. Gravels and cobbles rounded to sub angular flint chalk and sandstone, loose, saturated.	
16								(3.55)			
17											
18							59.26		18.05	17.50 - 17.50 fining to a gravelly sand with some chalk.	
							58.31		(0.95) 19.00	Recovered as grade Dc Chalk cobbles.	
19										Borehole complete at 19.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	
23-05-18	00.00	8.00		8.00	305						Hand dug starter pit to 1.2m. Dual Casing String: 305mm casing to 8m. Bentonite seal 7.5m - 8.0m prioir to using 254mm casing to 19.0m. Dual well installed, screened 2.0m to 6.9m and 10.24m to 17.32m.
24-05-18	00.00	19.00		19.00	254						

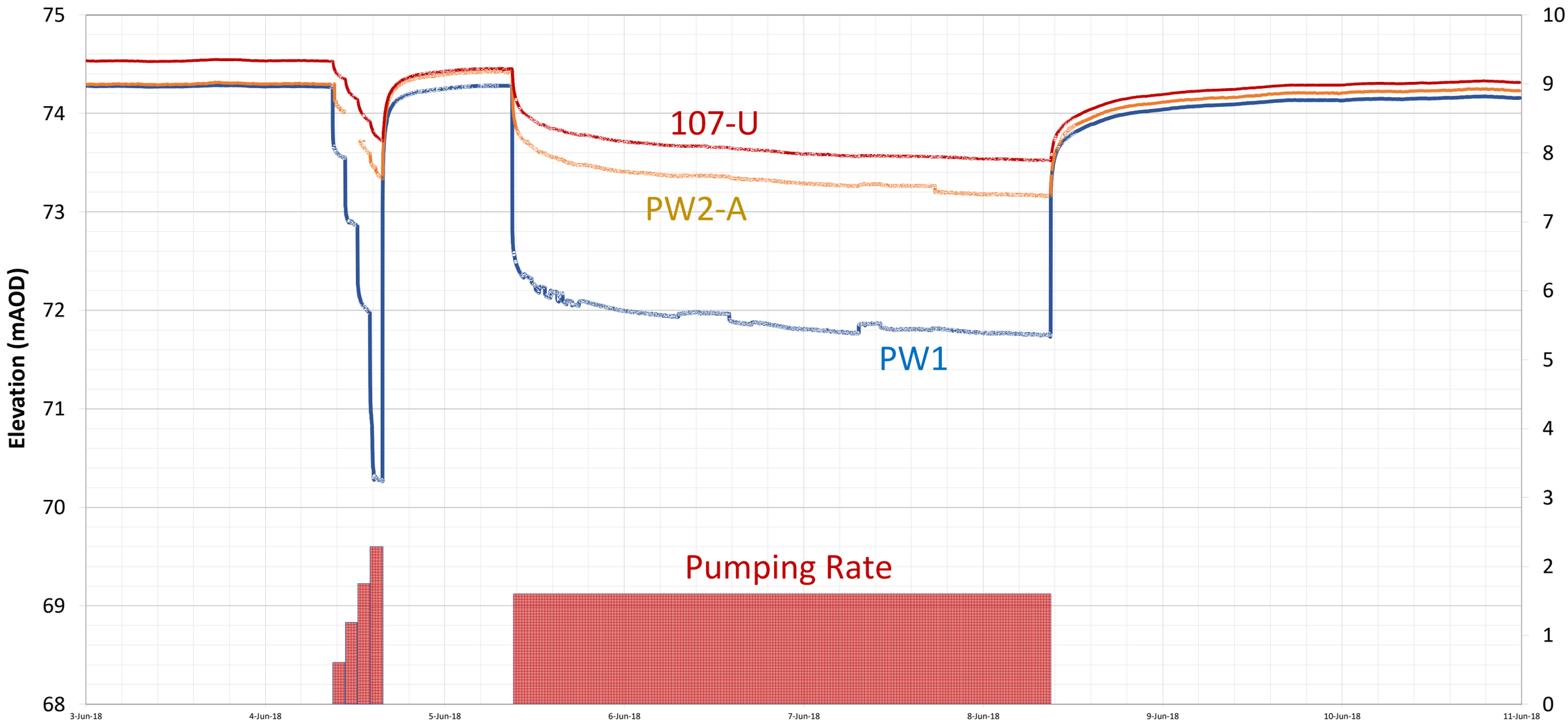
All dimensions in metres	Contractor : B.Hawes Drilling	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:125	Plant:	Hole Size305mm - 254mm	JG	

SLR Consulting Ltd, Treenwood House, Rowden lane, Bradford-on-Avon, BA152AU, Tel: 01225309400, Fax:

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930

APPENDIX 05

Well Test Hydrographs and Step-Test Files



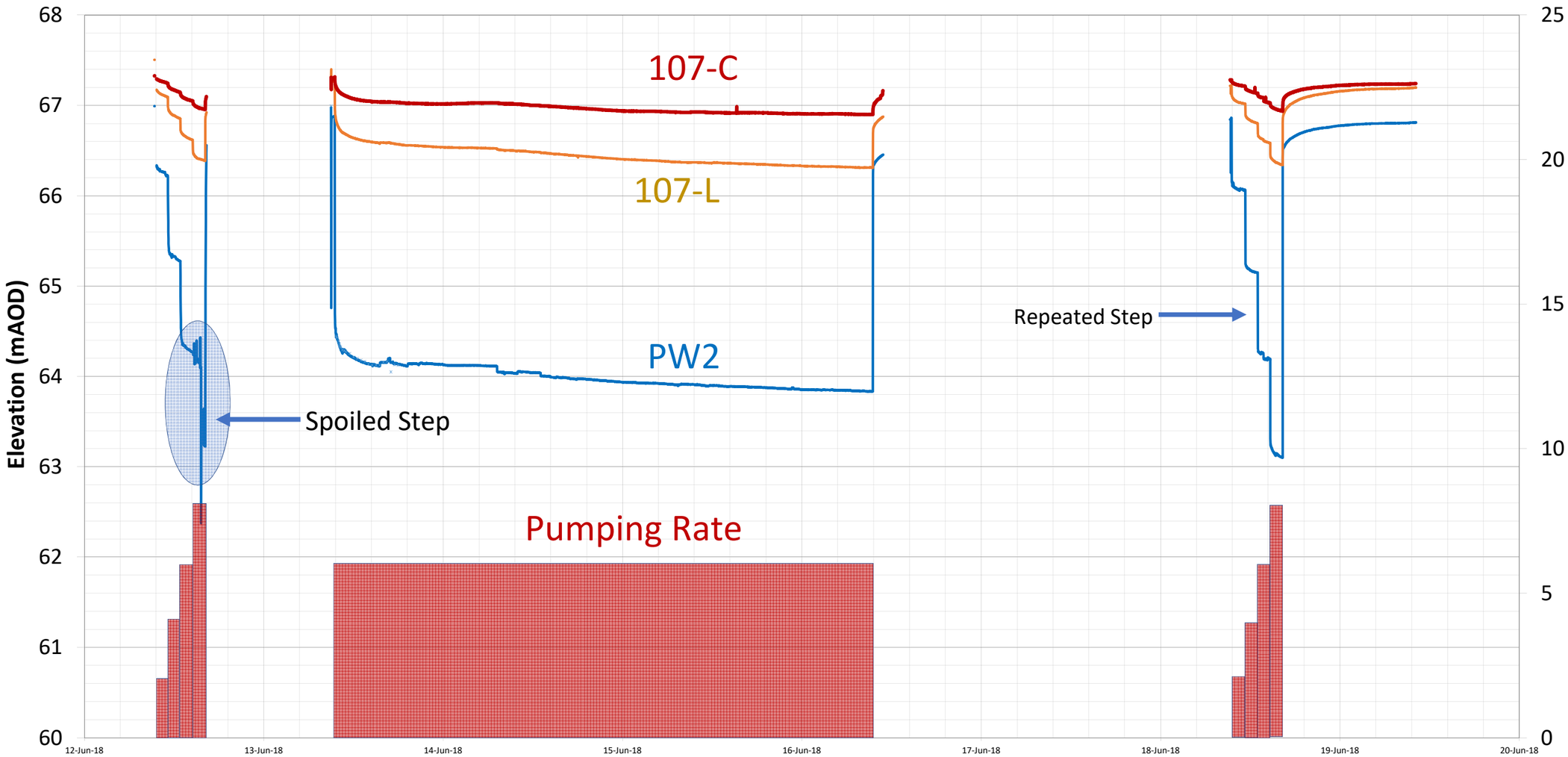
LEGEND

Data Logger (continuous)

Hydrographs

Hatfield Pumping Tests- Upper Mineral Aquifer (UMA)

Appendix 06



LEGEND

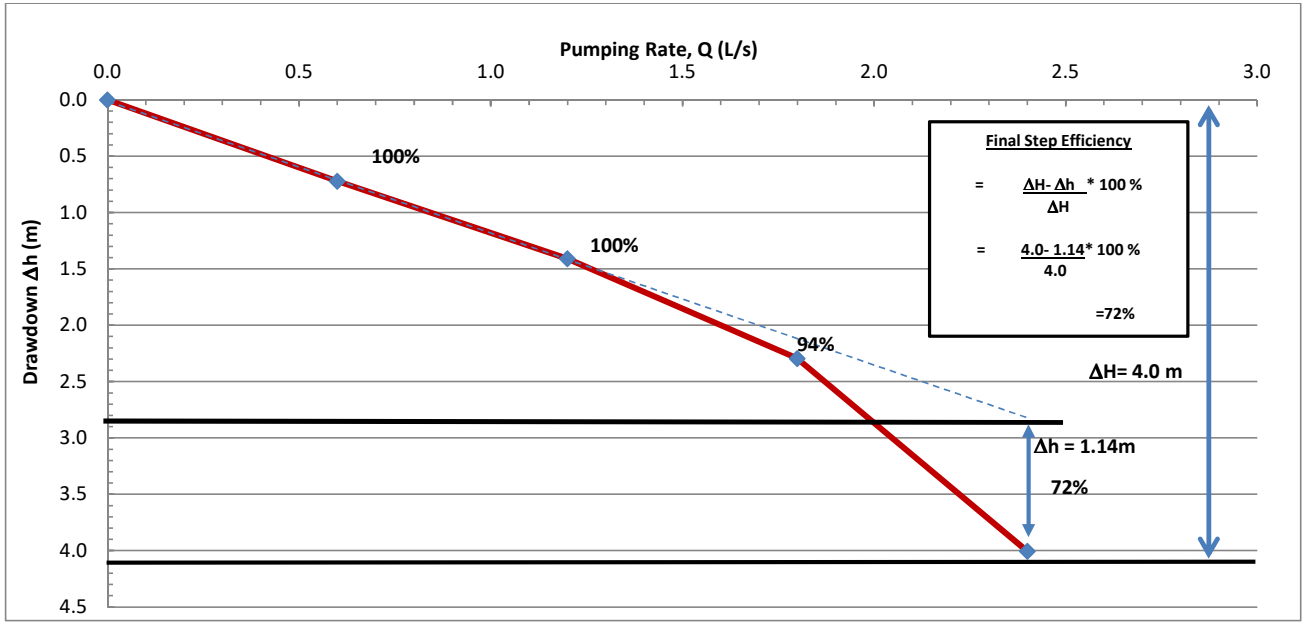
——Data Logger (continuous)

		Hydrographs	**Appendix 06**
		Hatfield Pumping Tests- Lower Mineral Aquifer (LMA)	

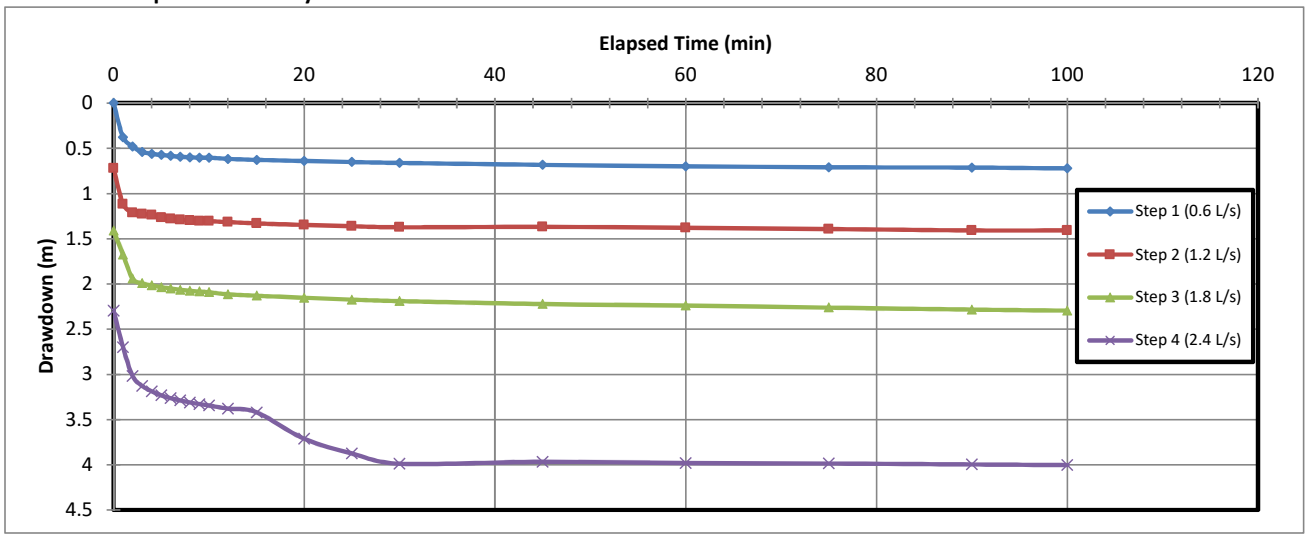
APPENDIX 06

Analysis Files

Appendix 6- Figure 1
Well Performance PW1

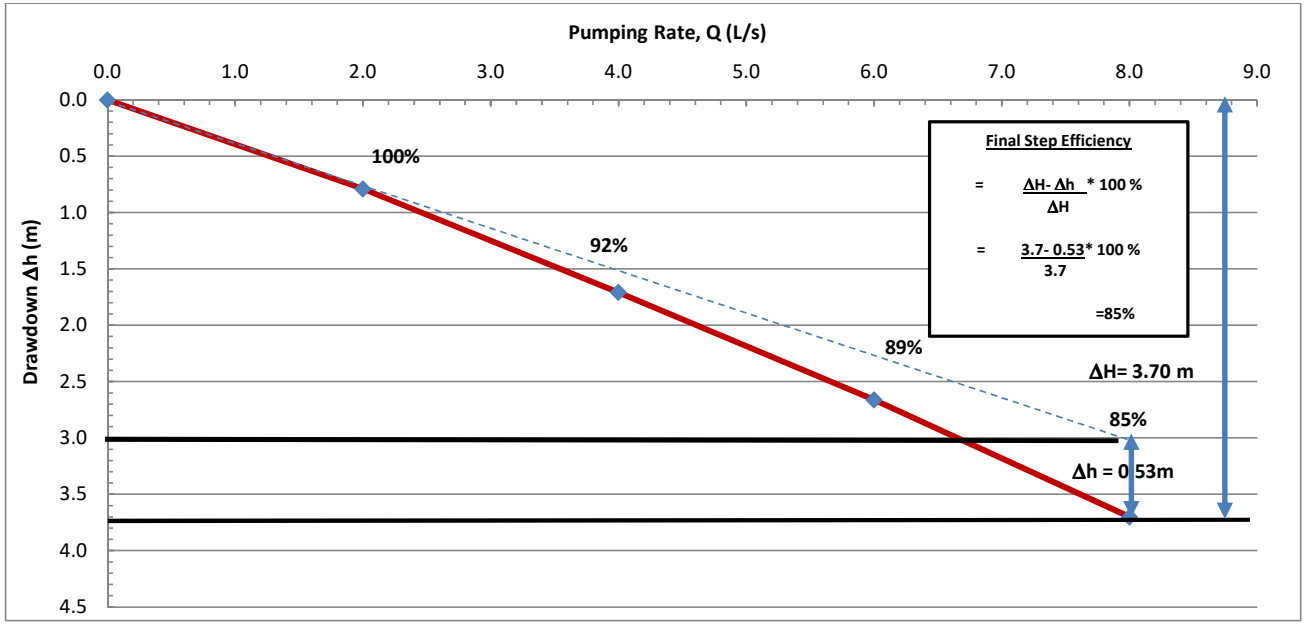


Step Test Efficiency Results for Well PW1

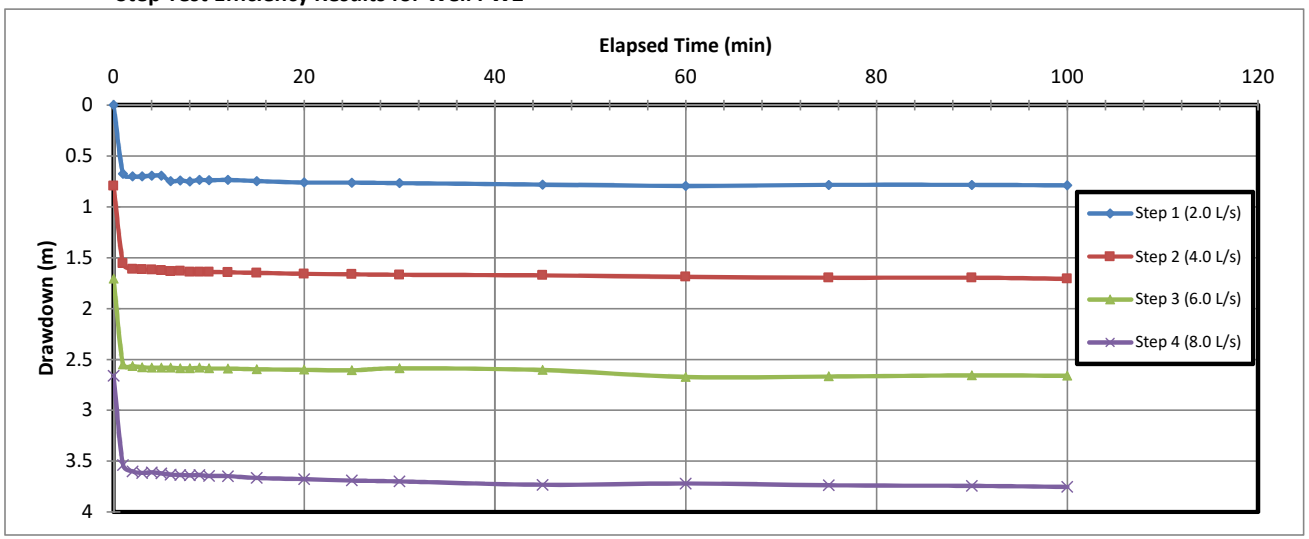


Pumping Period for Well PW1

Appendix 6- Figure 2
Well Performance PW2

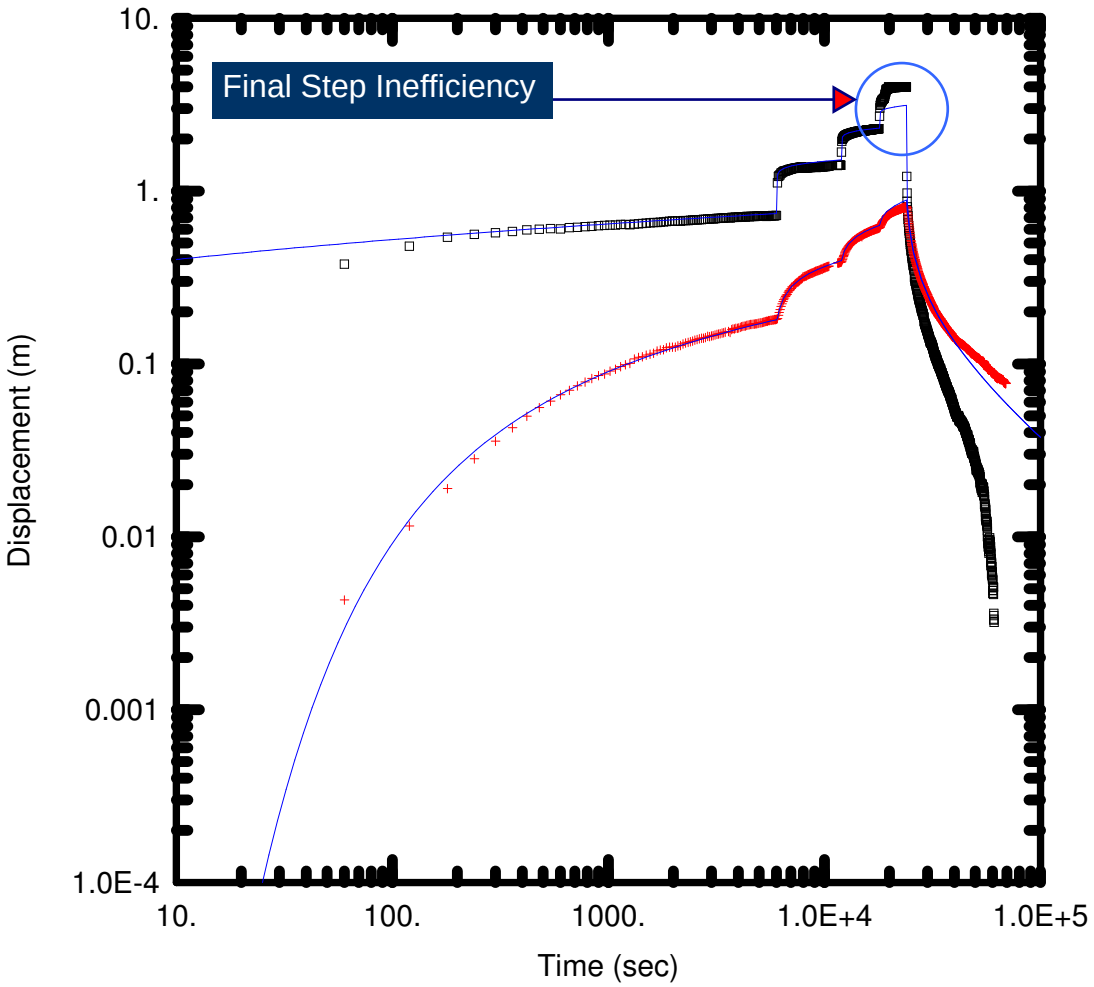


Step Test Efficiency Results for Well PW2



Pumping Period for Well PW2

Appendix 6- Figure 3
PW1 Step-Drawdown Test



WELL TEST ANALYSIS

Data Set: T:\...\PW1-Step Test.aqt
Date: 07/18/18 Time: 11:26:35

PROJECT INFORMATION

Company: Brett
Client: SLR
Project: 402.01009.00226
Test Well: PW1
Test Date: 15 June 2018

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW1	0	0

Observation Wells

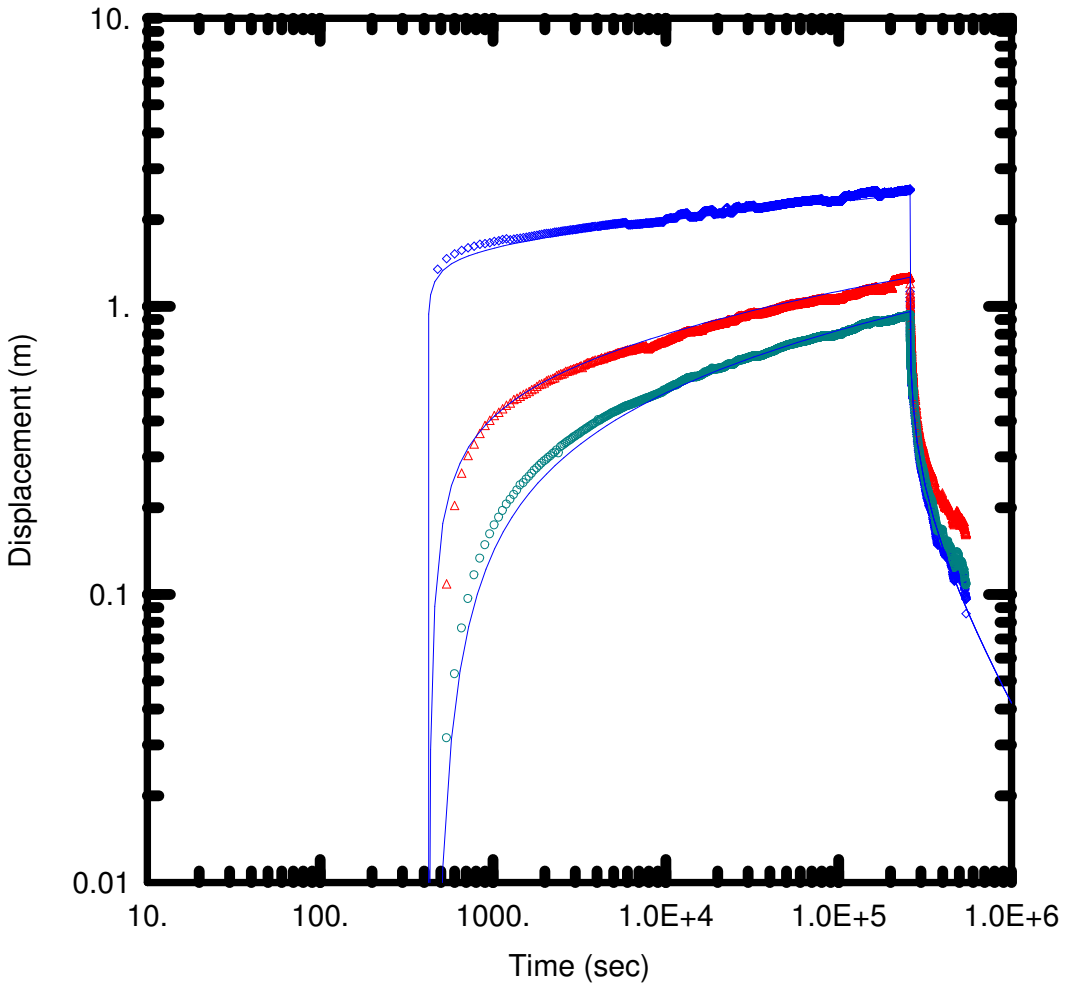
Well Name	X (m)	Y (m)
□ PW1	0	0
+ 107-U	0	15

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 77.93 m^2/day
S = 0.001841
Kz/Kr = 1.
b = 5. m

Appendix 6- Figure 4
PW1 Constant Rate Test



WELL TEST ANALYSIS

Data Set: T:\...\PW1-Constant.aqt
Date: 06/29/18 Time: 14:24:08

PROJECT INFORMATION

Company: Brett
Client: SLR
Project: 402.01009.00226
Test Well: PW1
Test Date: 15 June 2018

AQUIFER DATA

Saturated Thickness: 5. m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW1	0	0

Observation Wells

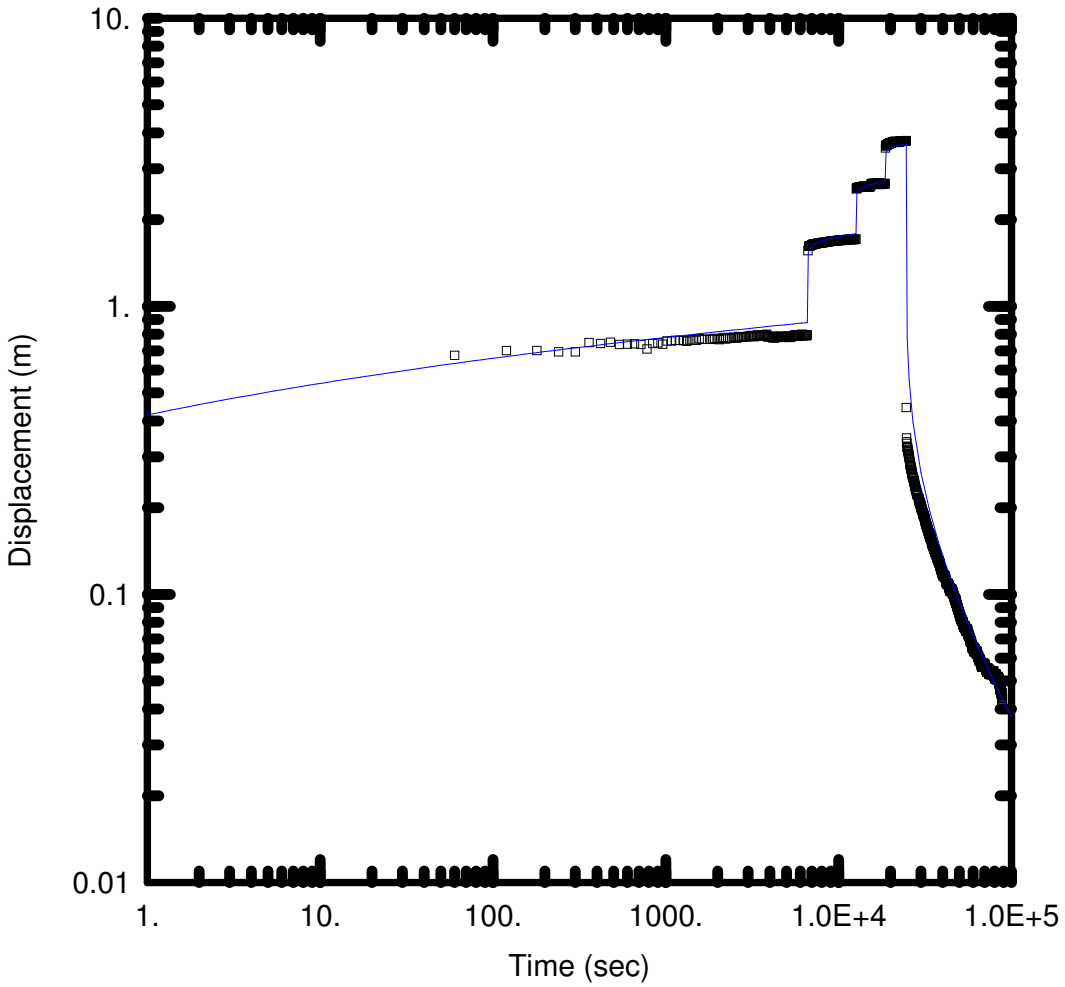
Well Name	X (m)	Y (m)
◇ PW1	0	0
△ PW2-a	0	5.1
○ 107-U	0	15

SOLUTION

Aquifer Model: Unconfined
Solution Method: Neuman

T = 78.64 m^2/day
S = 0.002201
Sy = 0.0002888
Kz/Kr = 3.111E+4

Appendix 6-Figure 5
PW2-Step-Drawdown Test



WELL TEST ANALYSIS

Data Set: T:\...\PW2- Step Test.aqt
Date: 07/17/18 Time: 18:33:10

PROJECT INFORMATION

Company: Brett
Client: SLR
Project: 402.01009.00226
Test Well: PW2
Test Date: 15 June 2018

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW2	0	0

Observation Wells

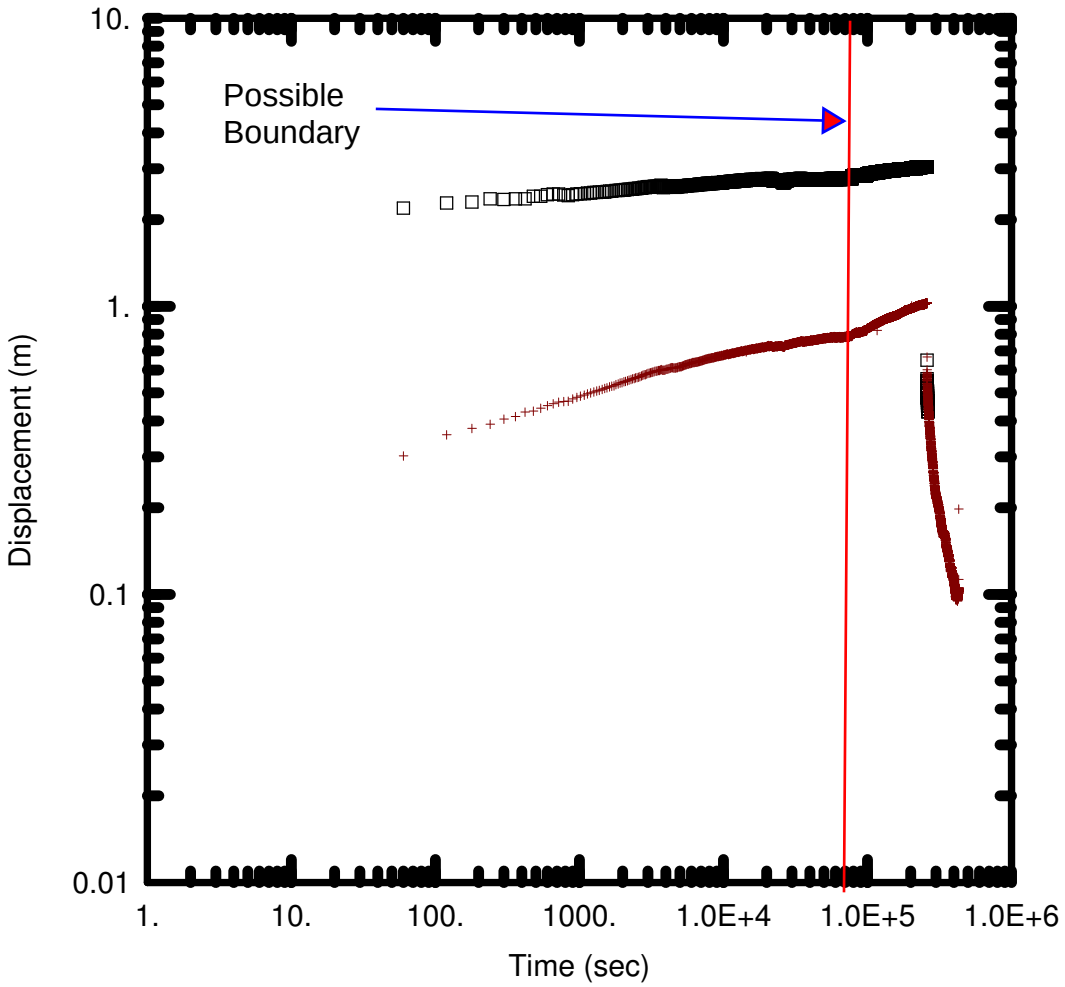
Well Name	X (m)	Y (m)
▫ PW2	0	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 263.9 m^2/day
S = 0.0002487
Kz/Kr = 0.15
b = 8. m

Appendix 6- Figure 6.
PW2- Constant Rate Test
Possible Boundary During Test



WELL TEST ANALYSIS

Data Set: T:\...\PW2Constant Rate 107-L.aqt
Date: 07/17/18 Time: 18:07:36

PROJECT INFORMATION

Company: Brett
Client: SLR
Project: 402.01009.00226
Test Well: PW2
Test Date: 13 June 2018

WELL DATA

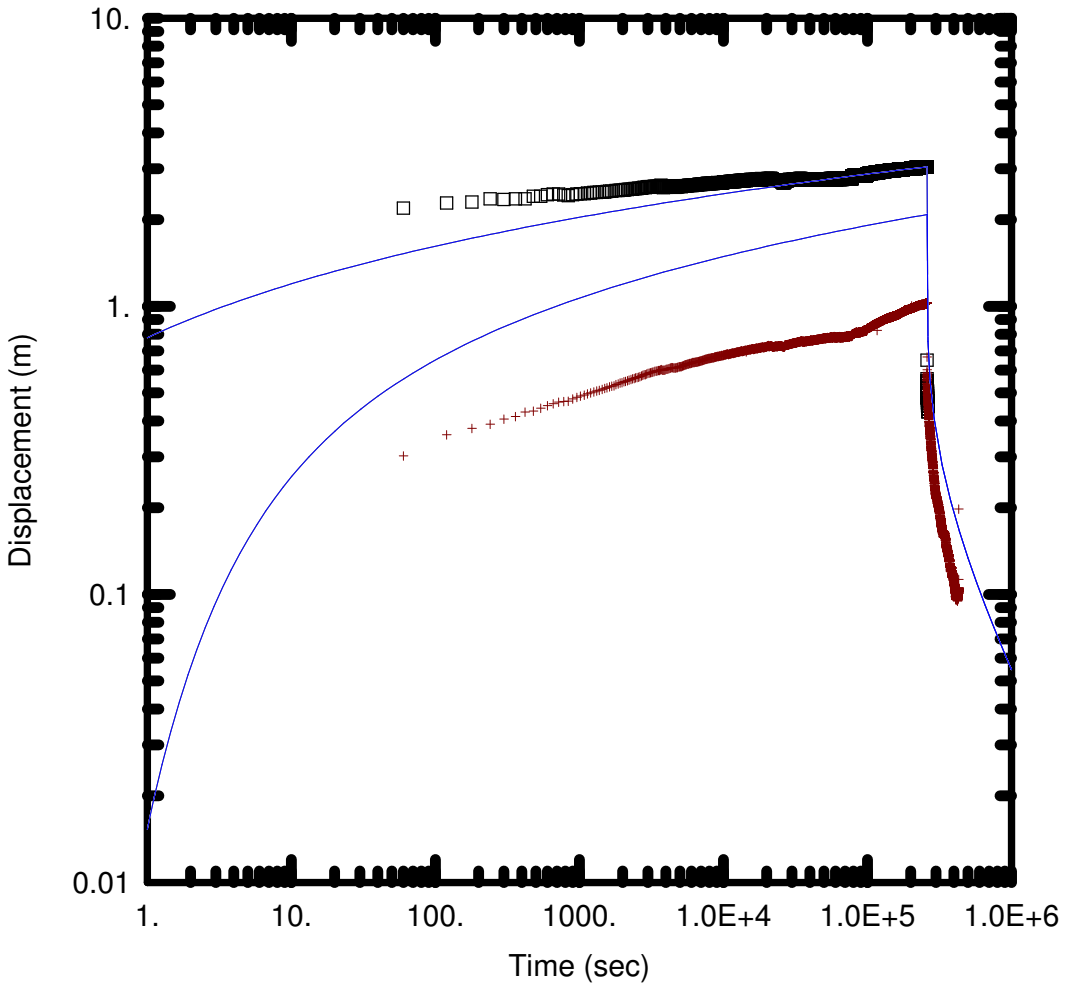
Pumping Wells

Well Name	X (m)	Y (m)
PW2	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ PW2	0	0
+ 107-L	0	10.3

Appendix 6- Figure 7
PW2-Constant Rate Test- Full Penetration (Theis)



WELL TEST ANALYSIS

Data Set: T:\...\PW2Constant Rate 107-L.aqt
Date: 07/17/18 Time: 18:04:04

PROJECT INFORMATION

Company: Brett
Client: SLR
Project: 402.01009.00226
Test Well: PW2
Test Date: 13 June 2018

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW2	0	0

Observation Wells

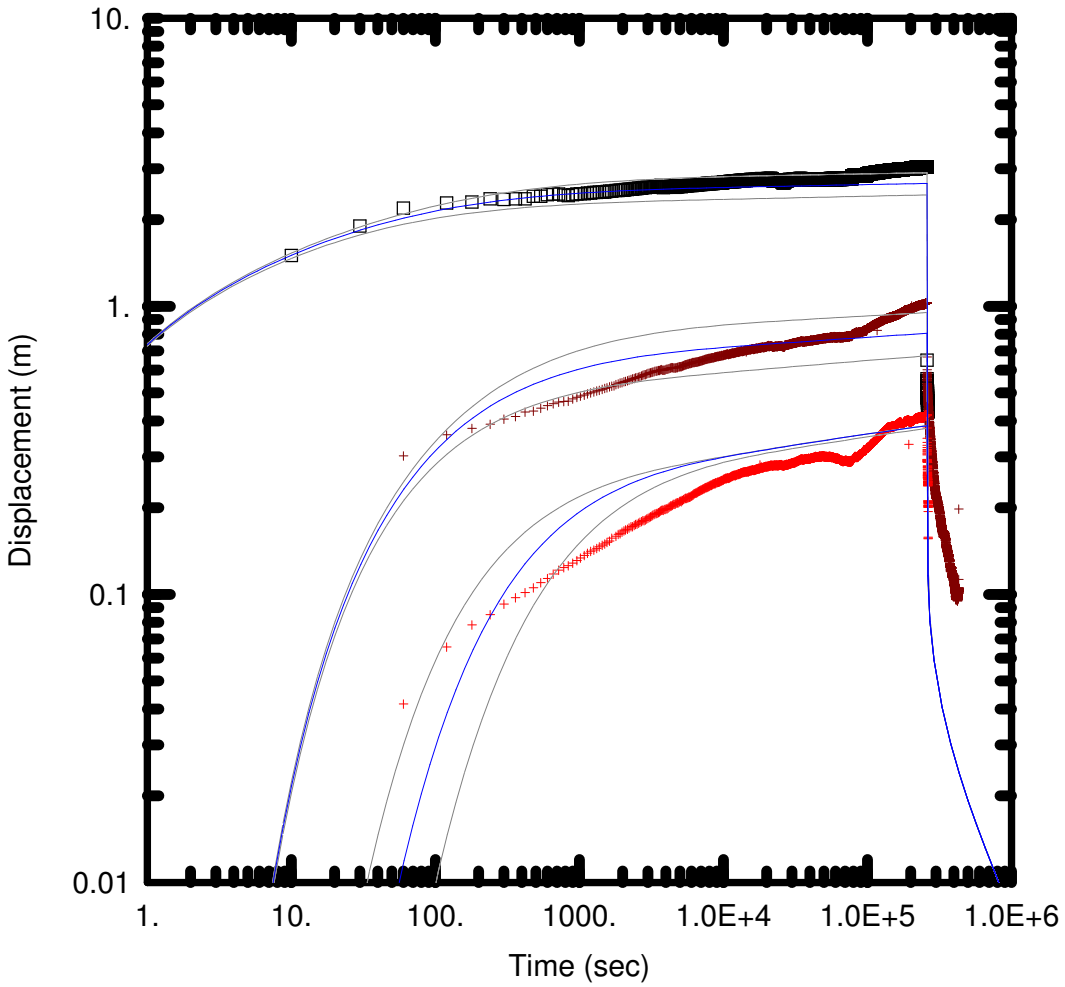
Well Name	X (m)	Y (m)
□ PW2	0	0
+ 107-L	0	10.3

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 226.2 m^2/day
S = 0.00016
Kz/Kr = 0.15
b = 8. m

Appendix 6-Figure 8
PW2 Constant Rate Test
Partial Penetration (b=100m)



WELL TEST ANALYSIS

Data Set: C:\Users\jgordon\Desktop\Analyses\PW2Constant Rate 107-60m.aqt
Date: 09/03/18 Time: 11:00:54

PROJECT INFORMATION

Company: Brett
Client: SLR
Project: 402.01009.00226
Test Well: PW2
Test Date: 13 June 2018

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW2	0	0

Observation Wells

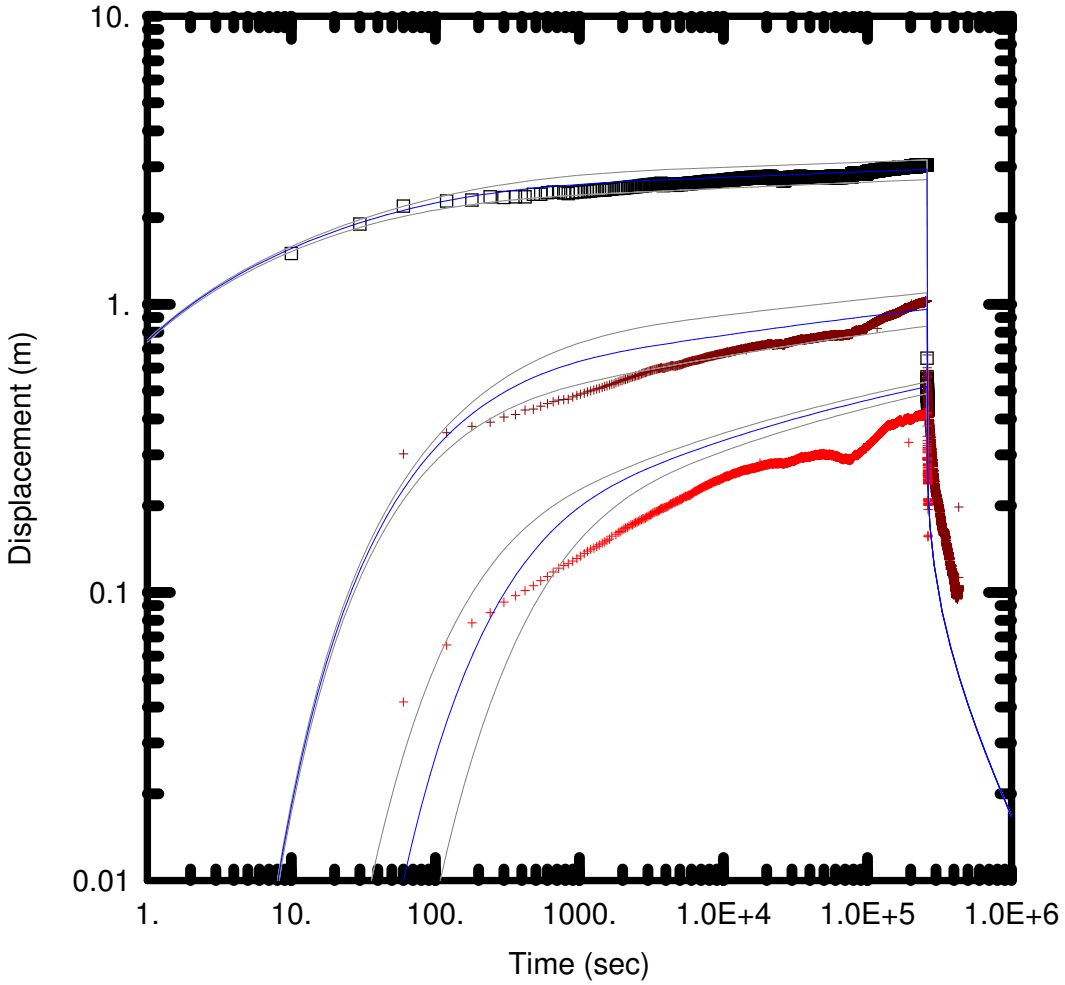
Well Name	X (m)	Y (m)
□ PW2	0	0
+ 107-L	0	10.3
+ 107-C	0	10.3

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 1545.8 m^2/day
S = 0.0111
Kz/Kr = 0.1867
b = 100. m

Appendix 6- Figure 9
PW2 Constant Rate Test
Partial Penetration (b=50m)



WELL TEST ANALYSIS

Data Set: C:\Users\jgordon\Desktop\Analyses\PW2Constant Rate 107-60m.aqt
Date: 09/03/18 Time: 10:59:58

PROJECT INFORMATION

Company: Brett
Client: SLR
Project: 402.01009.00226
Test Well: PW2
Test Date: 13 June 2018

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW2	0	0

Observation Wells

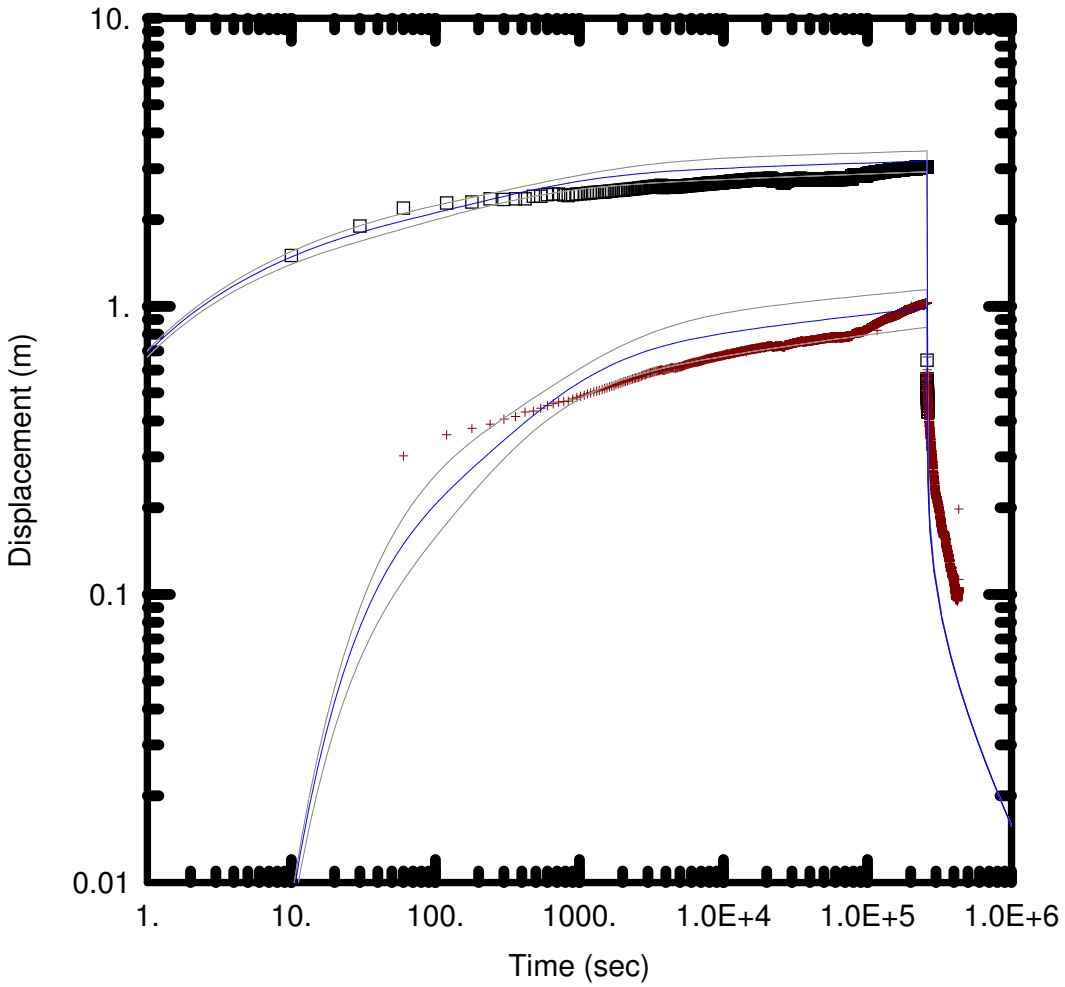
Well Name	X (m)	Y (m)
□ PW2	0	0
+ 107-L	0	10.3
+ 107-C	0	10.3

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 729. m^2/day
S = 0.005764
Kz/Kr = 0.1867
b = 50. m

Appendix 6- Figure 10
PW2 Constant Rate Test (Neumann)
Partial Penetration (b=60m)



WELL TEST ANALYSIS

Data Set: C:\Users\jgordon\Desktop\Analyses\PW2Constant Rate 107-60m.aqt
Date: 09/03/18 Time: 11:45:04

PROJECT INFORMATION

Company: Brett
Client: SLR
Project: 402.01009.00226
Test Well: PW2
Test Date: 13 June 2018

AQUIFER DATA

Saturated Thickness: 60. m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PW2	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ PW2	0	0
+ 107-L	0	10.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Neuman

T = 777. m^2/day
S = 0.008348
Sy = 0.001955
Kz/Kr = 0.2073

APPENDIX 07

Certificates of Analysis

Affinity Water Limited, Affinity Water UK Laboratory
The Causeway, Staines-upon-Thames, Middlesex TW18 3BX
Tel: 01707 398 500 Fax: 01707 398 501

1758

Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 05-Jun-2018
Sampled Date: 05-Jun-2018
Sample Number: 1839482

Sample Point: COMM
PW1-1,Job: 402.01009.00226

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	93	ug/l	BROMS

Signed 

Date: 19-Jun-2018

Chris Underwood, Principal Scientist

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Tel: 01707 398 500 Fax: 01707 398 501

1758

Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 06-Jun-2018
Sampled Date: 05-Jun-2018
Sample Number: 1839848

Sample Point: COMM
PW1 - 2,Job: 402.01009.00226

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	88	ug/l	BROMS

Signed 

Date: 27-Jun-2018

Chris Underwood, Principal Scientist

Tests marked * are not included in the laboratory's Accreditation Schedule. Tests marked $ have been carried out by a subcontractor using an accredited method. Tests marked # have been carried out by a subcontractor using a non-accredited method. Tests marked i are indicative results that are not UKAS accredited. Opinion and interpretations expressed herein are outside the scope of the accreditation. Details of date(s) analysis commenced, analytical methods and performance characteristics are available upon request. ">" means greater than, "<" means less than, "ND" means not detected, "~" means estimated result. The results above only relate to the sample tested. This report shall not be reproduced, except in full, without the permission of the laboratory.

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Tel: 01707 398 500 Fax: 01707 398 501

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Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 06-Jun-2018
Sampled Date: 06-Jun-2018
Sample Number: 1839849

Sample Point: COMM
PW1 - 3,Job: 402.01009.00226

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	88	ug/l	BROMS

Signed 

Date: 19-Jun-2018

Chris Underwood, Principal Scientist

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Tel: 01707 398 500 Fax: 01707 398 501

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Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 07-Jun-2018
Sampled Date: 06-Jun-2018
Sample Number: 1841245

Sample Point: COMM
PW1 - 4, Job:402.CS.17777

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	91	ug/l	BROMS

Signed 

Date: 03-Jul-2018

Chris Underwood, Technical Manager

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Tel: 01707 398 500 Fax: 01707 398 501

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Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 08-Jun-2018
Sampled Date: 07-Jun-2018
Sample Number: 1841494

Sample Point: COMM
PW1 - 6,Borehole Water, Quote:14 - 53_AWC, PO:402.CS.17777

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	92	ug/l	BROMS

Signed

Date: 03-Jul-2018

Chris Underwood, Technical Manager

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Tel: 01707 398 500 Fax: 01707 398 501

1758

Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 08-Jun-2018
Sampled Date: 08-Jun-2018
Sample Number: 1841495

Sample Point: COMM
PW1 - 7,Borehole Water, Quote:14 - 53_AWC, PO:402.CS.17777

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	92	ug/l	BROMS

Signed

Date: 03-Jul-2018

Chris Underwood, Technical Manager

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Tel: 01707 398 500 Fax: 01707 398 501

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Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 07-Jun-2018
Sampled Date: 07-Jun-2018
Sample Number: 1841246

Sample Point: COMM
PW1 - 5, Job:402.CS.17777

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	92	ug/l	BROMS

Signed

Date: 03-Jul-2018

Chris Underwood, Technical Manager

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The Causeway, Staines-upon-Thames, Middlesex TW18 3BX
Tel: 01707 398 500 Fax: 01707 398 501

1758

Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 14-Jun-2018
Sampled Date: 13-Jun-2018
Sample Number: 1843696

Sample Point: COMM
PW2 - 1,Quote:14 - 53_AWC, PO: 402.CS.17777

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	191	ug/l	BROMS

Signed

Date: 27-Jun-2018

Chris Underwood, Principal Scientist

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Tel: 01707 398 500 Fax: 01707 398 501

1758

Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 14-Jun-2018
Sampled Date: 13-Jun-2018
Sample Number: 1843697

Sample Point: COMM
PW2 - 2,Quote:14 - 53_AWC, PO: 402.CS.17777

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	206	ug/l	BROMS

Signed

Date: 25-Jun-2018

Chris Underwood, Principal Scientist

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Tel: 01707 398 500 Fax: 01707 398 501

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Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 14-Jun-2018
Sampled Date: 14-Jun-2018
Sample Number: 1843698

Sample Point: COMM
PW2 - 3,Quote:14 - 53_AWC, PO: 402.CS.17777

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	204	ug/l	BROMS

Signed

Date: 25-Jun-2018

Chris Underwood, Principal Scientist

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Tel: 01707 398 500 Fax: 01707 398 501

1758

Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 15-Jun-2018
Sampled Date: 14-Jun-2018
Sample Number: 1843938

Sample Point: COMM
PW2-4, QUOTE NO;14-53_AWC PO NO:402.CS.17777

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	183	ug/l	BROMS

Signed

Date: 27-Jun-2018

Chris Underwood, Principal Scientist

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Tel: 01707 398 500 Fax: 01707 398 501

1758

Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 15-Jun-2018
Sampled Date: 15-Jun-2018
Sample Number: 1843941

Sample Point: COMM
PW2-5, QUOTE NO:14-15_AWC PO NO:402.CS.17777

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	205	ug/l	BROMS

Signed  Date: 25-Jun-2018

Chris Underwood, Principal Scientist

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The Causeway, Staines-upon-Thames, Middlesex TW18 3BX
Tel: 01707 398 500 Fax: 01707 398 501

1758

Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 19-Jun-2018
Sampled Date: 16-Jun-2018
Sample Number: 1844414

Sample Point: COMM
PW2 - 6,Quote: 14 - 53_AWC, PO: 402.CS.17777

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	106	ug/l	BROMS

Signed

Date: 03-Jul-2018

Chris Underwood, Technical Manager

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The Causeway, Staines-upon-Thames, Middlesex TW18 3BX
Tel: 01707 398 500 Fax: 01707 398 501

1758

Test Report

Customer:

SLR Consulting Ltd
8 Stow Court
Stow - Cum - Quy
Cambridge
CB25 9AJ

Sample Received: 19-Jun-2018
Sampled Date: 15-Jun-2018
Sample Number: 1844413

Sample Point: COMM
PW2 - 5,Quote: 14 - 53_AWC, PO: 402.CS.17777

Determinand	Result	Units	Analysis
Bromate as BrO3	<0.5	ug/l	BROMS
Bromide as Br	117	ug/l	BROMS

Signed

Date: 03-Jul-2018

Chris Underwood, Technical Manager

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Ireland

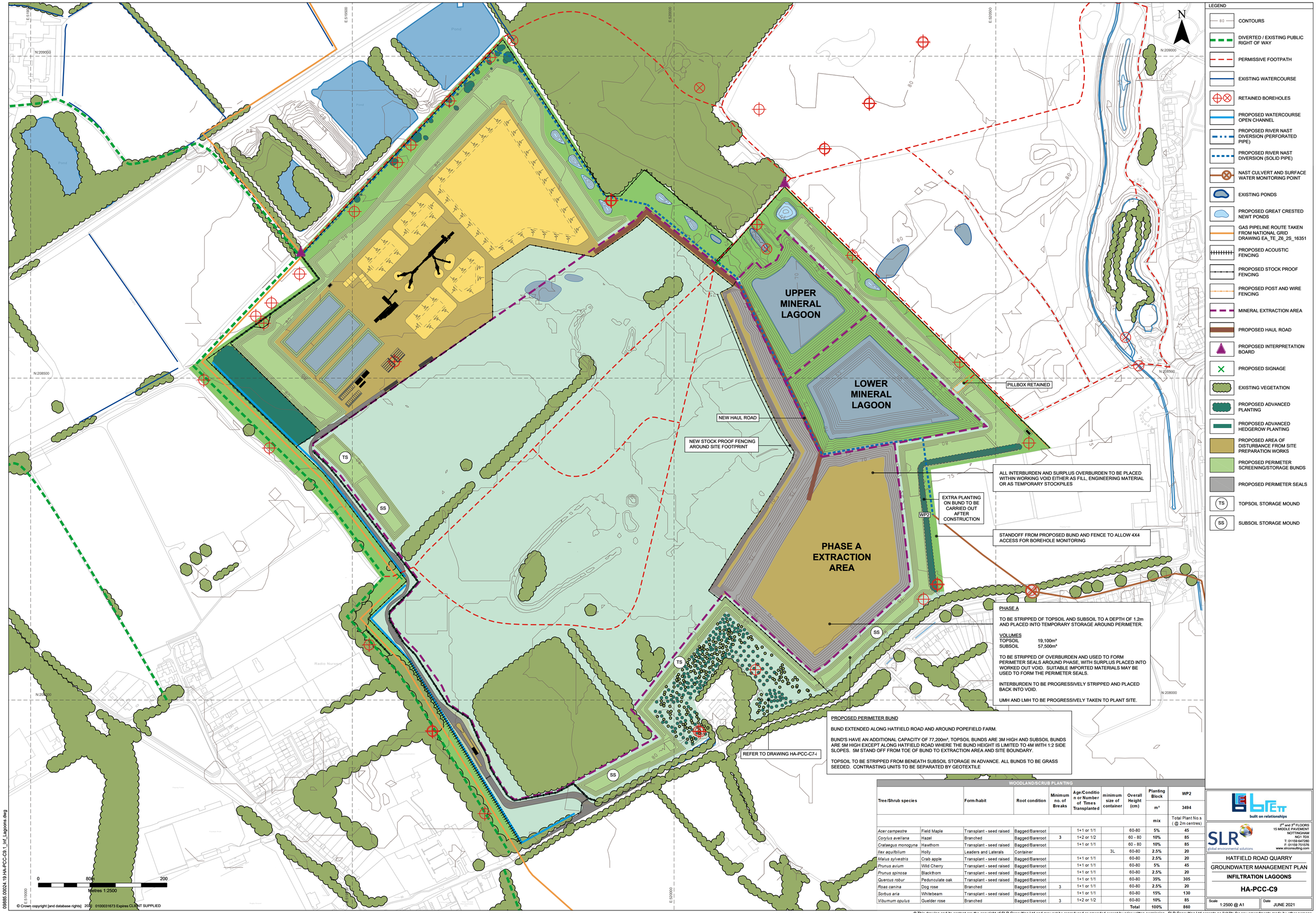
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GRENOBLE
T: +33 (0)6 23 37 14 14

APPENDIX 02

Phase A Layout and Lagoon Construction Drawings



LEGEND

- CONTOURS
- DIVERTED / EXISTING PUBLIC RIGHT OF WAY
- PERMISSIVE FOOTPATH
- EXISTING WATERCOURSE
- RETAINED BOREHOLES
- PROPOSED WATERCOURSE OPEN CHANNEL
- PROPOSED RIVER NAST DIVERSION (PERFORATED PIPE)
- PROPOSED RIVER NAST DIVERSION (SOLID PIPE)
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- EXISTING PONDS
- PROPOSED GREAT CRESTED NEWT PONDS
- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- PROPOSED ACOUSTIC FENCING
- PROPOSED STOCK PROOF FENCING
- PROPOSED POST AND WIRE FENCING
- MINERAL EXTRACTION AREA
- PROPOSED HAUL ROAD
- PROPOSED INTERPRETATION BOARD
- PROPOSED SIGNAGE
- EXISTING VEGETATION
- PROPOSED ADVANCED PLANTING
- PROPOSED ADVANCED HEDGEROW PLANTING
- PROPOSED AREA OF DISTURBANCE FROM SITE PREPARATION WORKS
- PROPOSED PERIMETER SCREENING/STORAGE BUNDS
- PROPOSED PERIMETER SEALS
- TS TOPSOIL STORAGE MOUND
- SS SUBSOIL STORAGE MOUND

PHASE A

TO BE STRIPPED OF TOPSOIL AND SUBSOIL TO A DEPTH OF 1.2m AND PLACED INTO TEMPORARY STORAGE AROUND PERIMETER.

VOLUMES
TOPSOIL 19,100m³
SUBSOIL 57,500m³

TO BE STRIPPED OF OVERBURDEN AND USED TO FORM PERIMETER SEALS AROUND PHASE, WITH SURPLUS PLACED INTO WORKED OUT VOID. SUITABLE IMPORTED MATERIALS MAY BE USED TO FORM THE PERIMETER SEALS.

INTERBURDEN TO BE PROGRESSIVELY STRIPPED AND PLACED BACK INTO VOID.

UMH AND LMH TO BE PROGRESSIVELY TAKEN TO PLANT SITE.

PROPOSED PERIMETER BUND

BUND EXTENDED ALONG HATFIELD ROAD AND AROUND POPEFIELD FARM.

BUND'S HAVE AN ADDITIONAL CAPACITY OF 77,200m³, TOPSOIL BUNDS ARE 3M HIGH AND SUBSOIL BUNDS ARE 5M HIGH EXCEPT ALONG HATFIELD ROAD WHERE THE BUND HEIGHT IS LIMITED TO 4M WITH 1:2 SIDE SLOPES. 5M STAND OFF FROM TOE OF BUND TO EXTRACTION AREA AND SITE BOUNDARY.

TOPSOIL TO BE STRIPPED FROM BENEATH SUBSOIL STORAGE IN ADVANCE. ALL BUNDS TO BE GRASS SEEDED. CONTRASTING UNITS TO BE SEPARATED BY GEOTEXTILE

WOODLAND/SCRUB PLANTING

Tree/Shrub species		Form /habit	Root condition	Minimum no. of Breaks	Age/Condition or Number of Times Transplanted	minimum size of container	Overall Height (cm)	Planting Block	WP2
								m²	3494
								mix	Total Plant No.s (@ 2m centres)
Acer campestre	Field Maple	Transplant - seed raised	Bagged/Bareroot		1+1 or 1/1		60-80	5%	45
Corylus avellana	Hazel	Branched	Bagged/Bareroot	3	1+2 or 1/2		60 - 80	10%	85
Crataegus monogyna	Hawthorn	Transplant - seed raised	Bagged/Bareroot		1+1 or 1/1		60 - 80	10%	85
Ilex aquifolium	Holly	Leaders and Laterals	Container			3L	60-80	2.5%	20
Malus sylvestris	Crab apple	Transplant - seed raised	Bagged/Bareroot		1+1 or 1/1		60-80	2.5%	20
Prunus avium	Wild Cherry	Transplant - seed raised	Bagged/Bareroot		1+1 or 1/1		60-80	5%	45
Prunus spinosa	Blackthorn	Transplant - seed raised	Bagged/Bareroot		1+1 or 1/1		60-80	2.5%	20
Quercus robur	Pedunculate oak	Transplant - seed raised	Bagged/Bareroot		1+1 or 1/1		60-80	35%	305
Roas canina	Dog rose	Branched	Bagged/Bareroot	3	1+1 or 1/1		60-80	2.5%	20
Sorbus aria	Whitebeam	Transplant - seed raised	Bagged/Bareroot		1+1 or 1/1		60-80	15%	130
Viburnum opulus	Guelder rose	Branched	Bagged/Bareroot	3	1+2 or 1/2		60-80	10%	85
							Total	100%	860

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GROUNDWATER MANAGEMENT PLAN

INFILTRATION LAGOONS

HA-PCC-C9

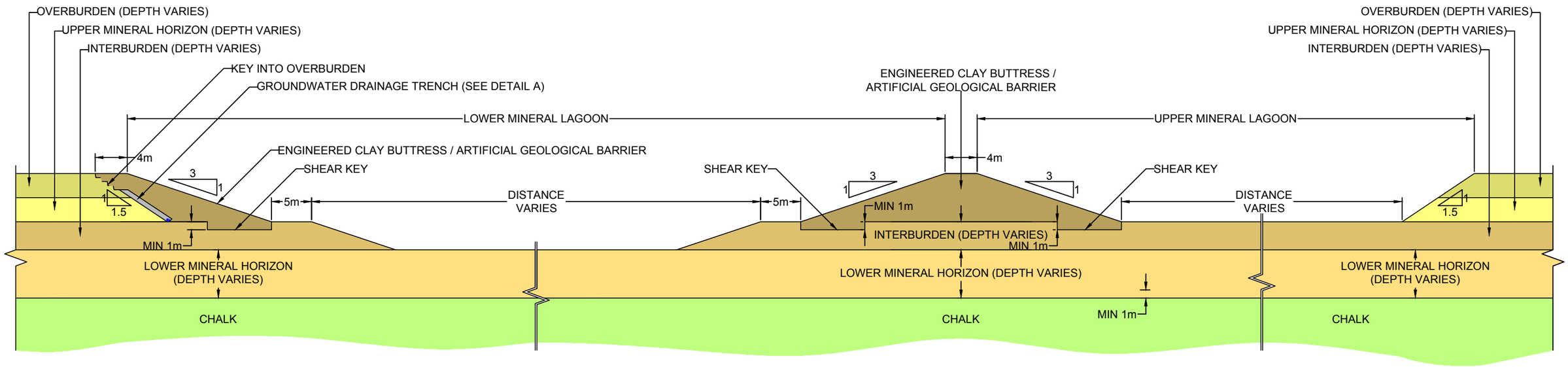
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Date JUNE 2021

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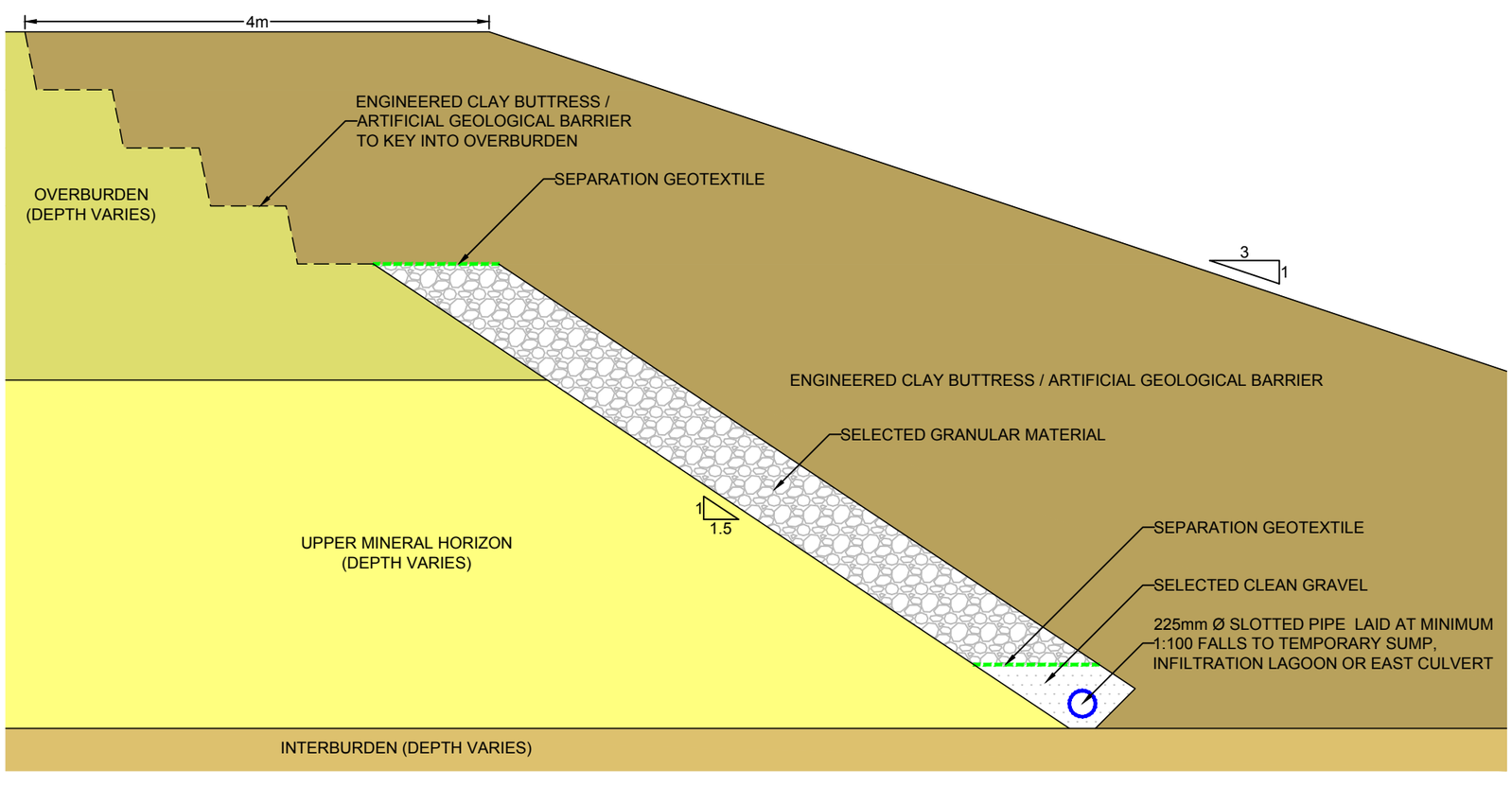
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SCHEMATIC DETAIL THROUGH LMA AND UMA INFILTRATION LAGOONS

SCALE 1:00



DETAIL A GROUNDWATER CONTROL DRAIN

SCALE 1:0

PT1	KW	JP	05/18	
Revision	By	Chk'd By	Date	Comments

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Project
HATFIELD EARTHWORKS - INFILTRATION LAGOONS & PHASE A

Drawing Title
INFILTRATION LAGOONS BUTTRESS SCHEMATIC SECTIONS

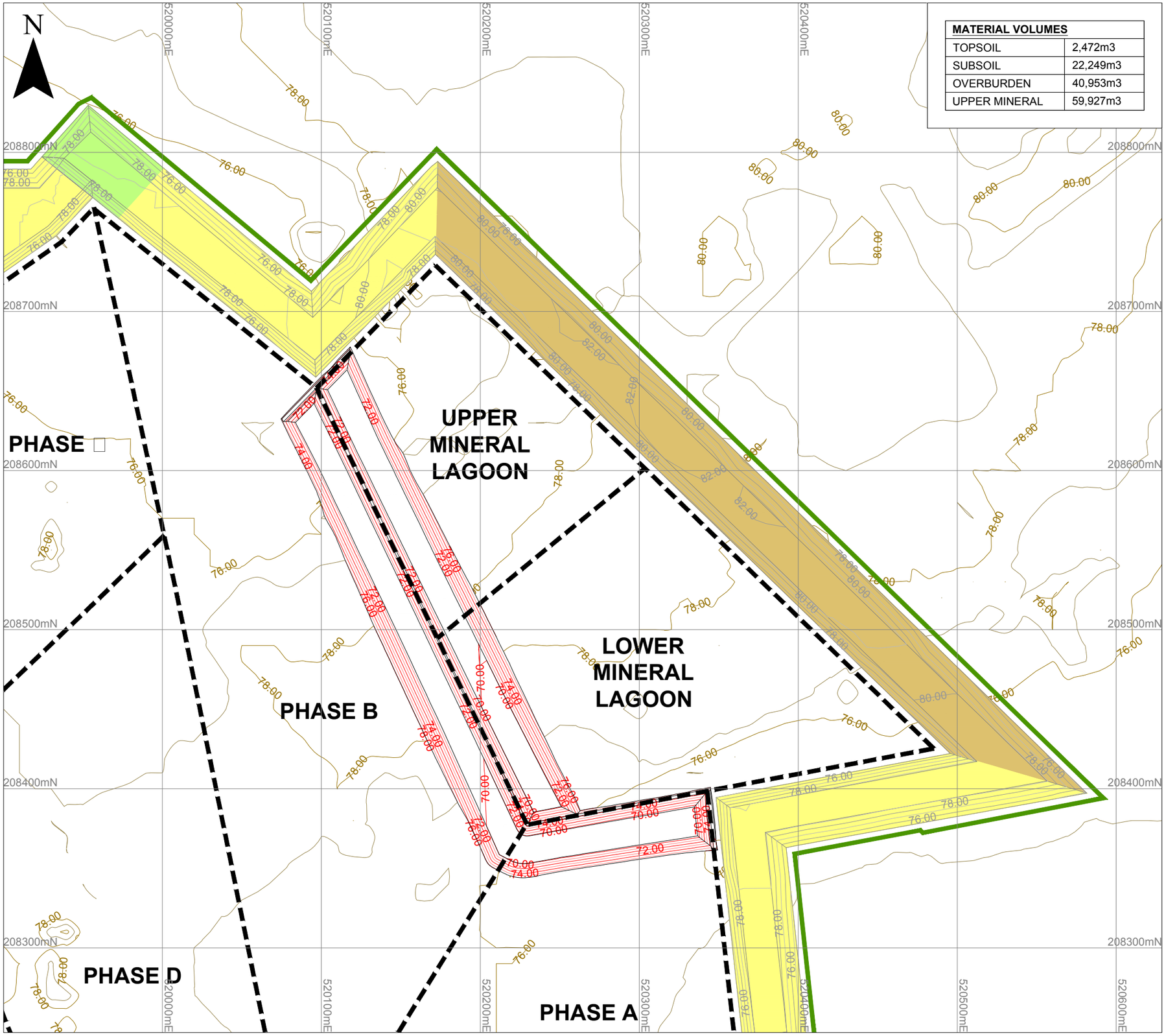
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AS SHOWN @ A3	MAY 2018

Drawing Number	Revision
01	PT1

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01009.00177.07.018.PT1A_Schematic_Sections.dwg



MATERIAL VOLUMES	
TOPSOIL	2,472m3
SUBSOIL	22,249m3
OVERBURDEN	40,953m3
UPPER MINERAL	59,927m3

EXCAVATION OF OVERBURDEN & UPPER MINERAL FROM WESTERN PERIMETER OF LAGOONS

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- 80.00 TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- 80.00 PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

Revision	By	Chk'd By	Date	Comments
PT0	KW	JP	01/18	

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Project
HATFIELD EARTHWORKS - INFILTRATION LAGOONS & PHASE A

Drawing Title
STAGE 1A
PROPOSED E□□AVATION LEVELS

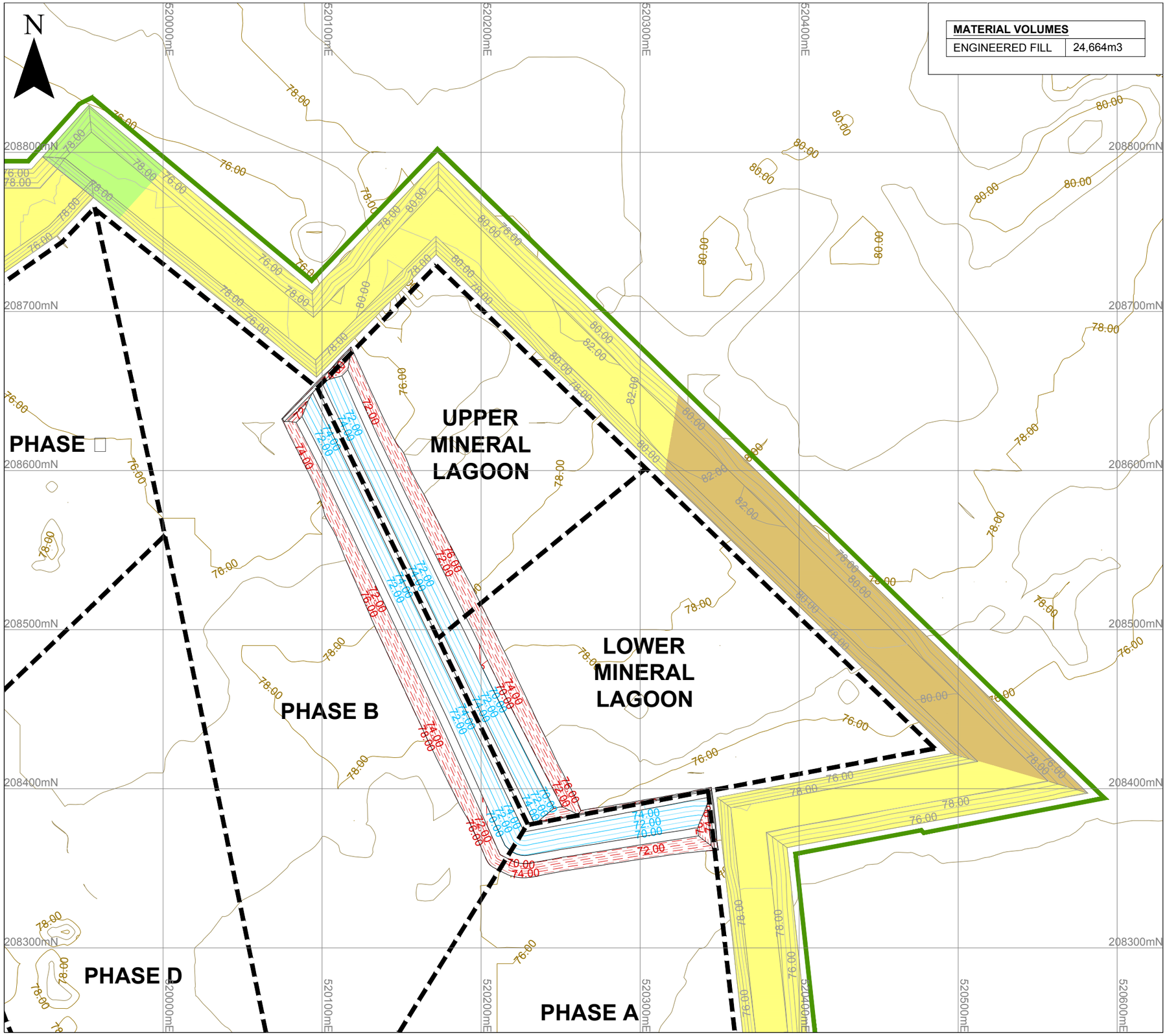
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Drawing Number	Revision
00□	PT0

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FILLING OF ENGINEERED BUTTRESS TO WESTERN PERIMETER OF LAGOONS

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

Revision	By	Chk'd By	Date	Comments
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Project
HATFIELD EARTHWORKS - INFILTRATION LAGOONS & PHASE A

Drawing Title
STAGE 1B
PROPOSED ENGINEERED FILL LEVELS

Scale
1:2500 @ A3

Date
JANUARY 2018

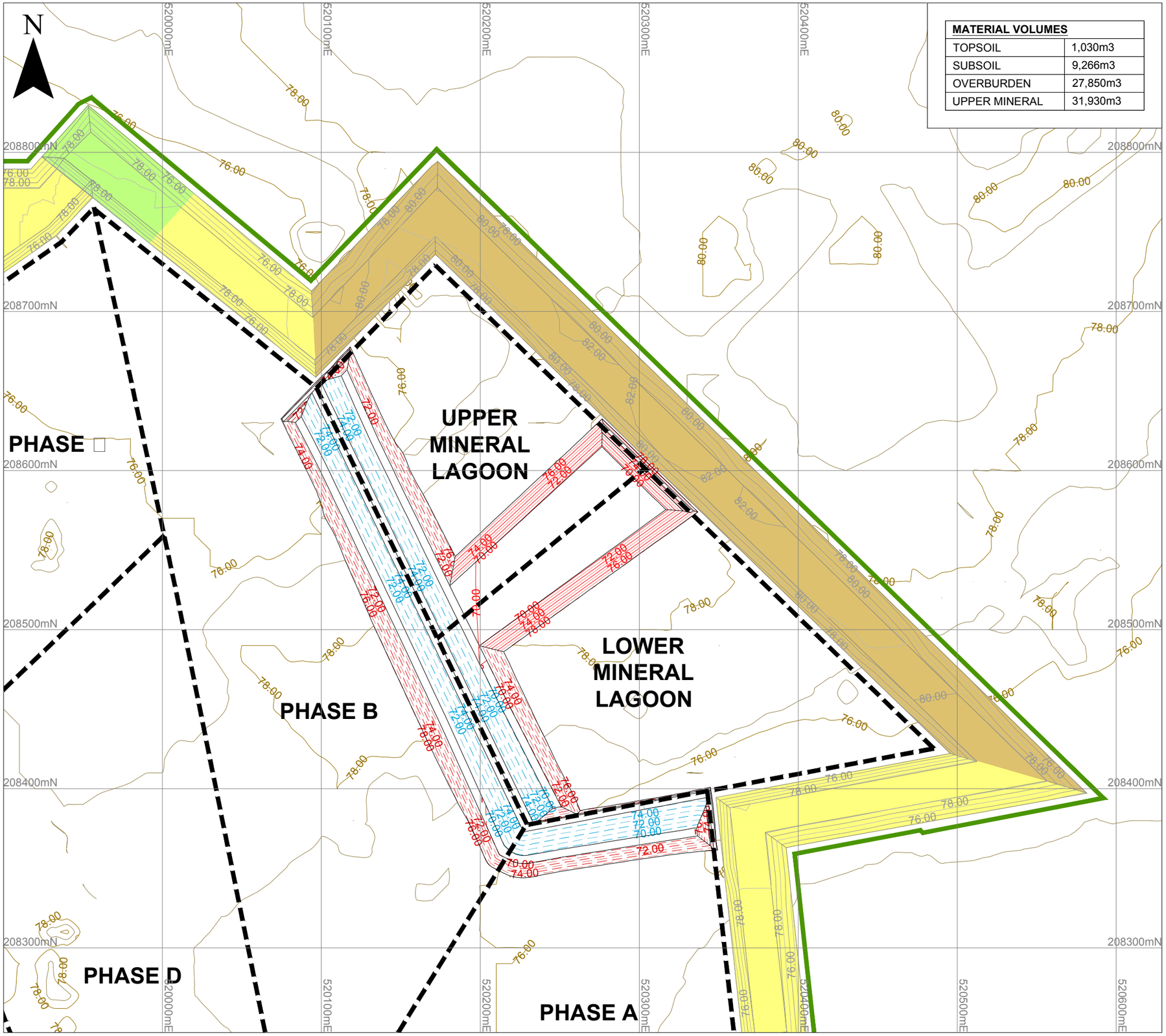
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PT0

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MATERIAL VOLUMES	
TOPSOIL	1,030m3
SUBSOIL	9,266m3
OVERBURDEN	27,850m3
UPPER MINERAL	31,930m3

EXCAVATION OF OVERBURDEN & UPPER MINERAL FROM SEPARATION BUND OF LAGOONS

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

Revision	By	Chk'd By	Date	Comments
PT0	KW	JP	01/18	

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Drawing Title
STAGE □A
PROPOSED E□□AVATION LEVELS

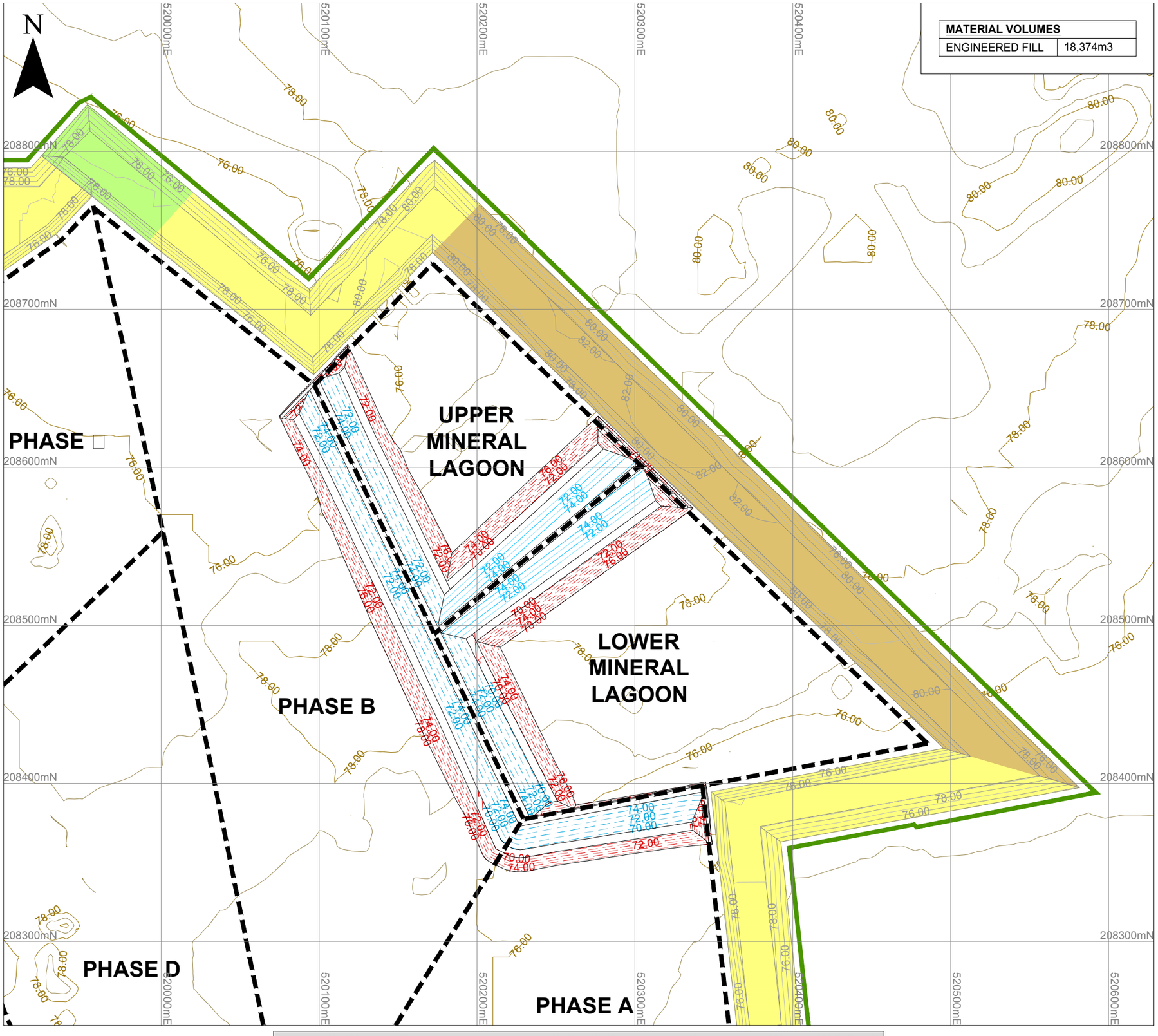
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Drawing Number	Revision
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FILLING OF ENGINEERED BUTTRESS TO SEPARATION BUND OF LAGOONS

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- 80.00 TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- 80.00 PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

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HATFIELD EARTHWORKS - INFILTRATION LAGOONS & PHASE A

Drawing Title
STAGE B
PROPOSED ENGINEERED FILL LEVELS

Scale
1:2500 @ A3

Date
JANUARY 2018

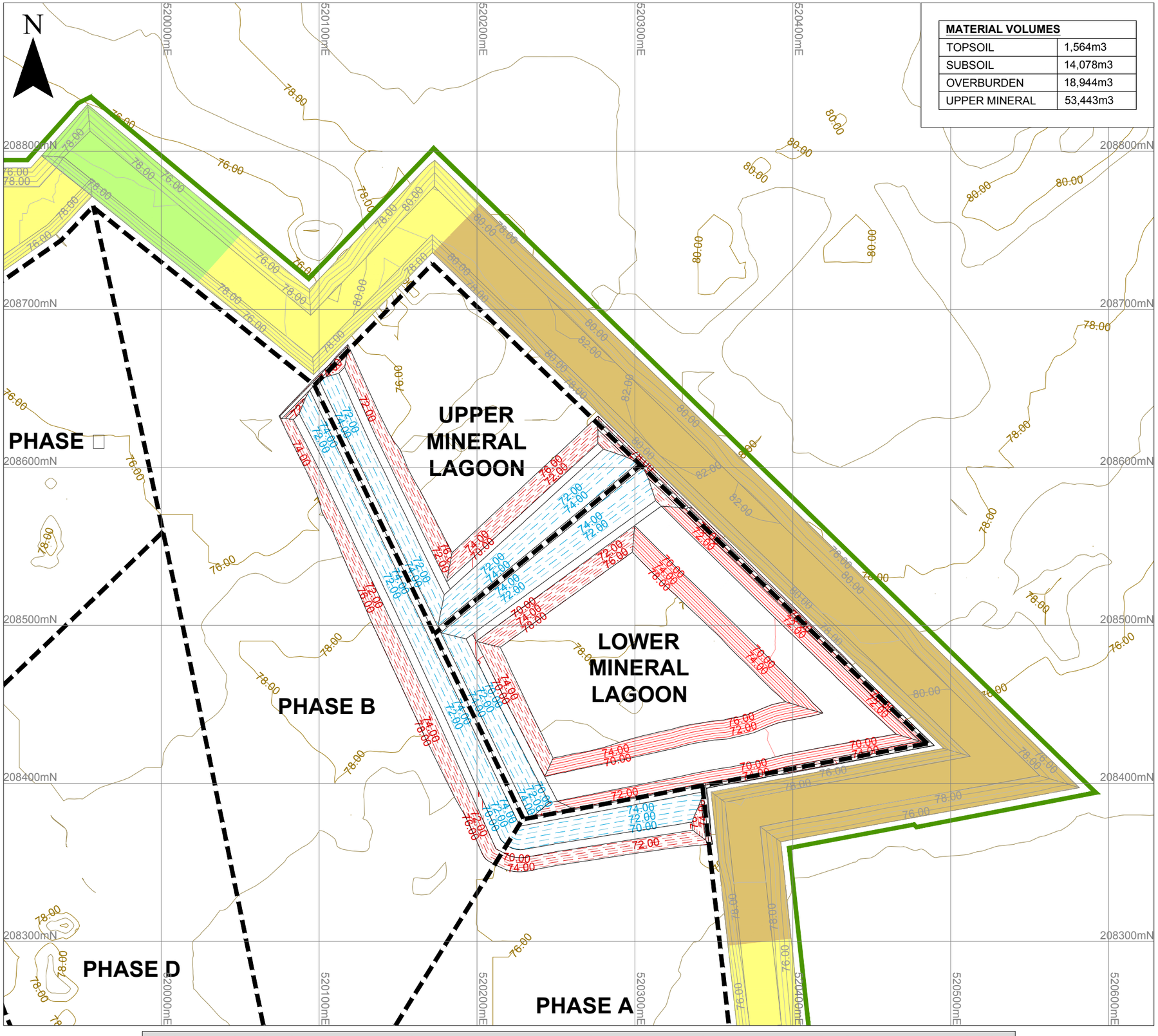
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EXCAVATION OF OVERBURDEN & UPPER MINERAL FROM REMAINING PERIMETER OF SOUTHERN LAGOON

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

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Drawing Title
STAGE □A
PROPOSED E□□AVATION LEVELS

Scale
1:2500 @ A3

Date
JANUARY 2018

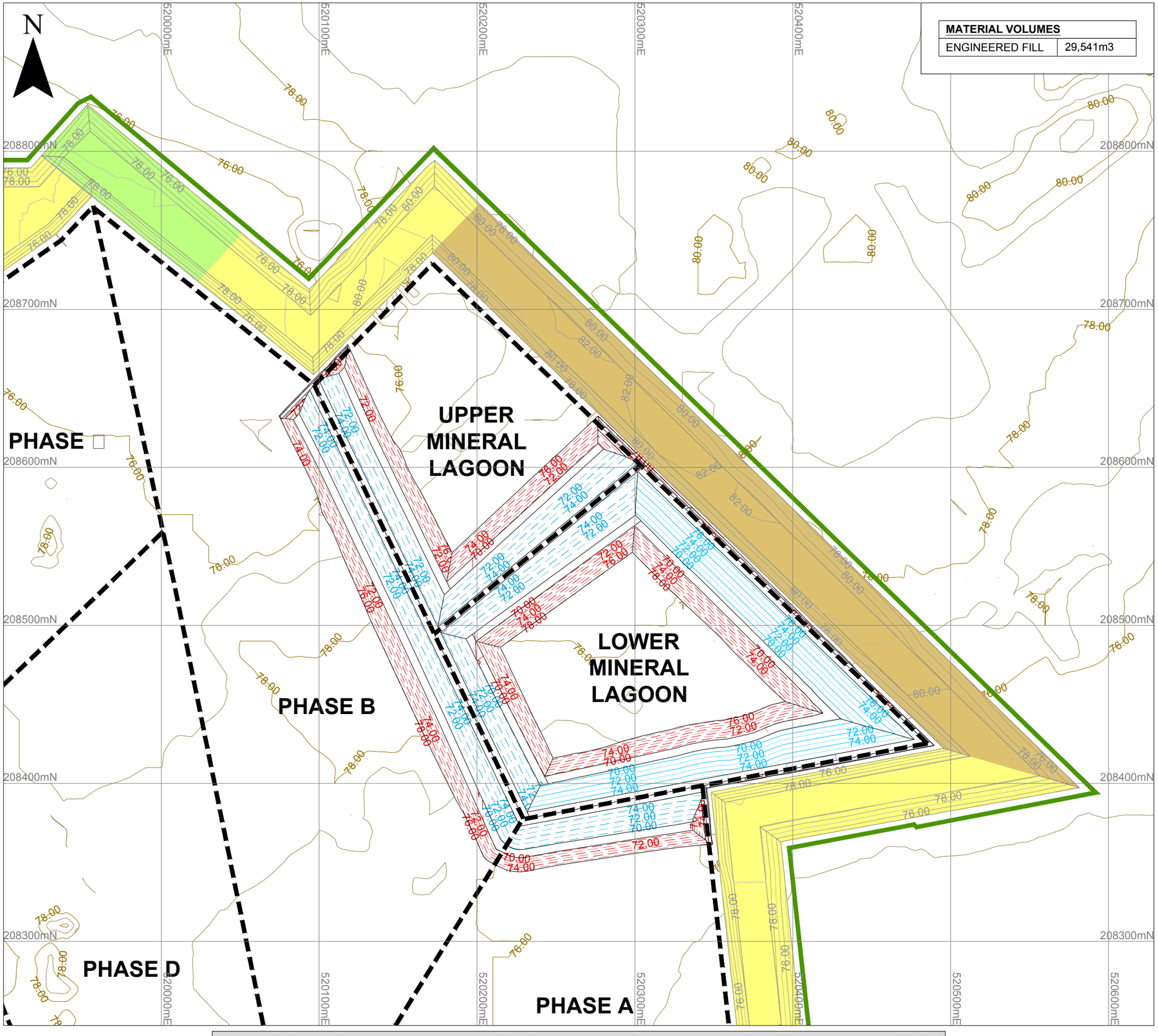
Drawing Number
007

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PT0

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FILLING OF ENGINEERED BUTTRESS TO REMAINING PERIMETER OF SOUTHERN LAGOON

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- 80.00 TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- 80.00 PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

Revision	By	Chk'd By	Date	Comments
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Drawing Title
STAGE 3B
PROPOSED ENGINEERED FILL LEVELS

Scale
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Date
JANUARY 2018

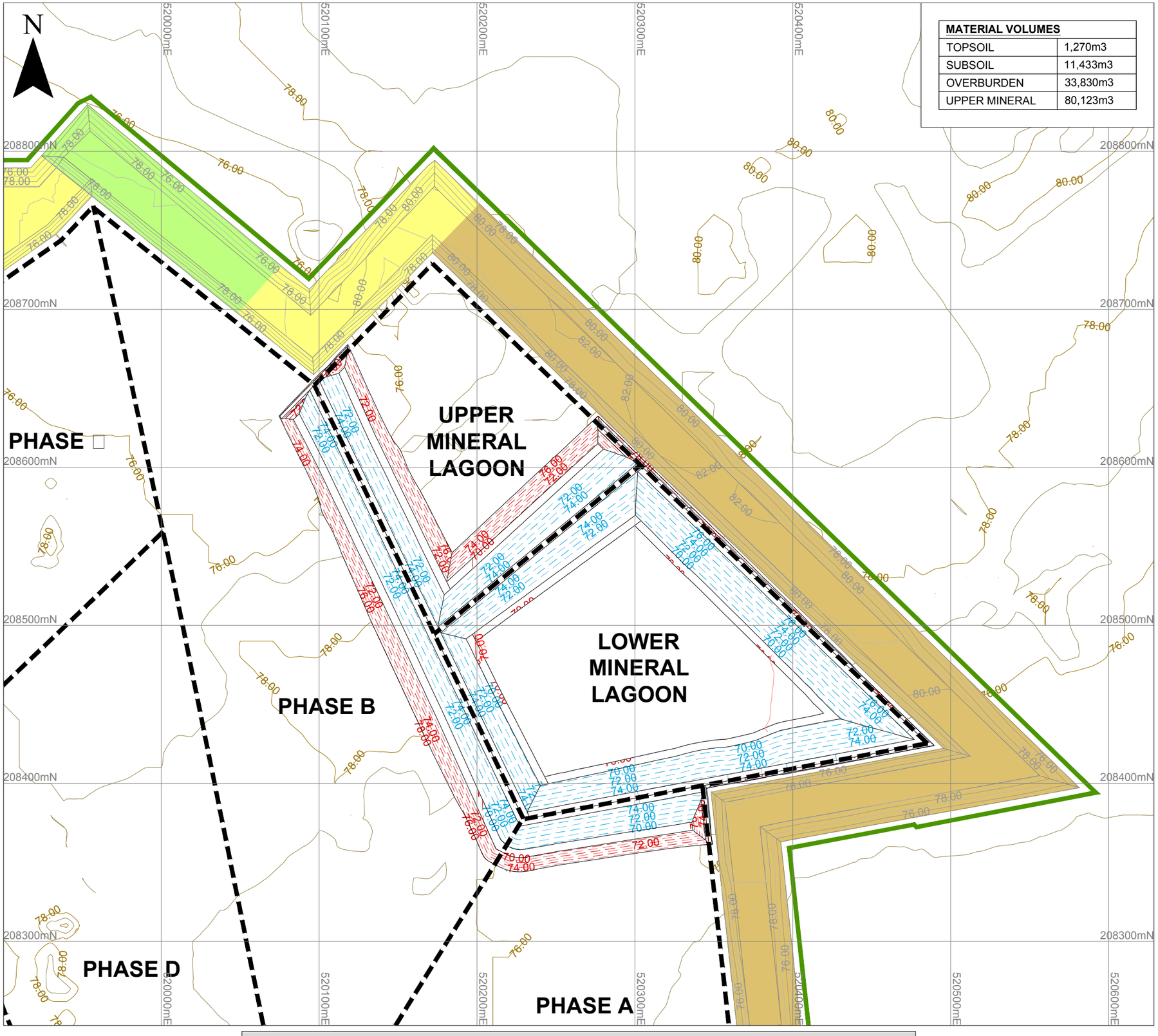
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EXCAVATION OF REMAINING OVERBURDEN / UPPER MINERAL IN LOWER LAGOON

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- 80.00 TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- 80.00 PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

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Drawing Title
STAGE □A
PROPOSED E□□AVATION LEVELS

Scale
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Date
JANUARY 2018

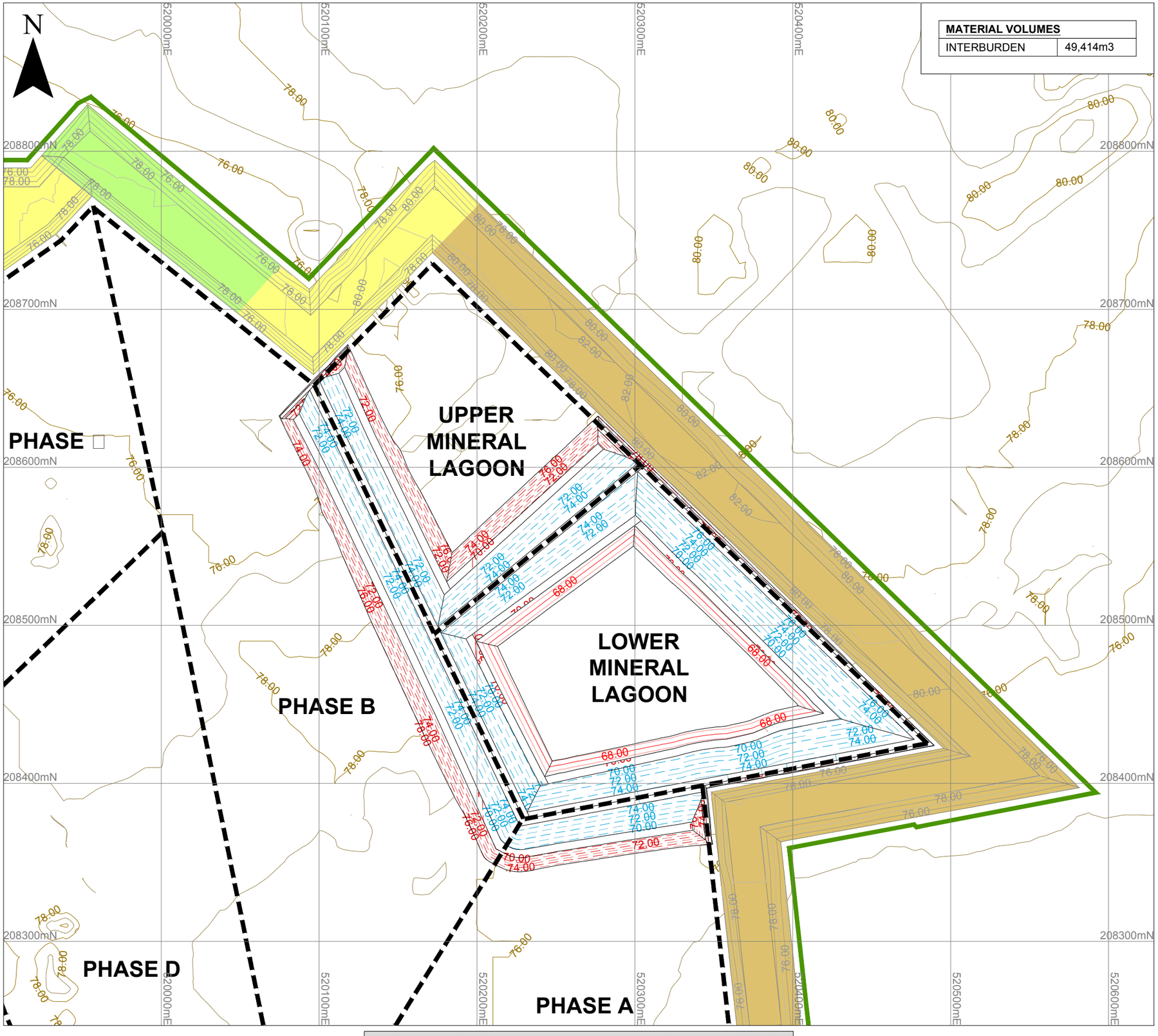
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EXCAVATION OF INTERBURDEN IN LOWER LAGOON

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- 80.00 TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- 80.00 PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

PT0	KW	JP	01/18	
Revision	By	Chk'd By	Date	Comments

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Drawing Title
STAGE □B
PROPOSED E□□AVATION LEVELS

Scale
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Date
JANUARY 2018

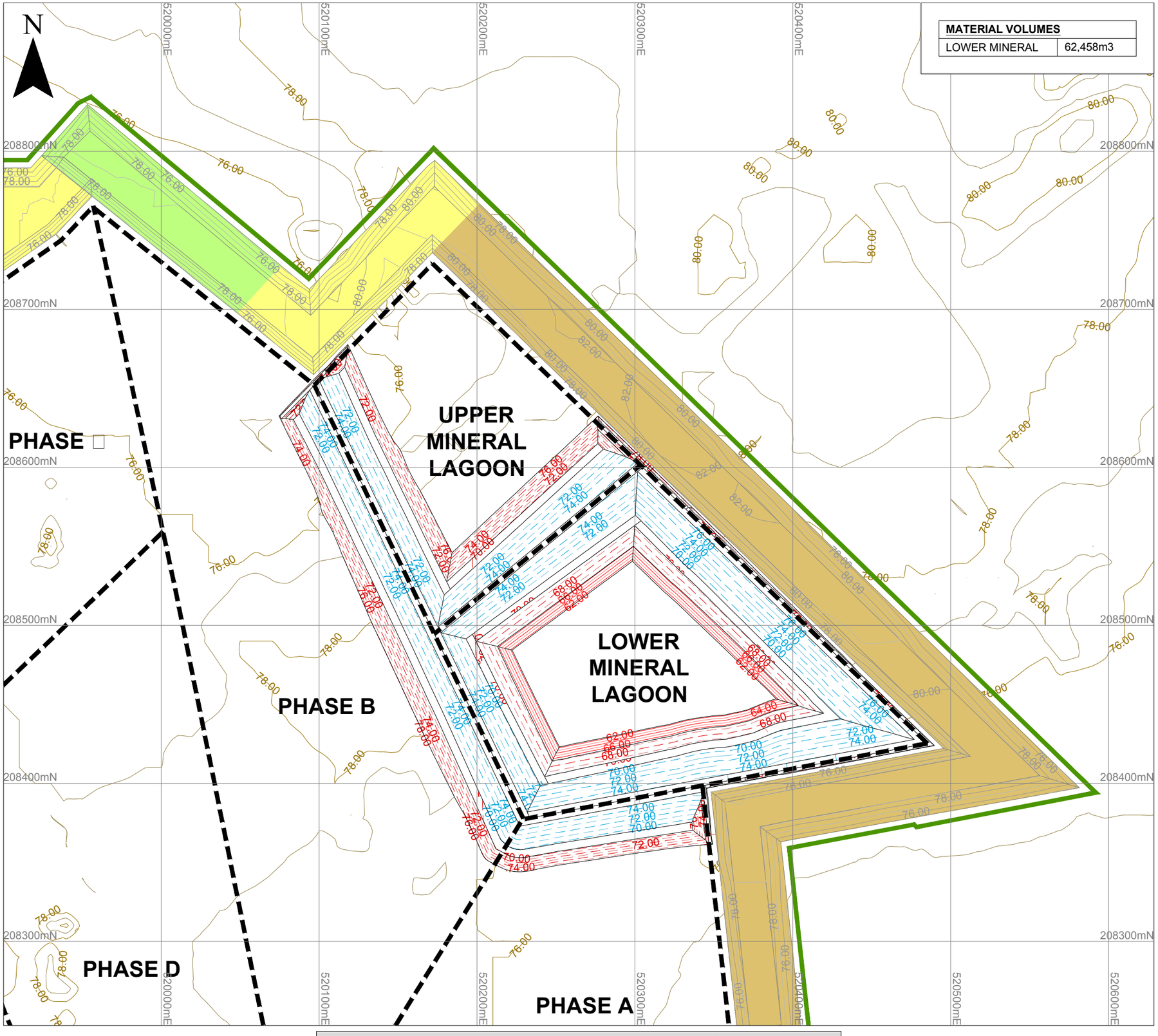
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EXCAVATION TO REMOVE LOWER MINERAL IN LOWER LAGOON

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

Revision	By	Chk'd By	Date	Comments
PT0	KW	JP	01/18	

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Drawing Title
STAGE □□
PROPOSED E□□AVATION LEVELS

Scale
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Date
JANUARY 2018

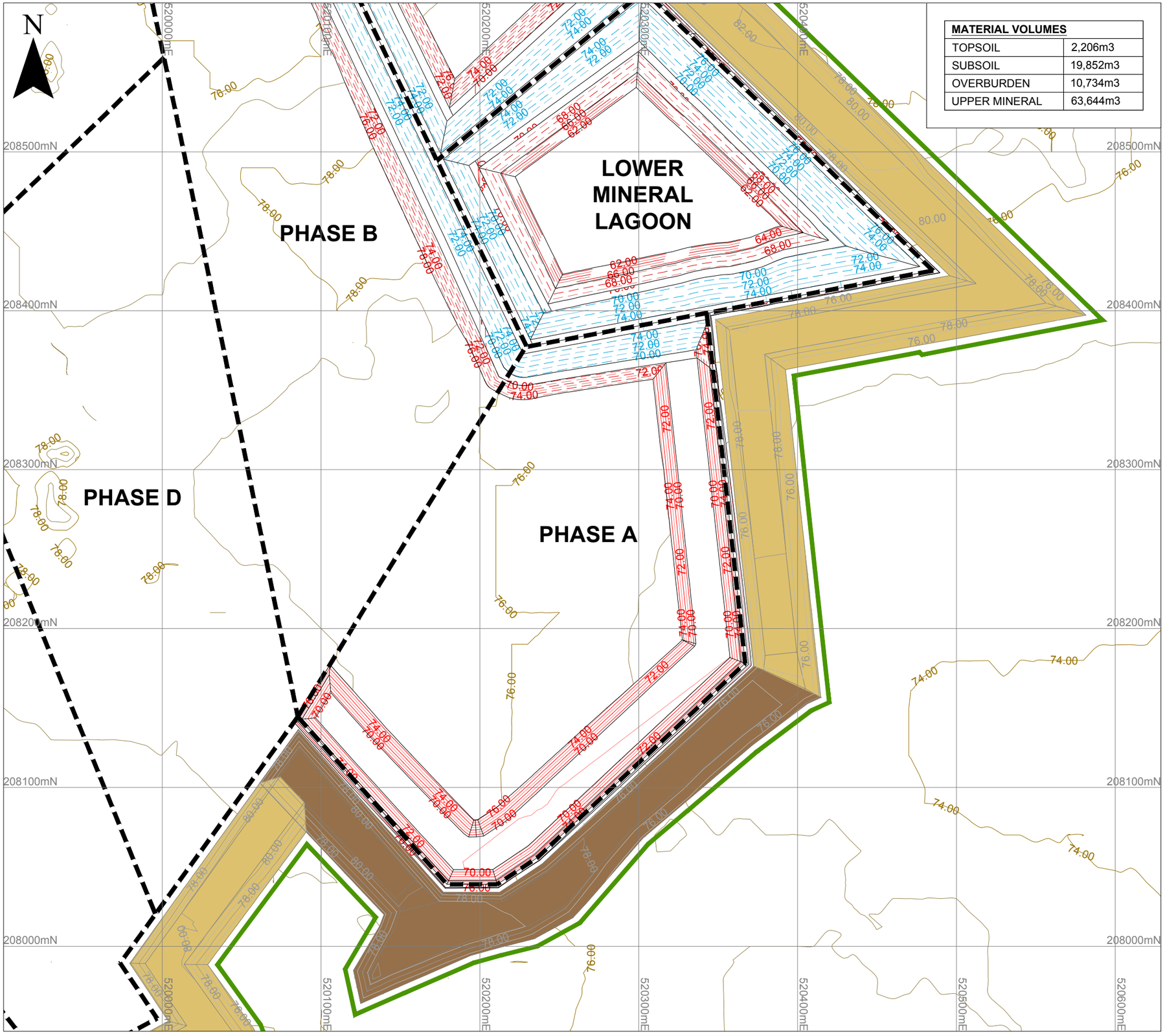
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PT0

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MATERIAL VOLUMES	
TOPSOIL	2,206m3
SUBSOIL	19,852m3
OVERBURDEN	10,734m3
UPPER MINERAL	63,644m3

EXCAVATION OF OVERBURDEN & UPPER MINERAL IN PHASE A SOUTHERN / EASTERN PERIMETER

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- 80.00 TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- 80.00 PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

PT0	KW	JP	01/18	
Revision	By	Chk'd By	Date	Comments

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Project
HATFIELD EARTHWORKS - INFILTRATION LAGOONS & PHASE A

Drawing Title
STAGE □A
PROPOSED E□□AVATION LEVELS

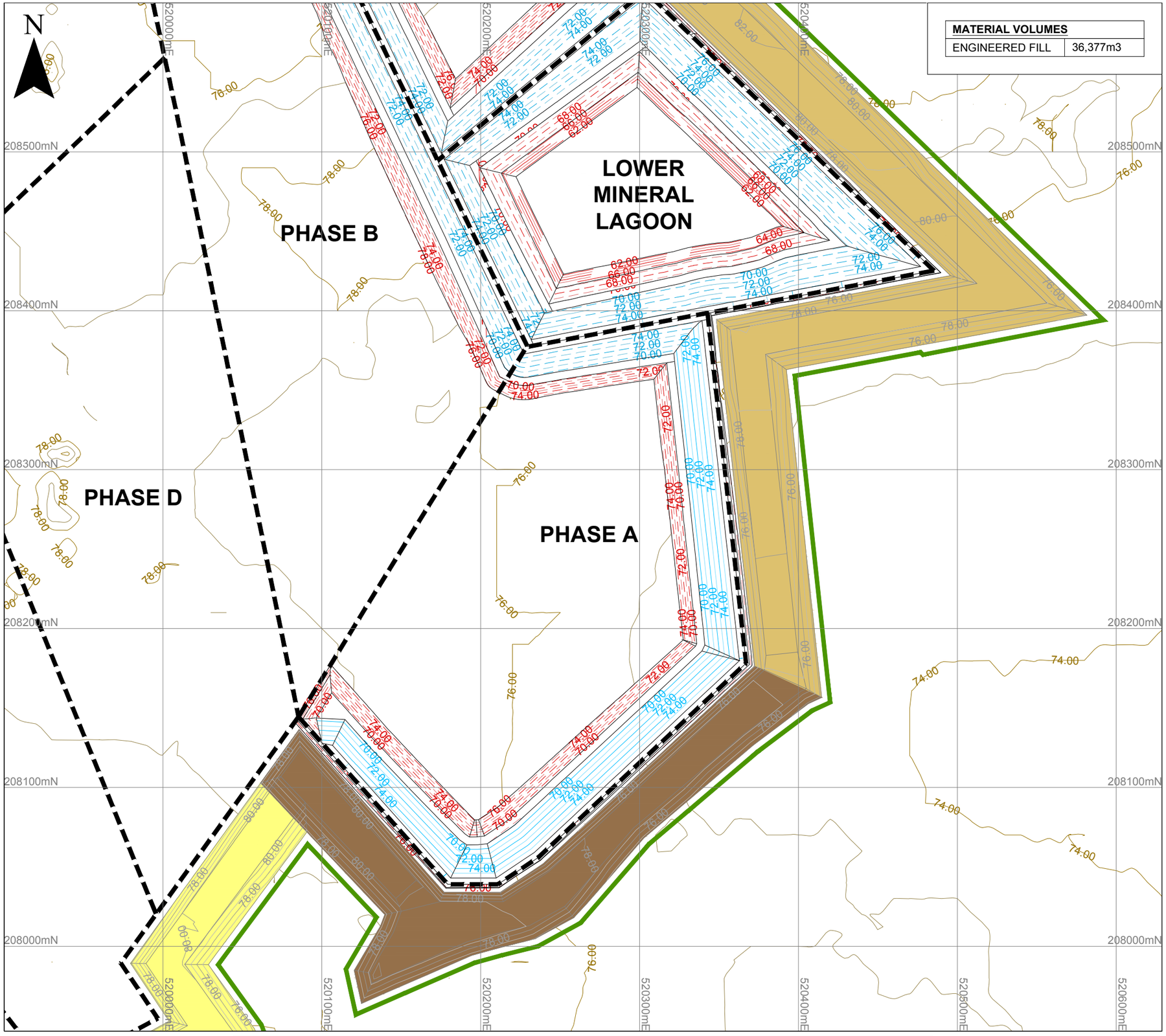
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Drawing Number
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FILLING OF ENGINEERED BUTTRESS IN PHASE A SOUTHERN / EASTERN PERIMETER

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- 80.00 TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- 70.00 PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- 70.00 PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- 80.00 PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

Revision	By	Chk'd By	Date	Comments
PT0	KW	JP	01/18	

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Project
HATFIELD EARTHWORKS - INFILTRATION LAGOONS & PHASE A

Drawing Title
STAGE 5B
PROPOSED ENGINEERED FILL LEVELS

Scale
1:2500 @ A3

Date
JANUARY 2018

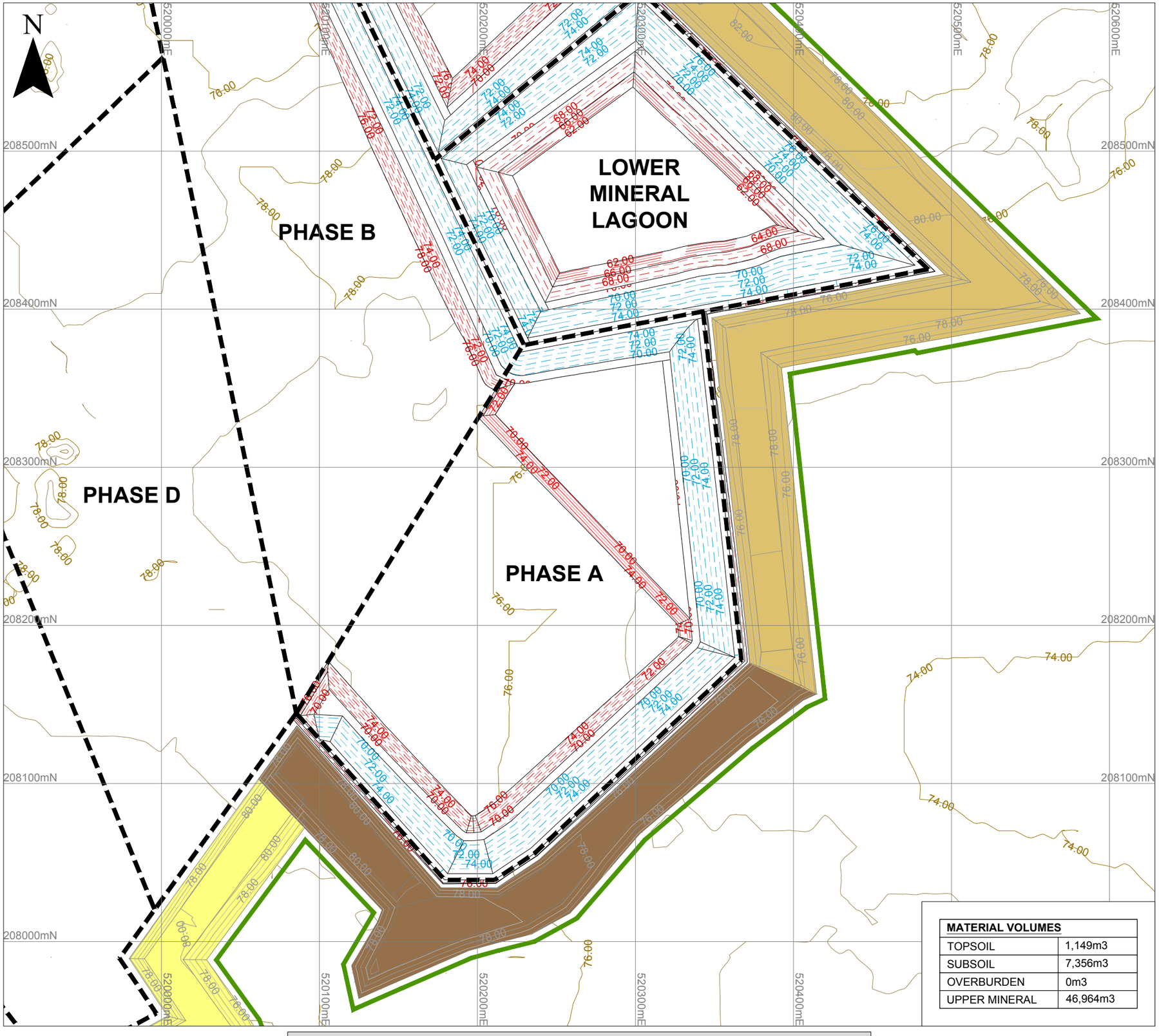
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MATERIAL VOLUMES	
TOPSOIL	1,149m3
SUBSOIL	7,356m3
OVERBURDEN	0m3
UPPER MINERAL	46,964m3

EXCAVATION OF OVERBURDEN / UPPER MINERAL IN PHASE A - AREA 1

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

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Drawing Title
STAGE 6A
PROPOSED E□□AVATION LEVELS

Scale
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Date
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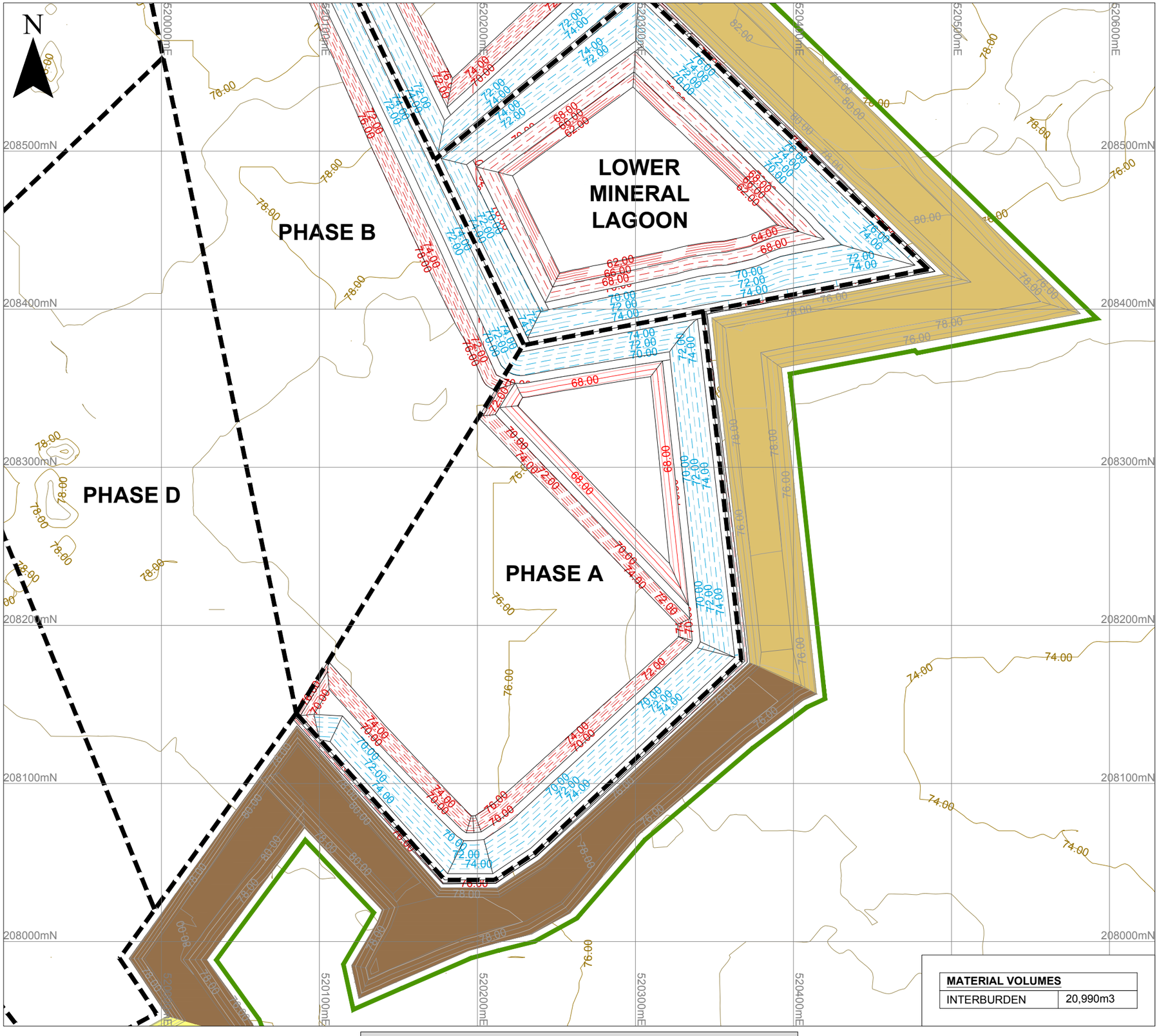
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MATERIAL VOLUMES	
INTERBURDEN	20,990m3

EXCAVATION OF INTERBURDEN IN PHASE A - AREA 1

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

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Drawing Title
STAGE 6B
PROPOSED E□□AVATION LEVELS

Scale
1:2500 @ A3

Date
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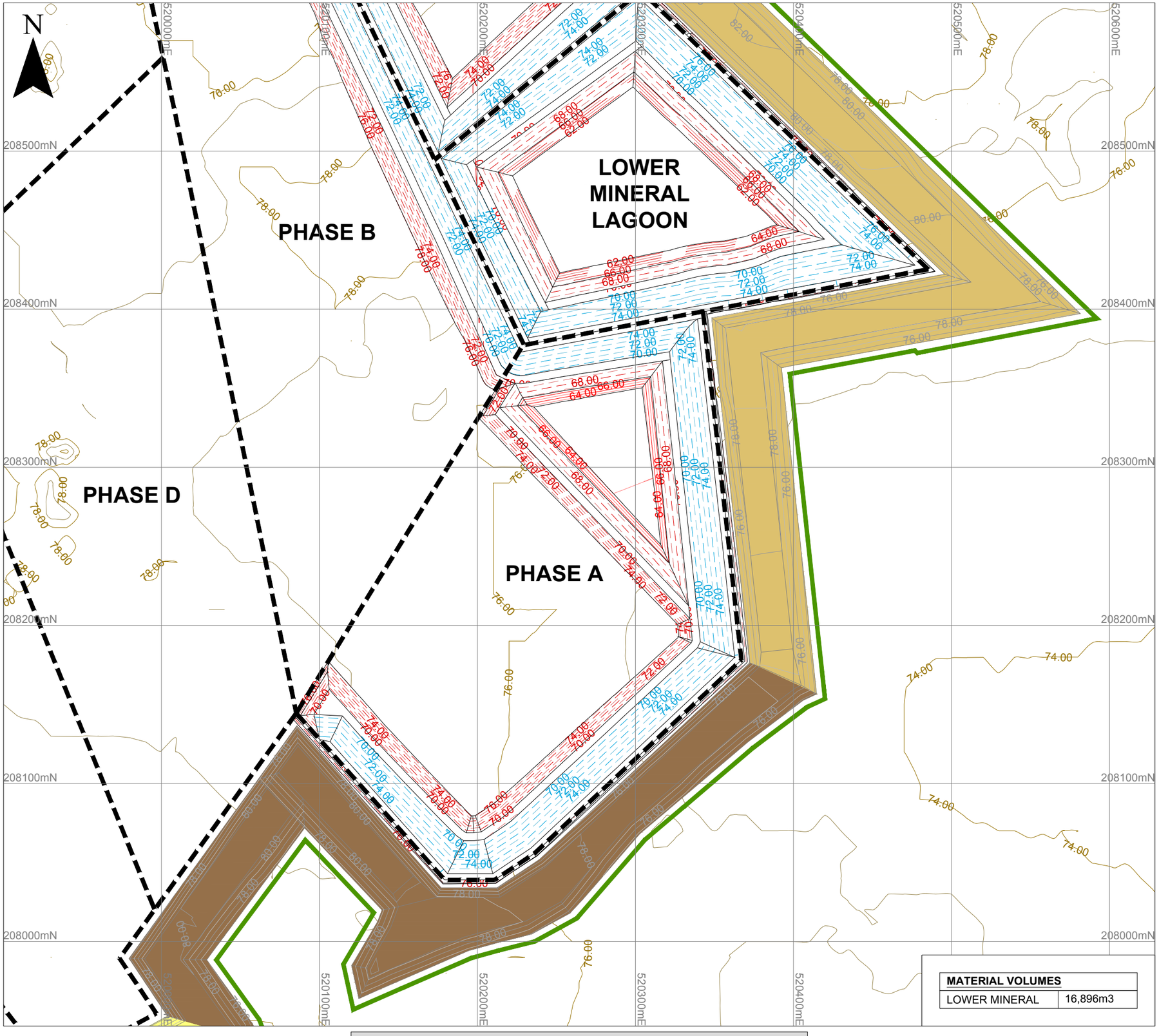
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MATERIAL VOLUMES	
LOWER MINERAL	16,896m3

EXCAVATION OF LOWER MINERAL IN PHASE A - AREA 1

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD) — 80.00
- PROPOSED EXCAVATION LEVEL CONTOURS (mAOD) — 70.00
- PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD) — 70.00
- PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD) — 70.00
- PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD) — 70.00
- PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD) — 80.00
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

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Drawing Title
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PROPOSED E□□AVATION LEVELS

Scale
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Date
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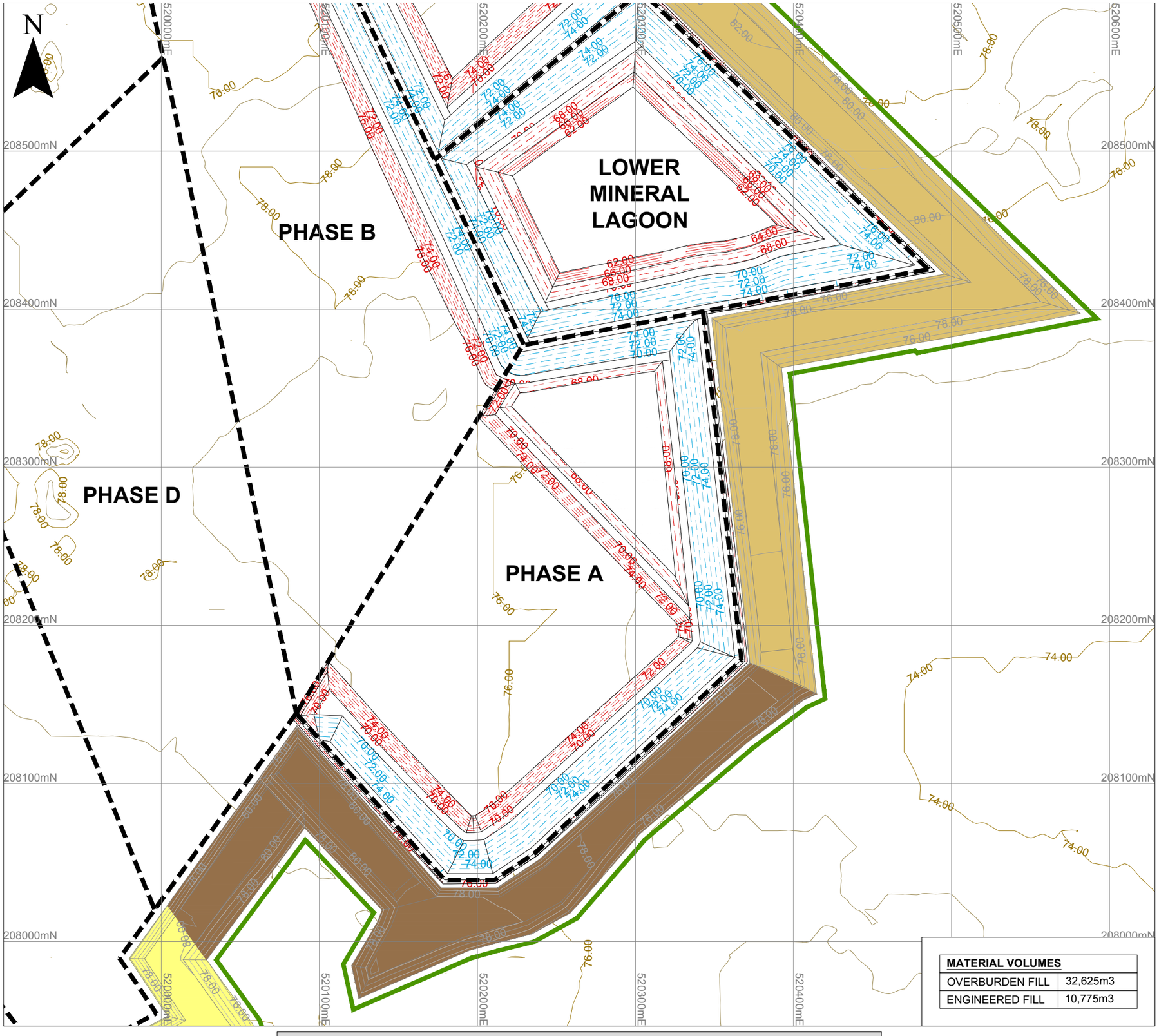
Drawing Number
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MATERIAL VOLUMES	
OVERBURDEN FILL	32,625m3
ENGINEERED FILL	10,775m3

FILLING OF RAFT MATERIAL / GEOLOGICAL BARRIER IN PHASE A - AREA 1

LEGEND

- ENVIRONMENTAL PERMIT BOUNDARY
- PHASE BOUNDARY
- TOPOGRAPHIC SURVEY LEVEL CONTOURS (mAOD)
- PROPOSED EXCAVATION LEVEL CONTOURS (mAOD)
- PREVIOUS EXCAVATION STAGE LEVEL CONTOURS (mAOD)
- PROPOSED ENGINEERED FILL LEVEL CONTOURS (mAOD)
- PREVIOUS ENGINEERED FILL STAGE LEVEL CONTOURS (mAOD)
- PROPOSED SCREENING BUND LEVEL CONTOURS (mAOD)
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED OVERBURDEN STORAGE AREA
- PROPOSED INTERBURDEN STORAGE AREA
- PROPOSED STORAGE AREA VOID

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Drawing Title
STAGE 6D
PROPOSED ENGINEERED FILL LEVELS

Scale
1:2500 @ A3

Date
JANUARY 2018

Drawing Number
017

Revision
PT0

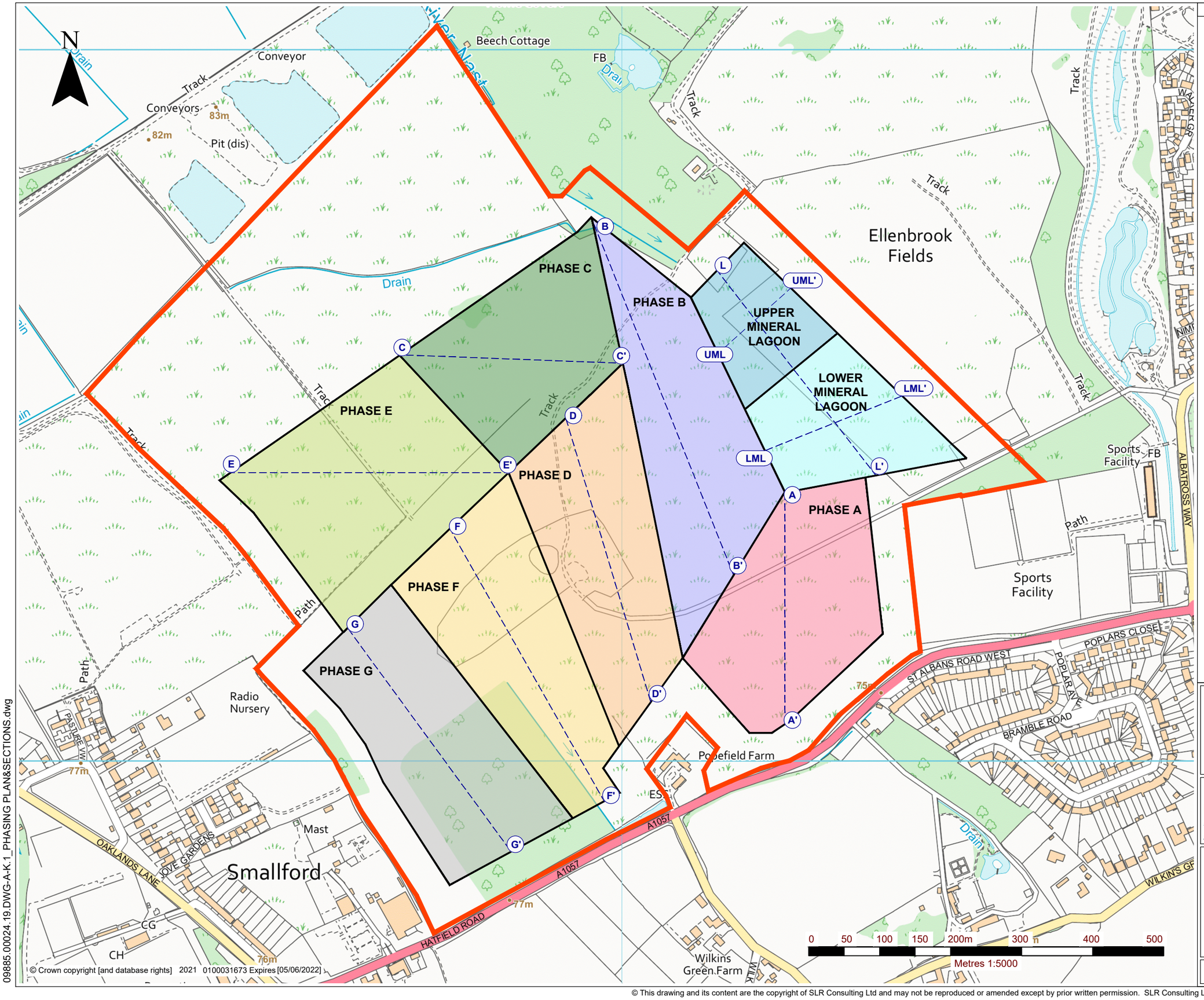
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APPENDIX 03

Water Operating Plan



LEGEND

- SITE BOUNDARY
- PHASE BOUNDARY
- SECTION LINE

PHASES

- PHASE A
- PHASE B
- PHASE C
- PHASE D
- PHASE E
- PHASE F
- PHASE G
- PHASE UPPER MINERAL LAGOON
- PHASE LOWER MINERAL LAGOON

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PHASING PLAN AND LINES OF SECTION

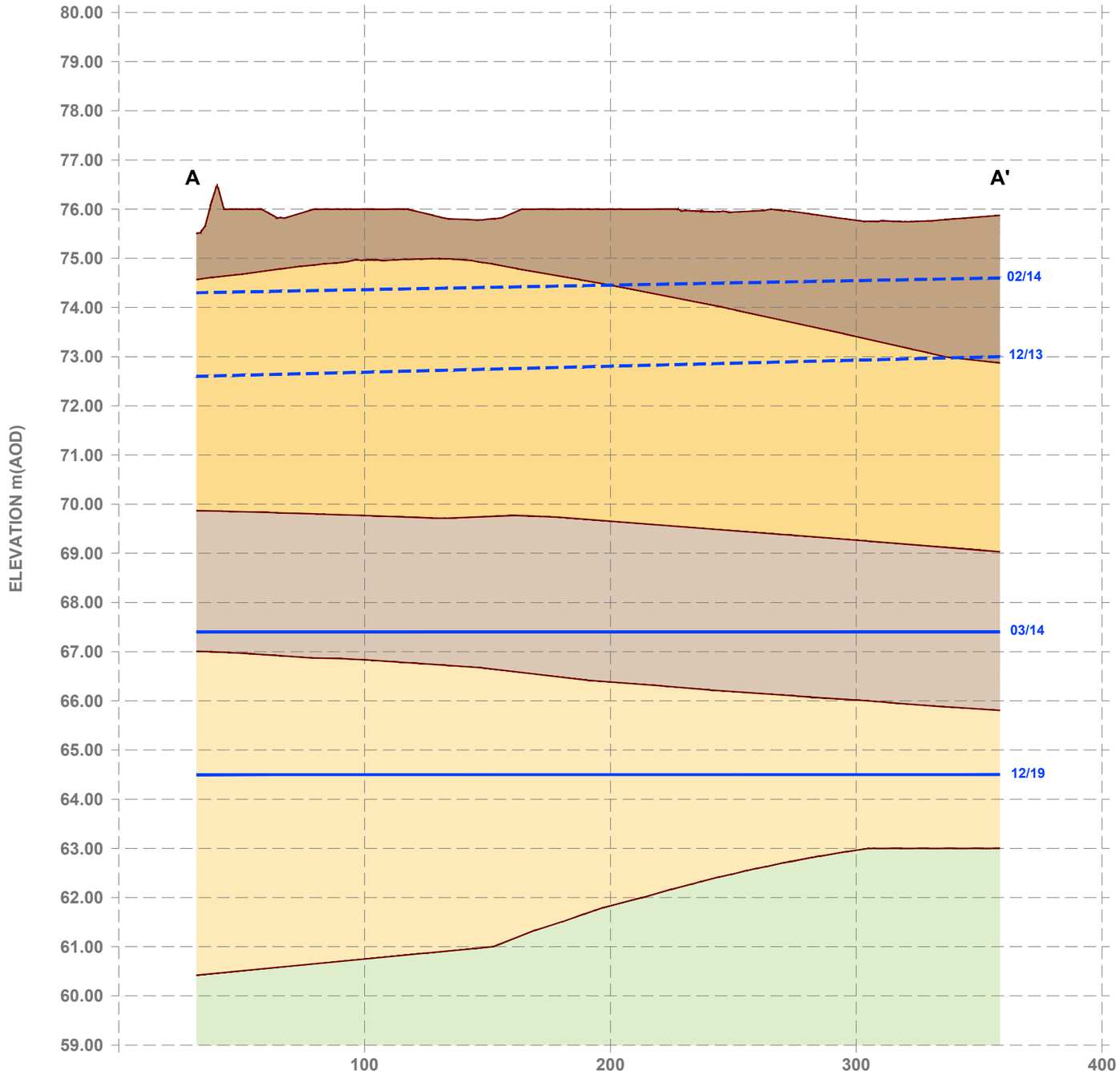
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Scale	Date
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PHASE A
SECTION A - A'



VERTICAL SCALE 1:100, HORIZONTAL SCALE 1:2000

LEGEND

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- LMA PIEZOMETRIC SURFACE
- OVERBURDEN
- UM HORIZON
- INTERBURDEN
- LM HORIZON
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SECTION A - A'

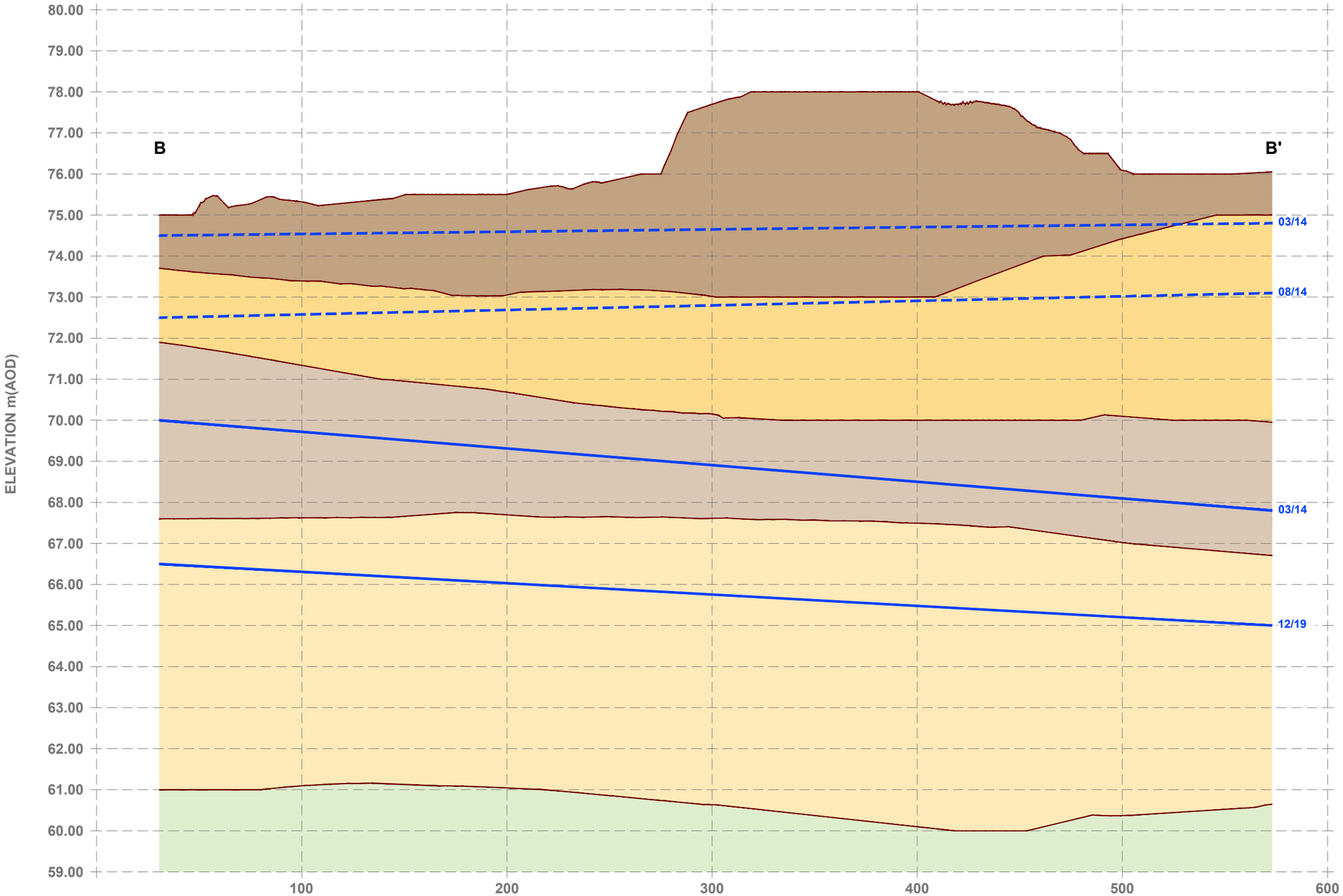
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PHASE B
SECTION B - B'



VERTICAL SCALE 1:100, HORIZONTAL SCALE 1:2000

LEGEND

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- LMA PIEZOMETRIC SURFACE
- OVERBURDEN
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SECTION B - B'

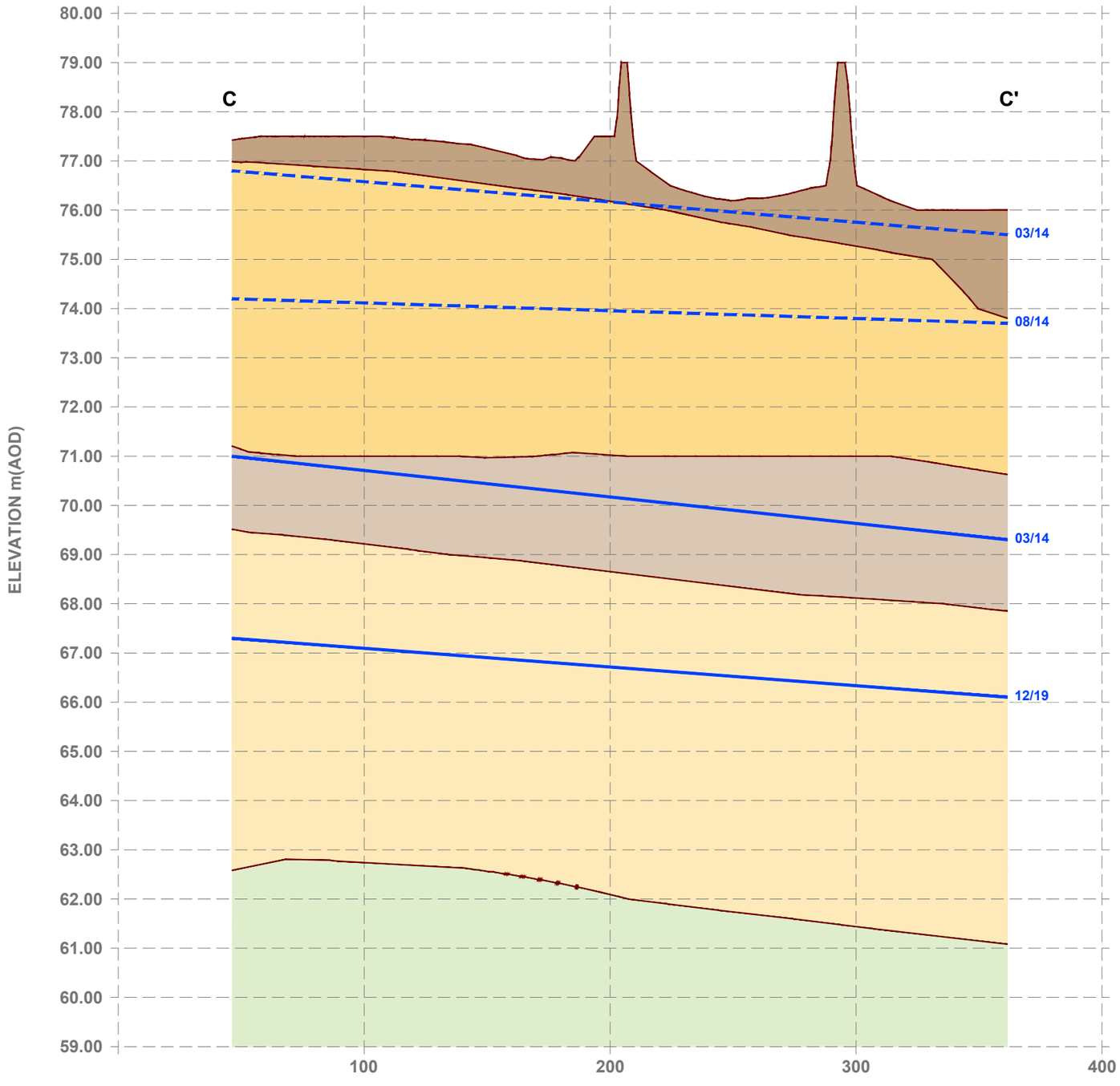
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PHASE C
SECTION C - C'



VERTICAL SCALE 1:100, HORIZONTAL SCALE 1:2000

LEGEND

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- LMA PIEZOMETRIC SURFACE
- OVERBURDEN
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SECTION C - C'

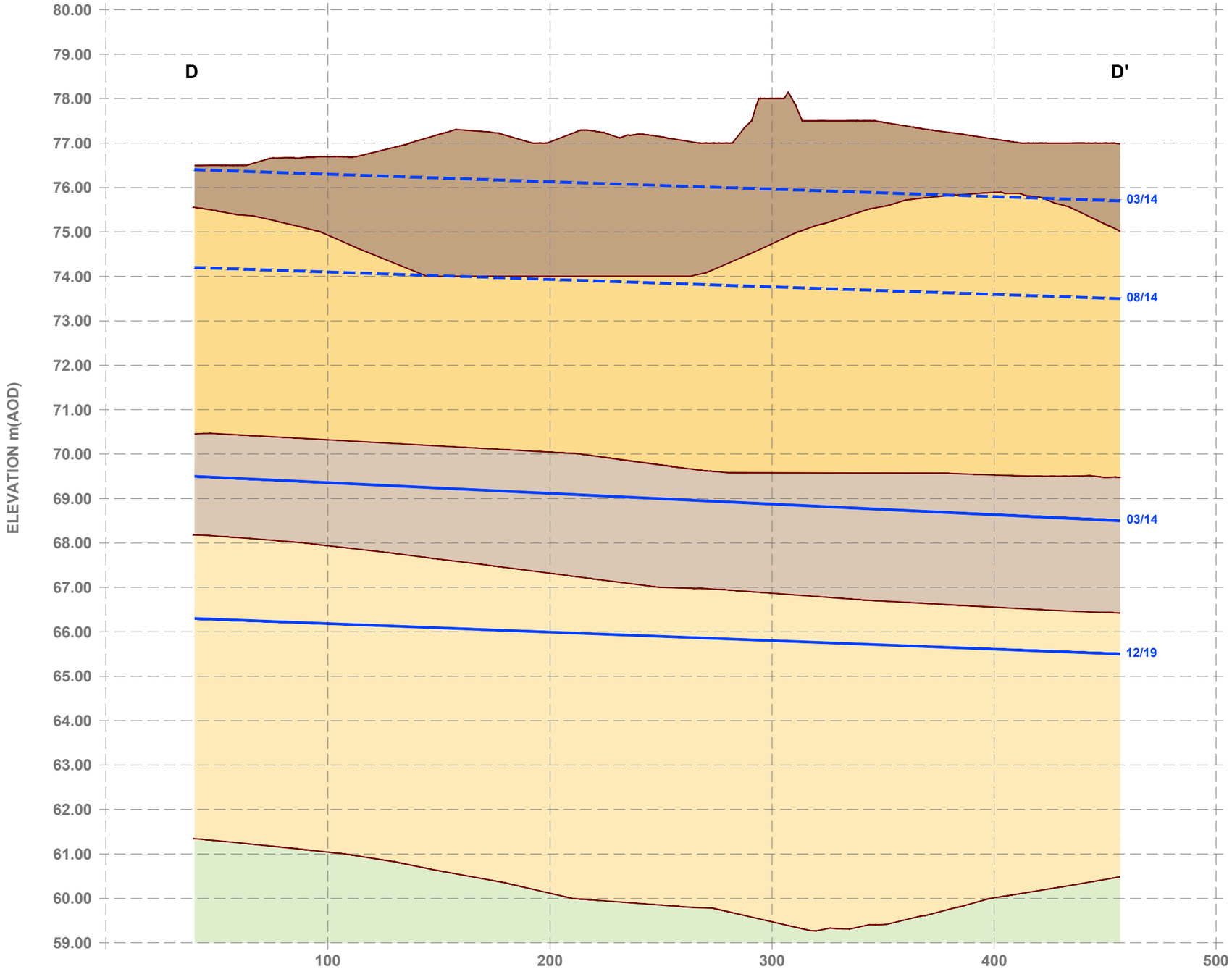
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PHASE D
SECTION D - D'



VERTICAL SCALE 1:100, HORIZONTAL SCALE 1:2000

LEGEND

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- OVERBURDEN
- UM HORIZON
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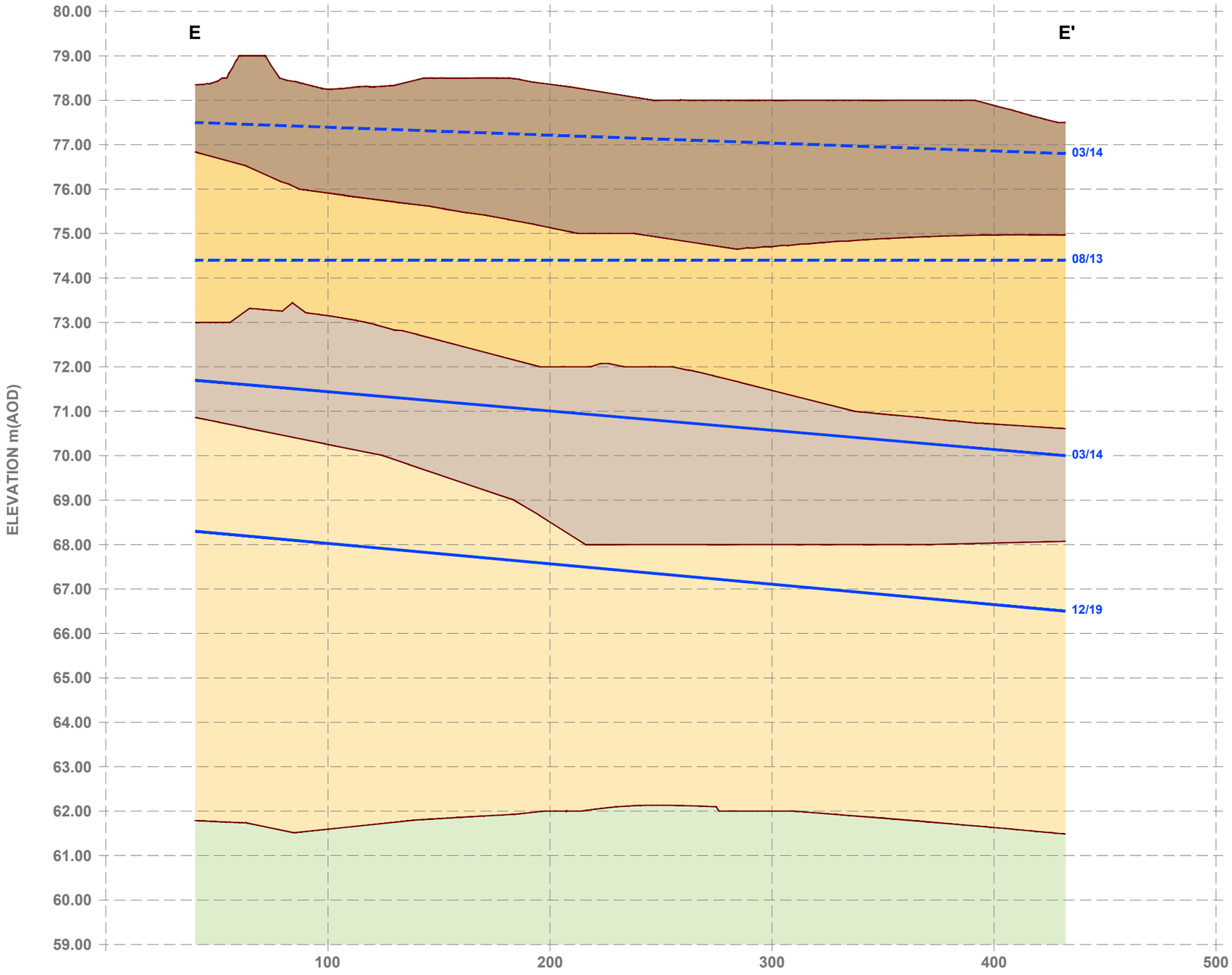
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PHASE E
SECTION E - E'



VERTICAL SCALE 1:100, HORIZONTAL SCALE 1:2000

LEGEND

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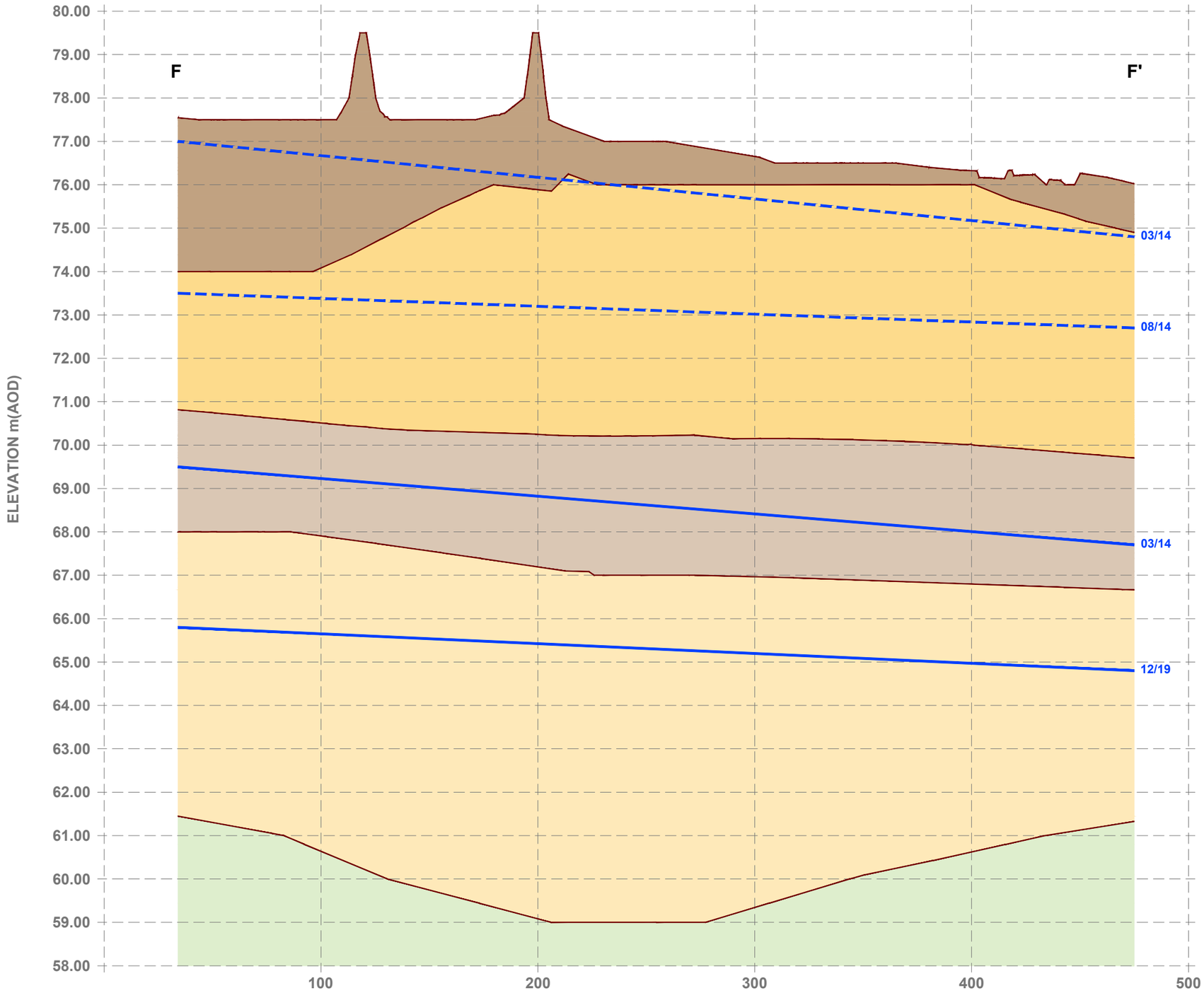
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PHASE F
SECTION F - F'



VERTICAL SCALE 1:100, HORIZONTAL SCALE 1:2000

LEGEND

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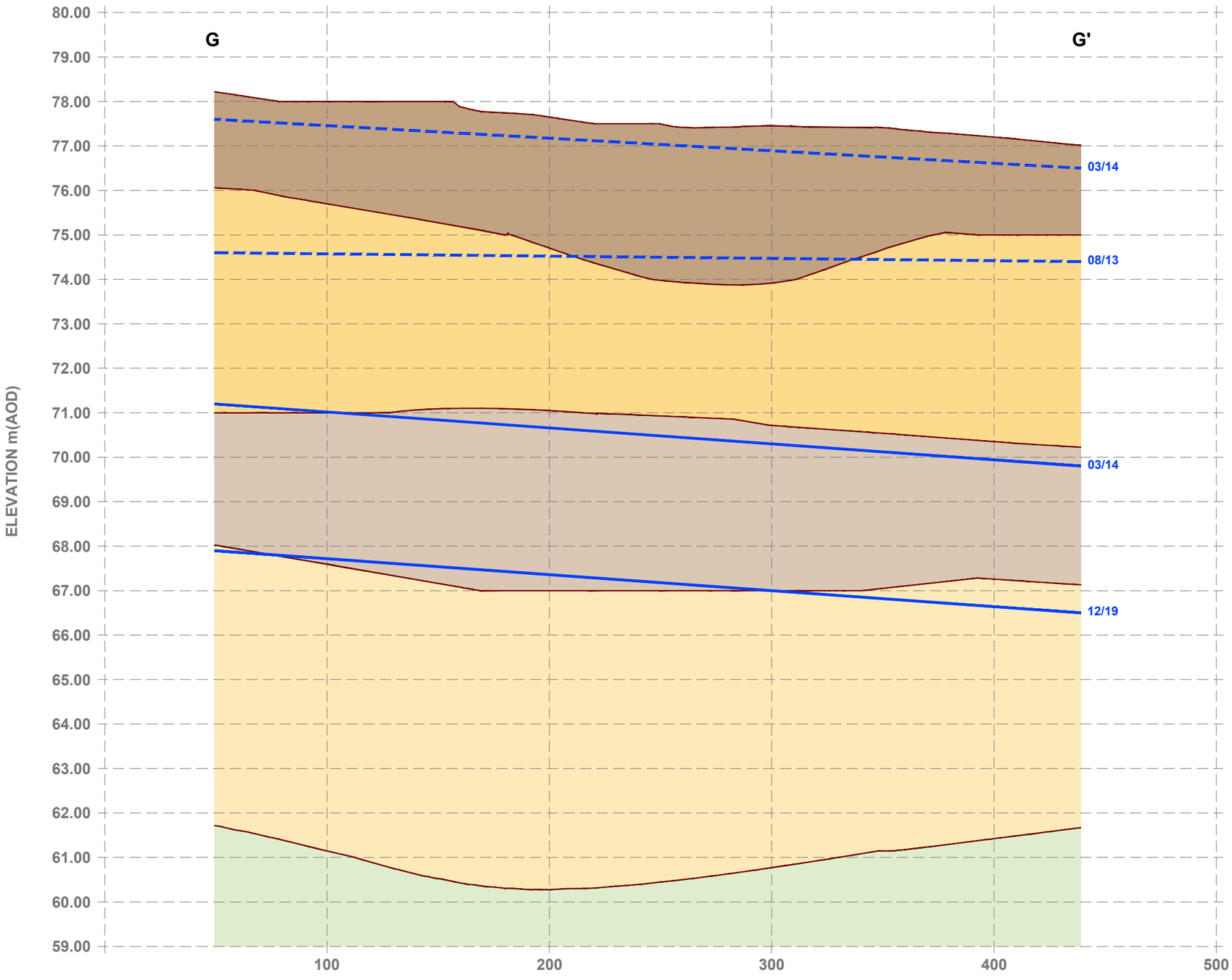
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PHASE G
SECTION G - G'



VERTICAL SCALE 1:100, HORIZONTAL SCALE 1:2000

LEGEND

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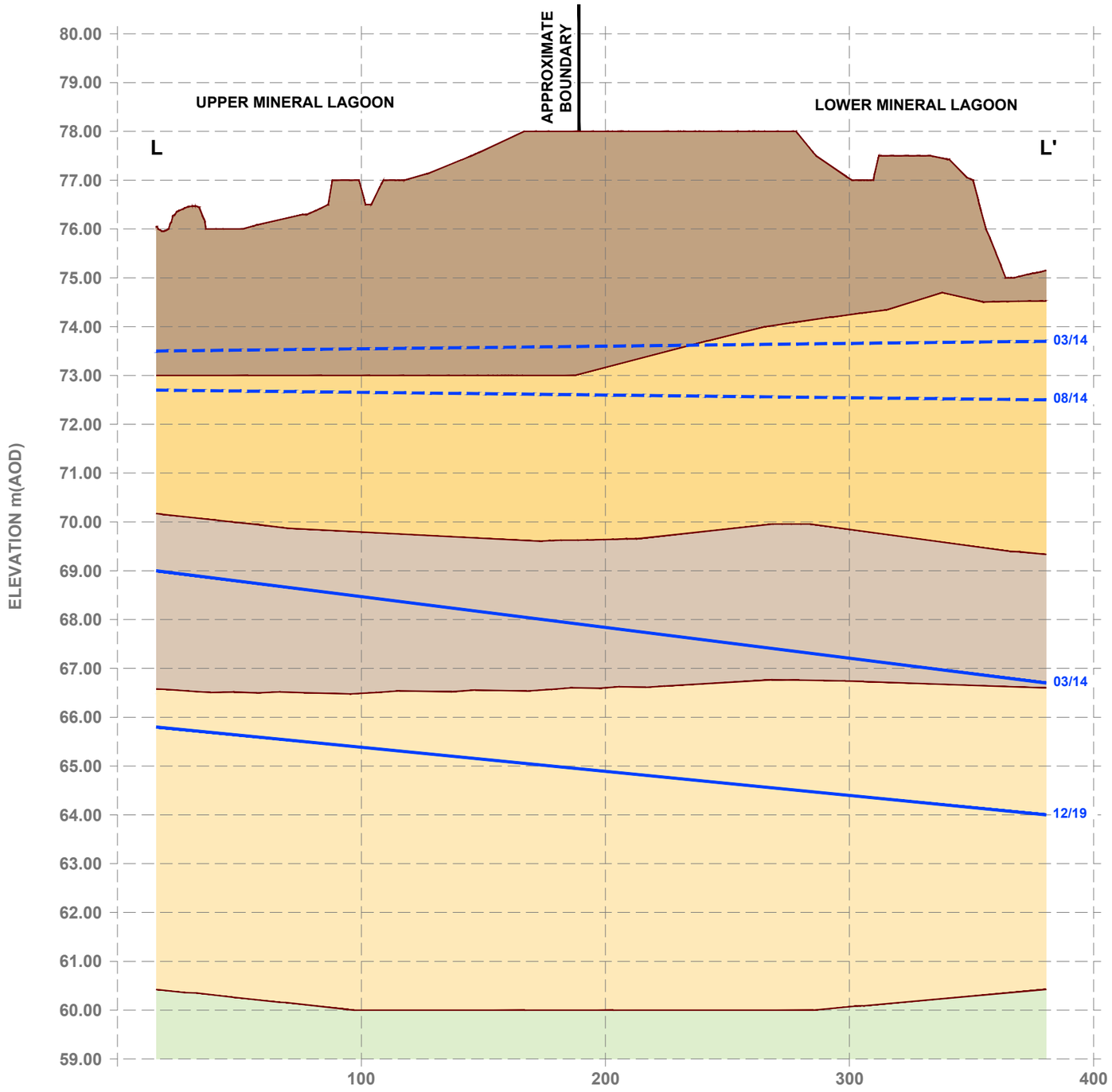
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MINERAL LAGOONS
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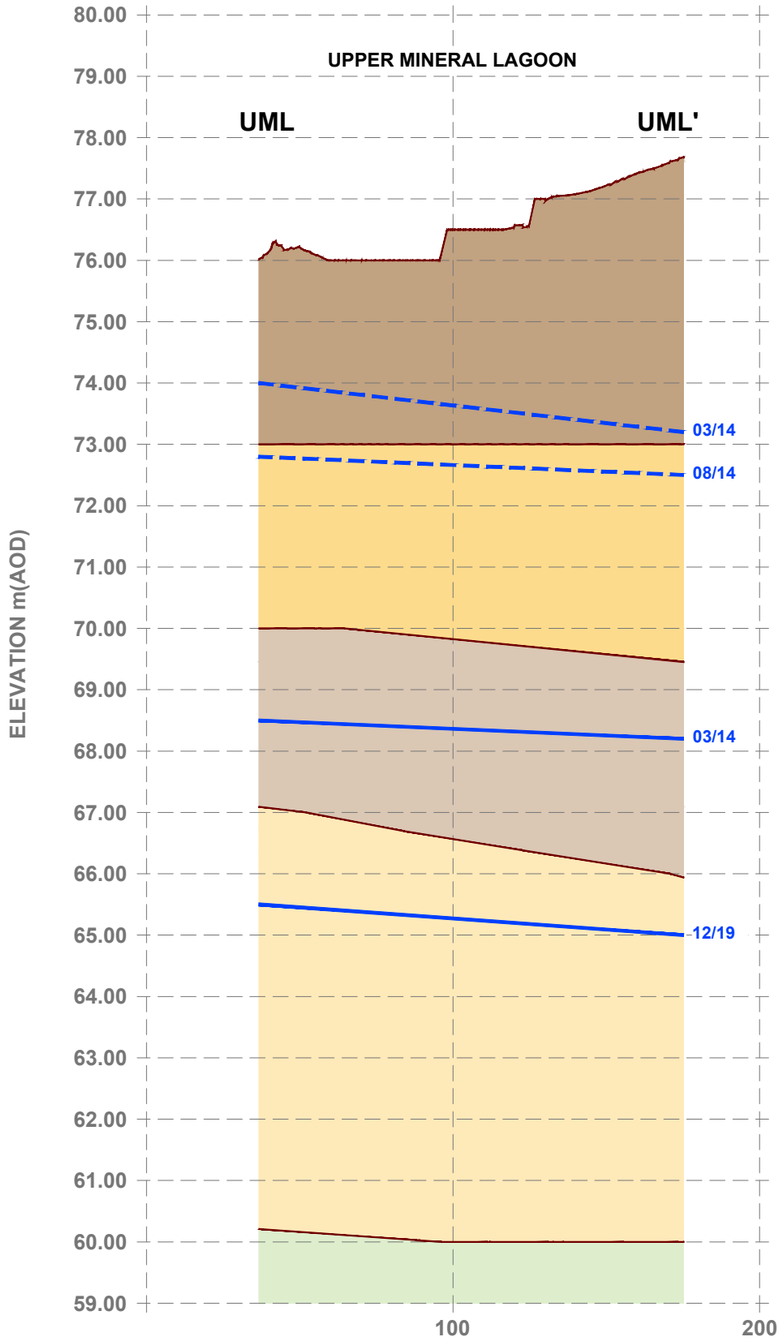
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UPPER MINERAL LAGOONS
SECTION UML - UML'



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LEGEND

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- OVERBURDEN
- UM HORIZON
- INTERBURDEN
- LM HORIZON
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SECTION UML - UML'

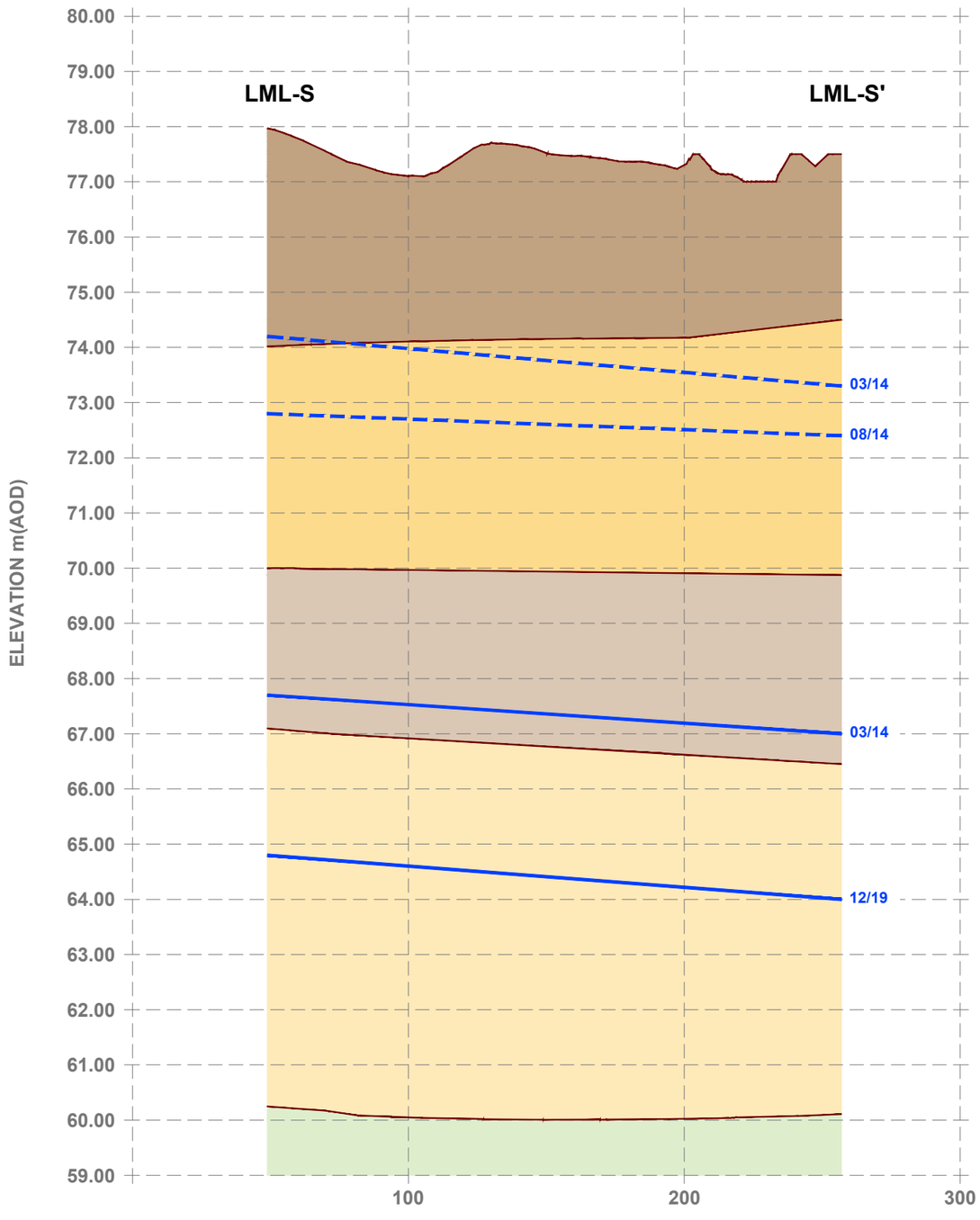
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Scale	Date
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LOWER MINERAL LAGOON
SECTION LML - LML'



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LEGEND

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- OVERBURDEN
- UM HORIZON
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HATFIELD AERODROME

ENVIRONMENTAL STATEMENT

SECTION LML - LML'

DRAWING K

Scale	Date
SEE DRAWING (A3)	AUGUST 2021

09885.00024.19.DWG-A-K.1_PHASING PLAN&SECTIONS.dwg

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<table>
<tr><th>Objective</th><th>Task</th><th>Description</th><th>Water Management Control Process</th><th>Water Volume</th></tr>
<tr><td>Isolate UMH aquifer within each 4 Year Operational Phase (Phase A through G).</td><td>1(a)</td><td>Excavate overburden and UMH around the perimeter of the mineral excavation phase down to a depth equal to the water saturated mineral. The depth will vary by season and phase.</td><td>None required</td><td></td></tr>
<tr><td rowspan="4">Install UMH Perimeter Bund Wall.</td><td>1(b)</td><td>Install well points and/or sumps along the perimeter of the worked phase, to selectively dewater the UMH along the phase perimeter. Excavate UMH down to the upper surface of the Interburden in suitable section lengths (10m wide x 50m length) to allow for installation of the perimeter bund and back drain.</td><td>The discharge is sensitive to hydraulic conductivity (k), aquifer thickness (b) and Ro which has been determined from borehole data and the results of a pumping test completed in 2018. Aquifer thickness (b) varies by c.25-30% by season.
Water being discharged will be used for washing mineral in the processing area of the site with excess discharged to the UMA and/or LMA infiltration lagoon.</td><td>Unconfined[1]
m³/day
Ro=300, K = 19m/d
190m³/d
Range 55 to 350m³/d</td></tr>
<tr><td>1(c)</td><td>Install UMH phase perimeter clay bund with a back drain, keying the bund into the interburden surface. Bund crest elevations will be as detailed below, which are above the highest UMH groundwater levels (AOD) recorded on the site (March 2014):</td><td>The back drain will control the maximum groundwater head outside of the Phase bund. Drain invert elevations (AOD, listed below) will vary for each Phase, but the intention is to manage the groundwater head at 1m below the maximum recorded water level for that Phase.</td><td></td></tr>
<tr><td colspan="3">
<table>
<tr><th>Phase</th><th>Bund Crest (AOD)</th><th>Bund Length (m)[2]</th><th>Phase</th><th>Lowest Interburden Elevation (mAOD)</th><th>Groundwater Level in UMH (mAOD)[3]</th><th>Aquifer Thickness</th><th>Back Drain IL (mAOD)</th><th colspan="3">Back Drain Flow (m³/day and L/sec)[4]</th></tr>
<tr><td>A</td><td>76m</td><td>770</td><td>A</td><td>68.5</td><td>75.5 – 74.0</td><td>7</td><td>74m</td><td>A</td><td>360</td><td>4.2</td></tr>
<tr><td>B</td><td>76m</td><td>760</td><td>B</td><td>70</td><td>75.5 – 74.0</td><td>5.5</td><td>74.5</td><td>B</td><td>190</td><td>2.2</td></tr>
<tr><td>C</td><td>77m (west), 76m (east)</td><td>780</td><td>C</td><td>71</td><td>76.8 – 74.5</td><td>5.8</td><td>76m</td><td>C</td><td>170</td><td>2.0</td></tr>
<tr><td>D</td><td>77m (west), 76m (east)</td><td>570</td><td>D</td><td>69</td><td>76.7 – 75.5</td><td>7.7</td><td>76m</td><td>D</td><td>140</td><td>1.6</td></tr>
<tr><td>E</td><td>78m (west), 77m (east)</td><td>900</td><td>E</td><td>71</td><td>77.6 – 77.0</td><td>6.6</td><td>76.5m</td><td>E</td><td>300</td><td>3.5</td></tr>
<tr><td>F</td><td>78m (west), 77m (east)</td><td>560</td><td>F</td><td>69</td><td>77.0 – 76.0</td><td>8</td><td>76.5m</td><td>F</td><td>110</td><td>1.3</td></tr>
<tr><td>G</td><td>78m</td><td>620</td><td>G</td><td>70</td><td>77.5 – 76.0</td><td>7.5</td><td>76.5m</td><td>G</td><td>210</td><td>2.4</td></tr>
<tr><td>UML</td><td>76m</td><td>-</td><td>UML</td><td>69.5</td><td>73.9 – 71.6</td><td>2.1 – 4.4</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>1(d)</td><td>Repeat Tasks 1(a-c) for the remaining perimeter sections of each phase until a continuous clay bund has been constructed around the perimeter of the site.

This scenario corresponds with the final reinstated site condition (see DWG HA-PCC-C55-REST). The outer perimeter of Phase E is 625m and Phase G is 650m before the perimeter drains discharge into the site.</td><td>The perimeter back drains will control UMH groundwater levels during the site restoration stage to a maximum elevation of 76.5mAOD. The reinstatement back drain will be constructed in 2 halves with flow around the north and the south sides of the site to where ground levels will fall below 76.5mAOD. This approximates to the outside lateral perimeter of Phase E and G.

It should be recognised that for the period of monitoring UMH groundwater only exceeded 76.5mAOD during the months of January to mid-March in 2014, 2020 and 2021 following an extremely wet winter period. Water levels did not reach this elevation in 2015, 16, 17, 18, 19 which means that the E and G back drains would not have captured groundwater during this period.</td><td>Back Drain Flow (m³/day and L/sec)[5]
E 205 2.4
G 220 2.5
E+G 425 4.9</td></tr>
</table>

[1] Calculated using Tab12. Well Points (UC) in 'Assessing the impacts of dewatering on water resources', Tier 1 Analytical Tools, Version 1.6; Environment Agency.
[2] Length excludes the shared internal bund if it is to be removed (See Task 6)
[3] Seasonal high-water level (March 2014, 2020, 2021)
[4] Calculations are based upon highest recorded groundwater level using March 2014, 2020, 2021 data (worse case). For significant period of the year there will be very little to no flow from the back drain. Calculated using Tab 8 .' Partial penetration by a single row of well points in an unconfined aquifer from a single line source', Tier 1 Analytical Tools, Version 1.6; Environment Agency.
[5]As footnote 5 above.

<table>
<tr><th>Objective</th><th>Task</th><th>Description</th><th>Water Management Control Process</th><th colspan="4">Water Volume</th></tr>
<tr><td rowspan="2">Excavate Overburden and UMH for storage, blending and processing.</td><td>2</td><td>Overburden and UMH within the bunded area of each phase will be excavated down to the Interburden surface in areas equivalent to an annual operating period</td><td>Reduce and maintain groundwater levels in the UMH inside the Phase using ditches, and sump pumps to control water levels.

Maintenance pumping will also be required to capture and discharge flow generated by precipitation.

Each Phase will be dewatered at a sustainable rate equal to recharge plus the volume held in storage. Discharge rates will be managed according to the available recharge lagoon infiltration capacity, supplemented by recharge into the LMH aquifer within the confines of each phase as its worked.</td><td>Phase</td><td>Water in Storage (m^3/day)</td><td>Precipitation Recharge (m^3/day)</td><td>Combined Discharge Requirement (m^3/day)</td></tr>
<tr><td colspan="2"></td><td colspan="2"></td><td>A
B
C
D
E
F
G</td><td>51
53
45
50
63
63
69</td><td>73
83
66
91
82
82
79</td><td>125
136
111
141
145
146
147</td></tr>
<tr><td rowspan="3">Recharge into UMH aquifer</td><td>3a
Approach 1
1 Thiem Equation</td><td rowspan="2">Water generated by the following tasks will be discharged to the UMH recharge lagoon:
• Task 1 (b) Dewatering UMH during placement of perimeter bunds
• Task 1 (c) Back drain discharge once UMH perimeter bunds are in place
• Task 2 Maintenance water management (storage in UMH and precipitation) during all excavations</td><td>Lagoon recharge capacity is controlled by the physical properties of the aquifer, and seasonally due to changes in the water level at the time of discharge. A range of potential recharge values have been calculated using the Theim equation and the following assumptions:
T = 80m2/d (from pumping test data)
r1 is the radial distance to the edge of the lagoon
r2 = Ro, i.e., 300m acting as a locally confined aquifer by the overburden
Head difference in the lagoon is 2.1m (winter conditions)
Head difference in the lagoon is 2.7m (summer conditions)</td><td colspan="4">UM Lagoon
600 - 1,400m^3/d</td></tr>
<tr><td>3a
Approach 2
16 Driscoll</td><td>Saturated thickness at time of discharge 2.1m (Lowest groundwater level)
Saturated thickness at time of discharge 4.4m (Highest groundwater level)</td><td colspan="4">1,375m^3/d
725m^3/d</td></tr>
<tr><td>3a
Approach 3
Pumping Test Discharge Data</td><td>A pumping test was carried out in June 2018 in the UMA.
• Water was discharged into a lagoon located near the proposed UML
• GL was c.76.6mAOD, Lagoon base was at 72mAOD, Groundwater level prior to the test was c. 72mAOD.
• The lagoon base and sidewalls had developed a soil structure and was heavily vegetated so is not representative of an engineered lagoon. Physical infiltration parameters therefore may be higher than recorded.
• An infiltration rate of 1.27 to 3.38x10^{-6} $m^3/m^2/s$ was calculated from the test results</td><td>Lagoon infiltration capacity:
UML Area = 24,361m2. A 10m perimeter reduction is assumed to account for side batter
1) 1.27x10^{-6} x Lagoon Area (18,250) x 86,400 = 2,000m^3/d
2) 3.38x10^{-6} x Lagoon Area (18,250) x 86,400 = 5,300m^3/d

A 40% reduction in infiltration capacity has been applied to compensate for higher seasonal groundwater level, which was not the case during the test period.</td><td colspan="4">UM Lagoon (low groundwater)
2,000 to 5,000m^3/d

UM Lagoon (high groundwater)
(40% Reduction)
1,200 – 3,000m^3/d</td></tr>
</table>

Objective	Task	Description	Water Management Control Process	Water Volume
Recharge into LMH aquifer	3b Approach 1 1 Thiem Equation	As per 3a. The LMH Lagoon is an additional, secondary water discharge route during the sites operational period. It would be utilised if demand requires subject to prior stakeholder agreement as outlined in the Groundwater and Water Management Plan.	Assumptions for the LMH lagoon are based upon the following criteria: • The LMH is expected to have a greater hydraulic conductivity than the UMH (c. 30m/d) • A transmissivity of 180m2/d in the LMH (6m x 30m/d) • There is a minimum of 6.5m head difference between LMA groundwater elevation and the maximum fill level in the lagoon • The lagoon area is 37,957m2 (without buffer), 24,387m2 (with 18m buffer)	LM Lagoon 6,000m^3/d
	3b Approach 2 16 Driscoll	Assumed base of aquifer is the underlying top of the chalk	Saturated thickness at time of discharge 4m (Lowest groundwater level) Saturated thickness at time of discharge 7m (Highest groundwater level)	9,500m^3/d 6,700m^3/d
	3b Approach 3 Pumping test discharge data to UM	Conservative assumptions for the LMH lagoon are based upon the following criteria: • Infiltration rates no better than the UMA • The lagoon area is 37,957m2 (without buffer), 24,387m2 (with 18m internal perimeter buffer)	Calculation 1.27x10-6 m3/m2/s x 24,387m2 (with 18m buffer) x 86,400 3.38x10^{-6} $m^3/m^2/s$ x 24,387m2 (with 18m buffer) x 86,400	LM Lagoon 2,700 to 7,100m^3/d
Final Restoration	4	Perimeter bund drainage (as per 1(d) above)	The perimeter drain for Phase E and G will remain in place during the restoration stage and discharge into the interior of the restored site within shallow swales and hedgerow boundary ditches that will eventually discharge into the combined UMH recharge lagoon. Following a period of water level review, the perimeter drains around Phase A, B, C (part of), D and F will be removed.	425m^3/d
Combined Lagoons	5	Create a pathway for surface water (comprising a) Rainfall runoff b) Groundwater fed runoff (Phase E and G) All to be recharged into UM Lagoon (N) and (S) (combined as a single UMH lagoon).	The LMH lagoon will be reinstated to the upper surface of the interburden. The bund between the UMH and LMH lagoon will be removed so forming a single UMH lagoon. a) RW runoff for the reinstated site will be at the greenfield rate. b) The Phase E & G drain will be set at 76.5mAOD and is designed to capture rising groundwater, if any c) Combined lagoon recharge capacity	The combined flow to the infiltration lagoon will comprise: a) RW runoff — 36 – 41,000m^3 b) E & G back drain runoff — 425m^3/day
				Combined lagoon recharge capacity
			Theim Solution	T = 80m2/d 1,300 – 1,800m^3/day
			Driscoll Solution	1,500 to 2,000m^3/d
			The combined lagoon will have a storage capacity equal to its area X the available rise in water head from the static water level up to the spill point at 75.5mAOD The static water level recorded at the lagoon area ranges seasonally from 72.8m to 74mAOD so a rise in available head of 2.7m to 1.5m.	93,000m^3 to167,000m^3

Assumptions and Example Calculations

Task 1b Install well points to dewater UMH along the alignment of the perimeter bund for each phase.

Water volumes have been estimated using the analytical tool 'Assessing the impacts of dewatering on water resources', Tier 1 Analytical Tools, Version 1.6; Environment Agency, specifically Tab 12 solution, Well Points (UC).

An example of the output is provided in the spreadsheet image to the side (Phase A). Significant assumptions are:

- Aquifer thickness is a maximum for each phase (minimum IB elevation minus high groundwater level)
- Hydraulic conductivity (K) = 19m/d (Range 15 to 30m/d)
- Ro = 300m (Range 250 to 350)
- Drawdown requirements vary according to average aquifer thickness in each phase. 7.7m is the maximum
- Length of trench= 50m along which dewatering is undertaken

12) Partial penetration by a double row of wellpoints of an unconfined aquifer midway between two equidistant and parallel line sources

$$Q=\left[\left(0.73+0.27\frac{(H-h_w)}{H}\right)\frac{Kx}{R_0}(H^2-h_w^2)\right]$$

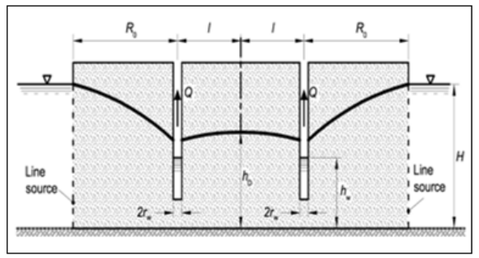
Essential input
Optional input
Calculated

			expected		min	max	
Head							
Height of water table at radius of influence	H	7.7	m		4.5	7.7	m
Height of water table at well	h_w	0.1	m		0.1	0.1	m
Conductivity							
Hydraulic conductivity of aquifer	K	19	m/d		19	30	m/d
Length of trench	x	50	m		50	50	m
Distance to line source, equal to radius of influence	R_0	300	m		250	350	m
Total discharge from wellpoints	Q	187.06	m^3/d		54.61	354.43	m^3/d

Height of WT at centre of dewatered area

$$h_D = h\left[\frac{C_1C_2}{R_0}(H-h)+1\right]$$

Distance to centre of dewatered area	l	5 m
	l/h	50
Coefficient 1	C_1	1.01
Radius of each well	r_w	0.1 m
	r_w/H	0.01299
Coefficient 2	C_2	1.26
Height of WT at centre of dewatered area	h_D	0.10 m



(Figures adapted from Mansur & Kaufman, 1962)

The following assumptions apply to this equation
- the slot is infinite in length
- R_0/H greater than or equal to 3
- the aquifer is unconfined
- the aquifer is homogeneous, isotropic and of uniform thickness
- the Dupuit Forcheimer assumption is valid
- the aquifer has reached steady state conditions
- the initial water table is horizontal

(Mansur & Kaufman, 1962)

Task 1c Calculation of Back Drain Flow for each Phase

Water volumes have been estimated using the analytical tool 'Assessing the impacts of dewatering on water resources', Tier 1 Analytical Tools, Version 1.6: Environment Agency, specifically Tab 8 Trench with Flow One Side (UC). The example is Phase G.

Significant assumptions are:

- Aquifer thickness is a maximum for each phase.
- Drawdown is between 0.5m and 1.5m and varies for each phase.
- Hydraulic conductivity (K) = 19m/d (Range 15 to 30m/d)
- Ro = 300m but ranges 250 to 350
- The length of the active perimeter for each phase is different and varies between 560m and 900m in length along which a flow is generated. The example below is for Phase G.

8) Partial penetration by a single row of wellpoints of an unconfined aquifer fed from a single line source

$$Q=\left[\left(0.73+0.27\frac{(H-h_w)}{H}\right)\frac{Kx}{2R_0}(H^2-h_w^2)\right]$$

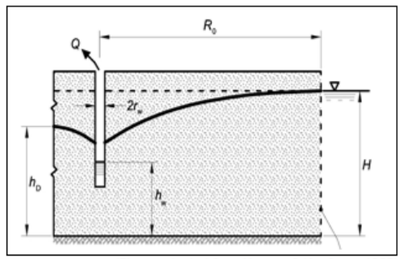
Essential input
Optional input
Calculated

			expected		min	max	
Head							
Height of water table at radius of influence	H	7.5	m			7	m
Height of water table at well	h_w	6.5	m			5.5	m
Conductivity							
Hydraulic conductivity of aquifer	K	19	m/d		15	30	m/d
Radius							
Length of trench	x	620	m				
Radius of influence	R_0	300	m		250	350	m
Is R_0/H greater than or equal to 3 ?		Yes			Yes	Yes	
Total discharge from wellpoints	Q	210.55	m^3/d		67.19	775.69	m^3/d

Height of WT downstream of slot

$$h_D = h_w\left[\frac{1.48}{R_0}(H-h_w)+1\right]$$

Height of WT downstream of slot	h_D	6.53207 m



(Figure adapted from Mansur & Kaufman, 1962)

The following assumptions apply to this equation
- the slot is infinite in length
- R_0/H greater than or equal to 3
- the aquifer is unconfined
- the aquifer is homogeneous, isotropic and of uniform thickness
- the Dupuit Forcheimer assumption is valid
- the aquifer has reached steady state conditions
- the initial water table is horizontal

(Mansur & Kaufman, 1962)

Task 1d Final Restoration Phase – Back Drain Flow (Solution 8 - Partial penetration by a single row of well points in an unconfined aquifer fed by a single line source)

It is proposed that an active back drain will remain upon completion of all mineral excavation works. The intention is to maintain a maximum UMH groundwater head below that recorded on site during the maximum water level recorded on site in March 2014.

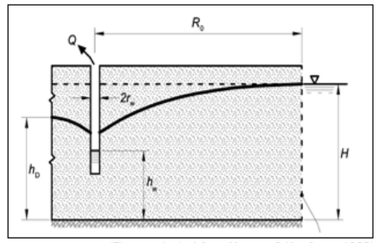
The invert elevation of the back drain will be set at 67.5mAOD and will surround the perimeter to a point where ground surface levels are also at 67.5mAOD. At this location, the drain will 'daylight' at the surface and a flow will discharge to the interior of the restored site. Flow will occur approximately between January and March although whether a flow occurs will be dictated by groundwater levels in the aquifer which are controlled by aquifer recharge events. Flow has been calculated using the same formula illustrated in Task 1c as shown below for the location of the back drain around Phase E and G.

8) Partial penetration by a single row of wellpoints of an unconfined aquifer fed from a single line source

$$Q=\left[\left(0.73+0.27\frac{(H-h_w)}{H}\right)\frac{Kx}{2R_0}(H^2-h_w^2)\right]$$

Essential input
Optional input
Calculated

			expected		min	max	
Head							
Height of water table at radius of influence	H	6.6	m			7	m
Height of water table at well	h_w	5.5	m			5.5	m
Conductivity							
Hydraulic conductivity of aquifer	K	19	m/d		15	30	m/d
Radius							
Length of trench	x	625	m				
Radius of influence	R_0	300	m		250	350	m
Is R_0/H greater than or equal to 3 ?		Yes			Yes	Yes	
Total discharge from wellpoints	Q	204.16	m^3/d		138.15	553.96	m^3/d



(Figure adapted from Mansur & Kaufman, 1962)

The following assumptions apply to this equation
- the slot is infinite in length
- R_0/H greater than or equal to 3
- the aquifer is unconfined
- the aquifer is homogeneous, isotropic and of uniform thickness
- the Dupuit Forcheimer assumption is valid
- the aquifer has reached steady state conditions
- the initial water table is horizontal

(Mansur & Kaufman, 1962)

Height of WT downstream of slot

$$h_D=h_w\left[\frac{1.48}{R_0}(H-h_w)+1\right]$$

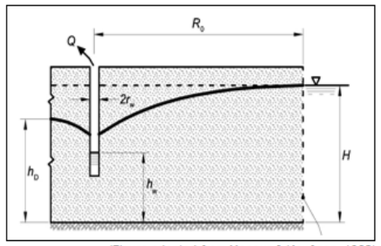
Height of WT downstream of slot h_D 5.52985 m

8) Partial penetration by a single row of wellpoints of an unconfined aquifer fed from a single line source

$$Q=\left[\left(0.73+0.27\frac{(H-h_w)}{H}\right)\frac{Kx}{2R_0}(H^2-h_w^2)\right]$$

Essential input
Optional input
Calculated

			expected		min	max	
Head							
Height of water table at radius of influence	H	7.5	m			7	m
Height of water table at well	h_w	6.5	m			5.5	m
Conductivity							
Hydraulic conductivity of aquifer	K	19	m/d		15	30	m/d
Radius							
Length of trench	x	650	m				
Radius of influence	R_0	300	m		250	350	m
Is R_0/H greater than or equal to 3 ?		Yes			Yes	Yes	
Total discharge from wellpoints	Q	220.74	m^3/d		70.45	813.23	m^3/d



(Figure adapted from Mansur & Kaufman, 1962)

The following assumptions apply to this equation
- the slot is infinite in length
- R_0/H greater than or equal to 3
- the aquifer is unconfined
- the aquifer is homogeneous, isotropic and of uniform thickness
- the Dupuit Forcheimer assumption is valid
- the aquifer has reached steady state conditions
- the initial water table is horizontal

(Mansur & Kaufman, 1962)

Height of WT downstream of slot

$$h_D=h_w\left[\frac{1.48}{R_0}(H-h_w)+1\right]$$

Height of WT downstream of slot h_D 6.53207 m

Task 2 Operational discharge estimates to dewater the UMH once the perimeter drain is installed plus an estimate of rainfall recharge.

Once the perimeter bund of each phase is constructed there will be a requirement to dewater the UMH within the phase. Each phase is approximately 4 years of operation so the total volume of water to be removed prior to mineral excavation will be the volume of water held in storage at the time of perimeter bund completion plus recharge. Precipitation (PPT) is 662mm/yr and an assumed recharge is equal to 65% of PPTs:

Phase Area		Groundwater in Storage					Recharge		Combined Flow to Discharge per day (Storage + Recharge) (m^3)
Phase	Area (m^2)	Saturated Thickness (m)	Porosity	Water Volume in Storage (m^3)	Annual Water Volume in Storage (m^3)	Daily Water Volume (m^3)	Ave Annual PPT (m^3)	Ave Daily PPT	
A	62274	6	0.2	74729	18682	51	26797	73	125
B	70505	5.5	0.2	77556	19389	53	30338	83	136
C	56335	5.8	0.2	65349	16337	45	24241	66	111
D	77532	4.7	0.2	72880	18220	50	33362	91	141
E	69380	6.6	0.2	91582	22895	63	29854	82	145
F	69239	6.8	0.2	94165	23541	64	29794	82	146
G	66805	7.5	0.2	100208	25052	69	28746	79	147

Task 3a Recharge into UMH Lagoon (Approach 1 – Thiem Equation)

The Thiem equation has been used to calculate recharge for the UMH lagoon. The assumptions used in this calculation include:

- Transmissivity of the aquifer is K (hydraulic conductivity) x b (thickness) where b is taken as the mineral thickness (3.5m) excluding overburden
- Hydraulic conductivity (K) = 19m/d (Range 15m/d to 30m/d)
- Ro = 300m but ranges 250 to 350
- Area of the LMH lagoon is 24,361m^2. A 10m side wall batter results in a lagoon base area of 18,249m^2
- Available +ve head change in the lagoon will be set by the bund height (elevation of 76mAOD) and spill point elevation (75.5mAOD) – this is equal to a 6m saturated aquifer
- Lowest groundwater elevation results in a saturated thickness of 2.1m
- Highest groundwater elevation results in a saturated thickness of 4.4m

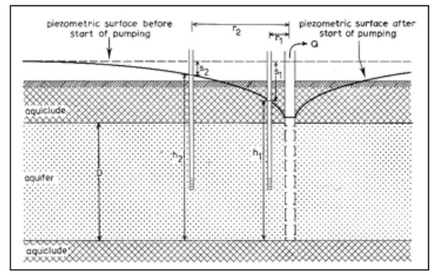
1) Thiem (Steady state confined)

$$Q = 2\pi T \frac{(s_1 - s_2)}{2.3\log(\frac{r_2}{r_1})} = 2\pi T \frac{(H - h_w)}{2.3\log(\frac{R_0}{r_w})}$$

Essential input
Optional input
Calculated

Steady state flow to a well in a confined aquifer

		expected		min	max	
Drawdown at observation well 1	s_1	6	m			m
Distance to observation well 1	r_1	76	m			
Drawdown at observation well 2	s_2	2.1	m	0.1	1	m
Distance of observation well 2	r_2	300	m			
Transmissivity of aquifer	T	80	m^2/d	250.00	350.00	m^2/d
Total discharge from well	Q	1429.34	m^3/d	1429.34	9460.23	m^3/d



(Figure taken from Kruseman & de Ridder, 1994)

To find the drawdown at a given radius

Discharge	Q	1429.34	m^3/d
Radius of interest	r_2	300	m
Drawdown at radius r_2	s_2	2.1	m

$$s_2 = s_1 - \frac{2.3Q\log(r_2/r_1)}{2\pi T}$$

To find the radius of a specific drawdown

Discharge	Q	1429.34	m^3/d
Required drawdown	s_2	0	m
Radius of required drawdown	r_2	628.4	m

$$r_2 = r_1 10^{\wedge}\left[\frac{2\pi T(s_1 - s_2)}{2.3Q}\right]$$

The following assumptions apply to this equation
- the aquifer is confined
- the aquifer has infinite areal extent
- the aquifer is homogeneous, isotropic and of uniform thickness
- flat initial water table
- the aquifer is pumped at a constant discharge rate
- the pumping well is fully penetrating, therefore flow is horizontal
- the flow to the well is in a steady state

(from Kruseman & de Ridder, 1994)

Task 3a Recharge in UMH Lagoon (Approach 2 – 16 Recharge Driscoll)

The assumptions used in this calculation include:

- Base of aquifer is the base of the UMH (c. 69.5mAOD)
- Lagoon Fill Point elevation is 75.5mAOD, equivalent to 6m of saturated thickness
- Pre-injection saturated thickness ranges between 2.1 (seasonal low) and 4.4m (seasonal high)
- Hydraulic conductivity (K) = 19m/d
- Ro = 300m but ranges between 250 to 350
- Area of the UMH lagoon is 18,249m2 equivalent to a circle with the radius of 76m and incorporates a 10m sidewall slope

16) Driscoll

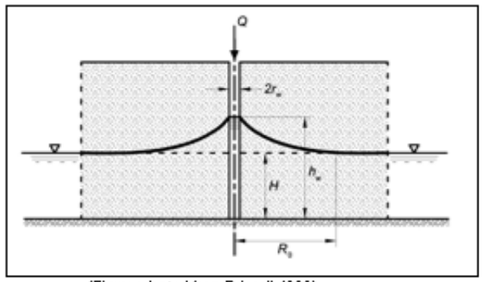
$$Q = \frac{K(h^2 - H^2)}{0.733\log(R_0/r)}$$

Essential input
Optional input
Calculated

Injection well recharge rate to an unconfined aquifer

(Injection so $h_1 > h_2$)

		expected		min	max	
Height of water table at radius r	h	6	m			m
Distance from centre of well at r	r	76	m			
Height of water table at radius of influe	H	2.1	m			m
Radius of influence	R_0	300	m			
Hydraulic conductivity of aquifer	K	19	m/d	250	350	m/d
Total recharge rate from featur	Q	1373.2	m^3/d	1373.2	######	m^3/d



(Figure adapted from Driscoll, 1986)

To find h at radius r

Radius r	r	2	m
Recharge rate from feature	Q	140.8	m^3/d
Height of water table at radius r	h	4.0	m

The following assumptions apply to this equation
- the aquifer is unconfined
- the aquifer has infinite areal extent
- the aquifer is homogeneous, and of uniform thickness
- the initial water table is flat
- the aquifer is injected at a constant recharge rate
- the aquifer recieves no recharge from any source
- laminar flow exists throughout the aquifer

Data sources (to complete an audit trail)

Height of water table at radius r	h	
Distance from centre of well at r	r	
Height of water table at radius of influe	H	
Radius of influence	R_0	
Hydraulic conductivity of aquifer	K	

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Task 3b Recharge in LMH Lagoon (Approach 1 – Thiem Equation)

The Thiem equation has been used to calculate recharge for the LMH lagoon. The assumptions used in this calculation include:

- Transmissivity of the aquifer is 180m2/d based on a K (hydraulic conductivity) of 30m/d, and b (aquifer thickness) of 6m based on the LMH thickness
- The aquifer is confined (more conservative)
- Hydraulic conductivity (K) = 30m/d (high end of the UMH)
- Ro = 300m but ranges between 250 to 350
- Area of the LMH lagoon is 24,387m^2, equivalent to a circle with the radius of 88m and incorporates an 18m low permeability sidewall slope
- Minimum available +ve head in the lagoon is 5m based on a lagoon fill level of 72mAOD and the highest natural groundwater elevation at the lagoon of 67mAOD
- The infiltration capacity will be greater when the LMH aquifer is seasonally lower

1) Thiem (Steady state confined)

$$Q = 2\pi T \frac{(s_1 - s_2)}{2.3\log(\frac{r_2}{r_1})} = 2\pi T \frac{(H - h_w)}{2.3\log(\frac{R_0}{r_w})}$$

Essential input
Optional input
Calculated

Steady state flow to a well in a confined aquifer

		expected		min	max	
Drawdown at observation well 1	s_1	5	m			m
Distance to observation well 1	r_1	88	m			
Drawdown at observation well 2	s_2	0	m	0.1	1	m
Distance of observation well 2	r_2	300	m			
Transmissivity of aquifer	T	180	m^2/d	250.00	350.00	m^2/d
Total discharge from well	Q	4615.96	m^3/d	3692.77	8975.48	m^3/d

To find the drawdown at a given radius

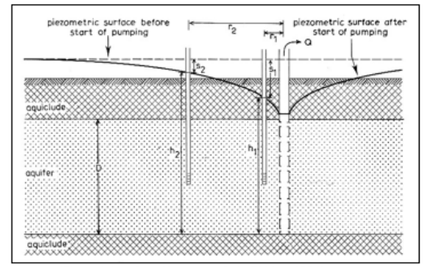
Discharge	Q	4615.96	m^3/d
Radius of interest	r_2	300	m
Drawdown at radius r_2	s_2	0.0	m

$$s_2 = s_1 - \frac{2.3Q\log(r_2/r_1)}{2\pi T}$$

To find the radius of a specific drawdown

Discharge	Q	4615.96	m^3/d
Required drawdown	s_2	0	m
Radius of required drawdown	r_2	300.0	m

$$r_2 = r_1 10^{\wedge}\left[\frac{2\pi T(s_1 - s_2)}{2.3Q}\right]$$



(Figure taken from Kruseman & de Ridder, 1994)

The following assumptions apply to this equation
- the aquifer is confined
- the aquifer has infinite areal extent
- the aquifer is homogeneous, isotropic and of uniform thickness
- flat initial water table
- the aquifer is pumped at a constant discharge rate
- the pumping well is fully penetrating, therefore flow is horizontal
- the flow to the well is in a steady state

(from Kruseman & de Ridder, 1994)

Task 3b Recharge in LMH Lagoon (Approach 2 – 16 Recharge Driscoll)

The assumptions used in this calculation include:

- Base of aquifer is the base of the LMH (c. 60mAOD)
- Lagoon Fill Point elevation is 72mAOD (beneath lowest UMA water level)
- Saturated thickness during infiltration = 72-60 = 12m
- Groundwater elevation ranges between 64.5 and 67.5mAOD
- Saturated thickness is therefore 4.5m to 7.5m (i.e., 64.5-60.0) prior to infiltration
- Hydraulic conductivity (K) = 30m/d
- Ro = 300m but ranges between 250 to 350
- Area of the LMH lagoon is 24,837m2, equivalent to a circle with the radius of 88m and incorporates an 18m sidewall slope

16) Driscoll

$$Q = \frac{K(h^2 - H^2)}{0.733\log(R_0/r)}$$

Essential input
Optional input
Calculated

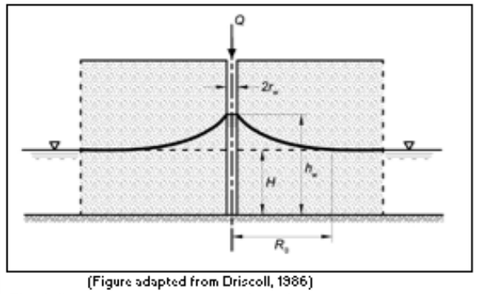
Injection well recharge rate to an unconfined aquifer

(Injection so $h_1 > h_2$)

		expected		min	max	
Height of water table at radius r	h	12	m			m
Distance from centre of well at r	r	88	m			
Height of water table at radius of influe	H	4.5	m			m
Radius of influence	R_0	300	m			
Hydraulic conductivity of aquifer	K	30	m/d	250	350	m/d
Total recharge rate from featur	Q	9508.9	m^3/d	9508.9	#######	m^3/d

To find h at radius r

Radius r	r	2	m
Recharge rate from feature	Q	140.8	m^3/d
Height of water table at radius r	h	5.3	m



(Figure adapted from Driscoll, 1986)

The following assumptions apply to this equation
- the aquifer is unconfined
- the aquifer has infinite areal extent
- the aquifer is homogeneous, and of uniform thickness
- the initial water table is flat
- the aquifer is injected at a constant recharge rate
- the aquifer recieves no recharge from any source
- laminar flow exists throughout the aquifer

Data sources (to complete an audit trail)

Height of water table at radius r	h	
Distance from centre of well at r	r	
Height of water table at radius of influe	H	
Radius of influence	R_0	
Hydraulic conductivity of aquifer	K	

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Task 5 Restoration Phase – Combined Lagoon Discharge Capacity (Approach 1 – Theim)

The Thiem equation has been used to calculate recharge for the combined UMH and LMH lagoon areas. The assumptions used in this calculation include:

- Transmissivity of 80m2/d from pumping test
- Area of the LMH lagoon is 61,955m^2 (24,361+37,594) equivalent to a circle with the radius of 140m
- Available +ve head change in the lagoon will be set by the bund height (elevation of 76mAOD) and spill point elevation (75.5mAOD) which will range between +2m and +2.7m above the static water level
- Ro = 300m (Range 250 to 350)

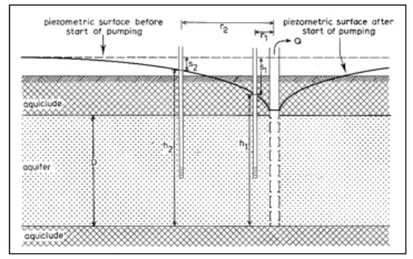
1) Thiem (Steady state confined)

$$Q = 2\pi T \frac{(s_1 - s_2)}{2.3\log(\frac{r_2}{r_1})} = 2\pi T \frac{(H - h_w)}{2.3\log(\frac{R_0}{r_w})}$$

Essential input
Optional input
Calculated

Steady state flow to a well in a confined aquifer

		expected		min	max	
Drawdown at observation well 1	s_1	2.7	m			m
Distance to observation well 1	r_1	140	m			
Drawdown at observation well 2	s_2	0	m	0.2	0.8	m
Distance of observation well 2	r_2	300	m			
Transmissivity of aquifer	T	80	m^2/d			m^2/d
Total discharge from well	Q	1782.73	m^3/d	1254.52	1782.73	m^3/d



(Figure taken from Kruseman & de Ridder, 1994)

To find the drawdown at a given radius

Discharge	Q	1782.73	m^3/d
Radius of interest	r_2	300	m
Drawdown at radius r_2	s_2	0.0	m

$$s_2 = s_1 - \frac{2.3Q\log(r_2/r_1)}{2\pi T}$$

To find the radius of a specific drawdown

Discharge	Q	1782.73	m^3/d
Required drawdown	s_2	1	m
Radius of required drawdown	r_2	226.2	m

$$r_2 = r_1 10^{\wedge}\left[\frac{2\pi T(s_1 - s_2)}{2.3Q}\right]$$

The following assumptions apply to this equation
- the aquifer is confined
- the aquifer has infinite areal extent
- the aquifer is homogeneous, isotropic and of uniform thickness
- flat initial water table
- the aquifer is pumped at a constant discharge rate
- the pumping well is fully penetrating, therefore flow is horizontal
- the flow to the well is in a steady state

(from Kruseman & de Ridder, 1994)

Task 5 Restoration Phase – Combined Lagoon Discharge Capacity (Approach 2 – 16 Recharge - Driscoll)

The assumptions used in this calculation include:

- k (hydraulic conductivity) is 19m/day
- Area of the LMH lagoon is 61,955m^2 (24,361+37,594) equivalent to a circle with the radius of 140m
- Ro = 300m (Range 250 to 350)
- Available +ve head change in the lagoon will be set by the bund height (elevation of 76mAOD) and spill point elevation (75.5mAOD) which will range between +2m and +2.7m above the static water level
- Groundwater head in the lagoon to the spill point is 6m

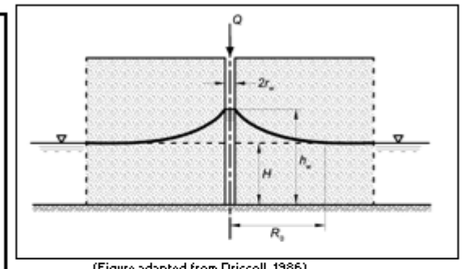
16) Driscoll

$$Q = \frac{K(h^2 - H^2)}{0.733\log(R_0/r)}$$

Essential input
Optional input
Calculated

(Injection so $h_1 > h_2$)

		expected		min	max	
Height of water table at radius r	h	6	m			m
Distance from centre of well at r	r	140	m			
Height of water table at radius of influe	H	3.3	m			m
Radius of influence	R_0	300	m			
Hydraulic conductivity of aquifer	K	19	m/d	250	350	m/d
Total recharge rate from featur	Q	1966.4	m^3/d	1966.4	######	m^3/d



(Figure adapted from Driscoll, 1986)

To find h at radius r

Radius r	r	2	m
Recharge rate from feature	Q	140.8	m^3/d
Height of water table at radius r	h	4.8	m

The following assumptions apply to this equation
- the aquifer is unconfined
- the aquifer has infinite areal extent
- the aquifer is homogeneous, and of uniform thickness
- the initial water table is flat
- the aquifer is injected at a constant recharge rate
- the aquifer recieves no recharge from any source
- laminar flow exists throughout the aquifer

Data sources (to complete an audit trail)

Height of water table at radius r	h	
Distance from centre of well at r	r	
Height of water table at radius of influe	H	
Radius of influence	R_0	
Hydraulic conductivity of aquifer	K	

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APPENDIX 04

Illustrative Restoration Concept

PLANT SITE AND STOCKING AREA TO BE RESTORED TO ACID GRASSLAND AND MOSAIC USING RESIDUAL MINERAL LEFT OVER AT END OF SITE CLEARANCE, WITH RIDGE AND FURROW, MICRO-TOPOGRAPHICAL VARIATION AND MANAGED AS TRANQUIL AREA FOR NATURE CONSERVATION.

TWO EXISTING GREAT CRESTED NEWT PONDS ON MARGIN OF SITE RETAINED

SEMI-NATURAL SPECIES, RICH GRASSLAND TO INCLUDE RIDGE AND FURROW, MICROTOPOGRAPHICAL AND SUBSTRATE VARIATION TO MAXIMISE OVERALL POTENTIAL HABITAT VALUE AND INTEREST

FRESHWATER AND SILT LAGOONS RETAINED AS PERMANENT WATERBODIES AS PART OF RESTORATION

THE TWO RECHARGE LAGOONS TO BE RETAINED AS PERMANENT WATERBODIES, BUT PARTIALLY BACKFILLED TO TOP OF INTERBURDEN USING SITE DERIVED AND IMPORTED MATERIAL

PILLBOX RETAINED

OVERFLOW/OUTFALL FROM RESTORED WATERBODY AS DITCH/PIPE AT 75.5m AOD TO DRAIN TO DIVERTED NAST CULVERT

INVERT OF EXISTING NAST CULVERT ALONG THE SIDE OF THE ROAD AT 71.78m AOD.

SW7A & SW7B
(71.788) (71.896)

PARTS OF PERIMETER SOIL BUND TO BE RETAINED AS A LOW BERM AROUND THE SITE FOR RECREATIONAL ACCESS AND VIEWS

CAR PARKING AND SITE OFFICES TO BE RETAINED FOR RECREATIONAL USE

ACCESS ROAD RETAINED

N

LEGEND

- SITE BOUNDARY
- PROPOSED CONTOURS (2m INTERVALS)
- PROPOSED NAST DIVERSION (PERFORATED PIPE)
- PROPOSED NAST DIVERSION (SOLID PIPE)
- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- PUBLIC RIGHT OF WAY
- BRIDLEWAY TO BE DEDICATED
- PERMISSIVE RIGHT OF WAY
- MINERAL EXTRACTION AREA
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- RETAINED BOREHOLES
- RETAINED ACCESS ROAD
- POTENTIAL INDICATIVE LOCATION OF BACK DRAIN
- PROPOSED OPEN DITCH/SWALE
- ADVANCE HEDGEROW AND TREE PLANTING
- EXISTING TREES AND SHRUBS
- PROPOSED HEDGROW
- PROPOSED SCRUB
- PROPOSED MARGINAL VEGETATION/REEDBED
- WATER BODY / PONDS
- UNIMPROVED NEUTRAL-ACIDIC GRASSLAND
- CALCAREOUS GRASSLAND
- PROPOSED RIDGE AND FURROW

0 80m 200
Metres 1:2500

built on relationships

SLR global environmental solutions
ASPECT HOUSE
ASPECT BUSINESS PARK
BENNERLEY ROAD
NOTTINGHAM NG6 8WR
T: 01159 647280
F: 01159 751576
www.slrconsulting.com

HATFIELD AERODROME

DISCHARGE OF CONDITIONS

RESTORATION PLAN

HA - PCC - C55 - REST

Scale 1:2,500 @ A1

Date MAY 2018

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APPENDIX 05

QHEST Management System

1.0 QHEST MANAGEMENT SYSTEM

1.1 Management System

The activities to be carried out at Hatfield Road Quarry will be managed and operated in accordance with the Brett Integrated Management System (IMS) known as QHEST (Quality, Health, Environment, Safety, Sustainably Together) which combines the requirements for quality, occupational health, environment and safety into one comprehensive set of procedures.

The management system is certified to the following standards:

BS EN ISO14001:2015, Environmental management systems
BS EN ISO9001:2015, Quality management systems
BS ISO 45001:2018, Occupational health and safety management systems
BES 6001 Issue 3.1, Responsible Sourcing of Construction Products
QSRMC Quality and Product Conformity Regulations 2017

The management systems will therefore ensure that:

the risks that the activities pose to the environment are identified
the measures that are required to minimise the risks are identified
the activities are managed in accordance with the management system
performance against the management system is audited at regular intervals

The QHEST management system comprises:

- Brett Group Safety, Health and Environment Policy
- Brett Group Quality Policy
- Brett Group Ethical Policy
- Brett Group Energy, Water, Waste and Resource Management Policy
- Brett Group Employee Training and Competency Policy
- Brett Group Community Liaison, Consultation and Complaints Policy
- Brett Group Sustainability and Responsible Sourcing Policy
- Brett Group Transport Policy

Introduction to the QHEST system
Brett Group Procedures
Brett Aggregates Procedures
QHEST Guidance Notes

The QHEST IMS is subject to continual review in response to significant changes to the activities, accidents or non-compliance. A copy of the QHEST IMS will be available for inspection on site.

1.1.1 Management Structure and Responsibilities

Structure, responsibilities and resources will be in accordance with the following QHEST procedure:

BG2.1 Structure, Responsibilities and Resources

1.1.2 Technical Competence and Training

The site will be managed by sufficient staff that are competent to operate the site without causing pollution.

Operations at the site will be under the control of a technically competent person who has received relevant training and has appropriate experience.

Training will be undertaken in accordance with the following QHEST procedures and forms:

BG2.2 Training, Awareness and Competence
Form BG2.2a Training Evaluation Form
Form BG2.2b Training Request Form
Form BG2.2e Training Attendance Form

1.1.3 Managing Documentation and Records

Controls will be in place to ensure that all documents are issued, revised and maintained in a consistent fashion in accordance with the following QHEST procedure and forms:

BG2.4 Document Control
Form BG2.4a Site Specific Procedures List
Form BG2.4b Site Specific Controlled Documents List

Records will be maintained in accordance with the following QHEST procedure and related forms:

BG2.5 Records and Records Management
Form BG2.5a QHEST forms
Form BG2.5b Site Specific Forms List

1.1.4 Reporting Non-Compliance and Taking Corrective Action

Procedures will ensure appropriate corrective action is taken in response to problems identified at the site. The procedures will ensure that non-conformances are reported, investigated and rectified, and that failures and weaknesses are prevented.

A number of QHEST procedures will be in place to implement the necessary action including:

BG4.1 Monitoring and Inspection
BG6.2 Non-Conformance, Corrective and Preventative Action
Form BG6.2a Corrective Action Report

BA1 WI01 Geotechnical Assessment, Appraisal and Inspection
Form BA1i Site Inspection Checklist including Lagoons and Restored Areas

1.1.5 Auditing and Legal Compliance

There will be a formalised internal auditing procedure to ensure the facility is audited at defined intervals and that the progress of corrective and preventative action is monitored in accordance with the following QHEST procedures and forms:

BG6.1 QHEST Audit Procedure
Form BG6.1a QHEST Audit Report and Checklist
Form BG6.1b Audit Checklist
Form BG6.1e Audit Checklist for Oil Storage Tanks
BG6.4 Procedure for Submitting Completed Audit Actions

1.1.6 Monitoring, Measuring and Reviewing Environmental Performance

A formalised management structure will review environmental performance, and ensure any necessary actions are taken in accordance with:

BG4.1 Monitoring and Inspection
BG4.6 Measuring Up
BG6.3 Management Review

1.1.7 Operational Control, Preventative Maintenance and Calibration

The QHEST IMS will ensure effective control of operations, the use of approved suppliers and contract services, the maintenance of operational equipment and the calibration of monitoring equipment.

All plant and equipment will be subject to a programme of Planned Preventative Maintenance (PPM) which will follow the inspection and maintenance schedule recommended by the manufacturer.

Relevant procedures and forms include:

BG1.9 Control of Purchasing
BG3.1 Permit to Work and Permission to Proceed
BG3.46 Control of Contractors
Form BG3.46a Contractors Inspection Form
BG3.46 WI01 Checking/Searching for Brett or Avetta Approved Contractors
BG3.46 WI02 Adding New Contractors to Avetta Approved Scheme
BG3.46 WI03 Authorisation of Non Avetta Approved Contractors
BG4.2 Plant and Equipment Maintenance
BG4.3 Instrument and Equipment Calibration

1.2 Accident Management Plan

Brett recognises the importance of the prevention of accidents that may have environmental consequences and that it is crucial to limit those consequences. As part of the QHEST IMS Brett has developed a system to identify, assess and minimise the environmental risks and hazards of accidents and their consequences in accordance with:

BG1.3 QHEST Risk Assessment
BG1.4 Hazardous Substances Risk Assessment (COSHH)
BG5.1 Emergency Preparedness and Response
BG5.2 Reporting and Investigation of Accident, Incident and Complaint
Form BG5.2a Group Incident Report Form
BG5.3 Near Miss Reporting

The following environmental hazards have been identified:

fire
loss of containment - spillage and leakage
security and vandalism
flooding

Actions that will be taken to minimise specific risks are detailed below.

1.2.1 Fire

As part of the QHEST IMS a number of procedures have been developed to prevent and minimise the potential impact of fire.

BG1.3 QHEST Risk Assessment
BG1.15 Fire and Explosion Management
BG3.1 Permit to Work and Permission to Proceed
BG3.19 Inspection, Testing and Maintenance of Electrical Equipment
BG4.2 Plant and Equipment Maintenance

Form BA1i Site Inspection Checklist including Lagoons and Restored Areas
Form BG1.15a Fire Safety Risk Assessment Proforma

GN8 Guidelines for Hot Work
GN21 Guidelines for Working with Electricity and Electrical Equipment

1.2.2 Loss of Containment - Spillage and Leakage

Loss of containment could lead to spillage and leakage of potentially contaminating liquids. To prevent loss of containment and minimise the risk and impact of releases a number of QHEST IMS Procedures have been developed as follows:

BG3.3 Control of Fuel and Gas Oil Deliveries
BG3.4 Fuel and Oil Storage
BG3.5 Refuelling of Plant/Vehicles on Site
BG4.2 Plant and Equipment Maintenance

GN29 Guidelines for Oil Storage

1.2.3 Security and Vandalism

To maintain security at the site the following QHEST procedures will be followed:

BG1.13 Design Security into Buildings and Plant
BG3.34 Brett Site Security

BG3.46 WI01 Checking/Searching for Brett preferred or Avetta Approved Contractor
BG3.46 WI02 Adding New Contractors to Avetta Approved Scheme
BG3.46 WI03 Authorisation of Non Avetta Approved Contractors

BA1 Design and Operation of a Quarry
Form BA1i Inspection Checklist including Lagoons and Restored Areas

GN42 Guidelines for Employees Encountering Unauthorised Individuals on Site
GN43 Guidelines for Vacant Property Security
GN44 Guidelines for CCTV Selection and Management

APPENDIX 06

Borehole Logs and Monitoring Well Construction Details

BOREHOLE LOG

BOREHOLE No. **BH101S**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	13/08/13	75.74maOD	E520037.814 N207951.650

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							75.34		0.40	Grass onto: Firm orange-brown sandy CLAY.	
1.10-1.50	B1						74.44		(0.90) 1.30	Orange brown silty very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint.	
							73.94		(0.50) 1.80	Stiff black grey orange mottled gravelly CLAY. Gravel is fine to medium angular flint.	
3.10-3.50	B2						71.44		(2.50) 4.30	Orange brown slightly silty very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint.	
							69.44		(2.00) 6.30	Yellow brown slightly gravelly fine to coarse SAND. Gravel is medium to coarse subrounded flint.	
							69.04		6.70	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
										Borehole complete at 6.70m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm to 6.7m. 3) 50mm well installed, screened from 2.1-6.1m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 200	Logged By: DH	Approved By: PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH101D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	12/08/13	75.75maOD	E520040.513 N207950.805

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							75.35		0.40	Grass onto: Firm orange-brown sandy CLAY.	
0.60-0.90	B1						74.45	(0.90)	1.30	Orange brown sandy fine to coarse GRAVEL. Gravel is fine to coarse rounded to subangular flint.	
							73.95	(0.50)	1.80	Stiff black grey orange mottled gravelly CLAY. Gravel is fine to medium angular flint.	
1.90-2.20	B2									Orange brown sandy fine to coarse sandy GRAVEL. Gravel is fine to coarse rounded to subangular flint.	
							71.25	(2.70)	4.50	3.90 ...becoming very sandy...	
3.90-4.20	B3						71.05		4.70	Yellow brown slightly gravelly fine to coarse SAND. Gravel is medium to coarse subrounded flint.	
										Yellow brown silty medium to coarse SAND.	
5.90-6.20	B4						69.15	(1.90)	6.60		
7.00-7.50	U100						66.45	(2.70)	9.30	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
9.50-10.00	B5							(1.00)		Orange brown slightly sandy GRAVEL. Gravel is fine to coarse rounded to subrounded flint.	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 8.9m, 200mm casing to 19m, bentonite seal from 7.9-8.9m. 3) Two 50mm wells installed, screen from 10.0-14.3m and 16.0-19.0m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH101D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	12/08/13	75.75maOD	E520040.513 N207950.805

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							65.45		10.30		
							65.25		10.50	Firm brown sandy CLAY.	
11										Orange brown slightly sandy GRAVEL. Gravel is fine to coarse angular to rounded flint.	
11.90-12.40	B6									11.90 ...very sandy..	
12									(4.00)		
13											
13.90-14.40	B7										
14							61.25		14.50		
15										White grey CHALK. (recovered as very soft gravelly chalk silt. Gravel is angular flint, chert and chalk)	
16											
17									(4.50)		
18											
19							56.75		19.00		
										Borehole complete at 19.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 8.9m, 200mm casing to 19m, bentonite seal from 7.9-8.9m. 3) Two 50mm wells installed, screen from 10.0-14.3m and 16.0-19.0m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH102S**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	23/08/13	77.94maOD	E519624.815 N207951.093

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							77.64		0.30	Grass onto: Firm orange brown sandy CLAY.	
							76.24		(1.40) 1.70	Firm orange brown sandy CLAY.	
							75.94		2.00	Soft orange brown gravelly CLAY. Gravel is rounded fine to coarse flint and quartz.	
4.00-4.40	B1						72.74		(3.20) 5.20	Soft orange brown very sandy gravelly CLAY. Gravel is fine to medium with occasional coarse, rounded to subrounded flint and quartz.	
6.00-6.40	B2						71.24		(1.50) 6.70	Orange brown very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint, chert and quartz.	
							70.94		7.00	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
										Borehole complete at 7.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm casing to 7M. 3) 50mm well installed, screened from 2.5-6.5m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 200	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH102D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	22/08/13	77.99maOD	E519623.953 N207952.320

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							77.69		0.30	Grass onto: Firm orange-brown sandy CLAY.	
							76.29		(1.40) 1.70	Firm orange brown sandy CLAY.	
							75.99		2.00	Soft orange brown gravelly CLAY. Gravel is fine to coarse rounded flint and quartz.	
3.00-3.40	B1								(3.20)	Soft orange brown very sandy gravelly CLAY. Gravel is fine to medium with occasional coarse rounded to subrounded flint and quartz.	
5.00-5.40	B2						72.79		5.20		
							71.29		(1.50) 6.70	Orange brown silty very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint / chert and quartz.	
									(3.90)	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.2m.
2) Bored 250mm casing to 7.5m, 200mm casing to 18m, bentonite seal from 6.5-7.5m.
3) Two 50mm wells installed, screened from 11.4-13.4m & 15.0-18.0m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	DH	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH102D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	22/08/13	77.99maOD	E519623.953 N207952.320

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							67.39		10.60	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk. *(continued)*	
							66.99		11.00	Stiff Orange brown slightly sandy CLAY.	
12.00-12.40	B3								(3.10)	Orange brown very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint / chert and quartz.	
							63.89		14.10		
							59.99		18.00	White grey CHALK. (recovered as very soft gravelly chalk silt. Gravel is angular, fine to coarse flint / chert and chalk).	
										Borehole complete at 18.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 7.5m, 200mm casing to 18m, bentonite seal from 6.5-7.5m. 3) Two 50mm wells installed, screened from 11.4-13.4m & 15.0-18.0m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH103S**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	06/08/13	77.23maOD	E519564.713 N208526.769

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							77.13		0.10	Grass onto: Brown gravelly medium to coarse SAND. Gravel is fine to medium, rarely coarse, rounded to very rounded flint.	
							76.43		(0.70) 0.80	Soft brown gravelly CLAY. Gravel is fine to medium angular slightly tabular flint.	
1							75.83		(0.60) 1.40	Soft brown gravelly slightly sandy CLAY. Gravel is fine to medium angular slightly tabular flint and subangular chert and chalk.	
2 2.00-2.00	B1						74.33		(1.50) 2.90	Brown gravelly coarse SAND with rare clay. Gravel is fine to coarse angular to rounded flint and chert	
3							73.83		(0.50) 3.40	Soft brown slightly gravelly CLAY. Gravel is fine to medium subrounded to subangular chert.	
3.40-3.85	U100						72.53		(1.30) 4.70	Firm grey slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded chert and rare chalk.	
4							71.23		(1.30) 6.00	No recovery.	
5							69.73		(1.50) 7.50	Stiff to very stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded chert and rare chalk.	
6										Borehole complete at 7.50m	
7											
8											
9											

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm casing to 7.5m. 3) 50mm well installed. screened from 3.0-6.0m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: CS	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH103D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	09/08/13	77.27maOD	E519565.451 N208525.664

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							77.17		0.10	Grass onto: Brown gravelly medium to coarse SAND. Gravels are fine to medium, rarely coarse, rounded to very rounded chert.	
							76.47		(0.70) 0.80	Soft brown gravelly CLAY. Gravel is fine to medium angular flint and rare chalk.	
1							75.87		(0.60) 1.40	Soft to firm brown gravelly slightly sandy CLAY. Gravel is fine to medium angular slightly tabular flint and subangular chert and chalk.	
2 2.00-2.00	B1						74.37		(1.50) 2.90	Brown silty very gravelly fine to coarse SAND with rare clay. Gravel is fine to coarse angular to rounded flint and chert. 1.80 ...becoming increasingly gravelly...	
3							73.87		(0.50) 3.40	Soft brown slightly gravelly CLAY. Gravel is fine subrounded to subangular chert.	
4							72.57		(1.30) 4.70	Firm becoming soft grey slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded chert and rare chalk.	
5 5.00-5.00	B2						71.27		(1.30) 6.00	Brown slightly gravelly fine to coarse SAND. Gravel is fine, occasionally medium, angular to subrounded chert.	
6							70.77		(0.50) 6.50	Soft grey slightly gravelly CLAY. Gravel is fine, occasionally medium, subrouded to subangular chert.	
7									(4.20)	Stiff locally very stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded chert and chalk.	
8 8.00-8.45	U100										
9											

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 7.0, 200mm casing to 19.5m, bentonite seal from 6.0-7.0m. 3) Two 50mm wells installed. screened from 16.3-19.5m and 11.0-14.7m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	CS	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH103D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	09/08/13	77.27maOD	E519565.451 N208525.664

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							66.57		10.70	Stiff locally very stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded chert and chalk. *(continued)*	
11							66.27		11.00	Stiff locally very stiff brown slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded chert and chalk	
12.00-12.00	B3						64.27	(2.00)	13.00	Brown and grey slightly sandy GRAVEL. Gravel is fine to coarse angular to rounded mixed lithologies.	
13							63.47	(0.80)	13.80	Brown occasionally grey gravelly coarse SAND. Gravel is fine to medium angular to subrounded quartz and chalk.	
14.00-14.00	B4						61.87	(1.60)	15.40	Brown and grey very sandy GRAVEL. Gravel is fine to coarse angular to rounded chalk and mixed lithologies.	
15							60.47	(1.40)	16.80	White CHALK (recovered as slightly cobbly gravel. Gravel is medium to coarse, occasionally fine, angular to subrounded chalk with occasional black, very angular to angular, medium to coarse flint clasts).	
16.00-16.00	B5						57.77	(2.70)	19.50	White grey CHALK (recovered as slightly silty gravel. Gravel is medium to coarse, occasionally fine, angular to subrounded chalk with rare black angular medium to coarse flint).	
17											
18											
19										Borehole complete at 19.50m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.2m.
2) Bored 250mm casing to 7.0, 200mm casing to 19.5m, bentonite seal from 6.0-7.0m.
3) Two 50mm wells installed. screened from 16.3-19.5m and 11.0-14.7m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	CS	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH104S**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	19/08/13	75.05maOD	E519901.770 N208775.531

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							74.75		0.30	Grass onto: Firm orange-brown sandy CLAY.	
							74.05		(0.70) 1.00	Firm orange brown gravelly CLAY. Gravel is medium to coarse rounded to subrounded flint.	
1.50-1.70	B1						72.75		(1.30) 2.30	Orange brown very sandy GRAVEL. Gravel is medium to coarse rounded to subrounded flint.	
3.50-3.70	B2						71.15		(1.60) 3.90	Yellow brown gravelly fine to coarse SAND. Gravel is medium to coarse round to subrounded flint.	
							70.55		(0.60) 4.50	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
										Borehole complete at 4.50m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm to 4.5m. 3) 50mm well installed, screened from 1.4-3.9m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 200	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH104D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	14/08/13	75.06maOD	E519902.757 N208776.232

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							74.76		0.30	Grass onto: Very stiff slightly sandy CLAY.	
							74.06		(0.70) 1.00	Firm to stiff grey and grey brown gravelly CLAY. Gravel is angular to subangular, medium to coarse flint and rare chert.	
2.00-2.00	B1						72.76		(1.30) 2.30	Brown and grey sandy GRAVEL with rare cobbles. Gravel is fine, occasionally medium, rarely coarse, angular to rounded flint and mixed lithologies. Cobbles are subangular to rounded mixed lithologies.	
							71.16		(1.60) 3.90	Brown occasionally orange-brown gravelly coarse SAND. Gravel are fine to medium angular to rounded mixed lithologies.	
							68.46		(2.70) 6.60	Stiff to very stiff grey slightly gravelly CLAY. Gravel is fine to medium, rarely coarse, subangular to rounded chert and chalk.	
7.00-7.45	U100						67.66		(0.80) 7.40	Stiff to very stiff brown slightly gravelly CLAY. Gravel is fine to medium, rarely coarse, subangular to rounded chert and chalk.	
8.00-8.00	B2									Brown and grey slightly to very sandy GRAVEL. Gravel is fine to coarse angular to rounded mixed lithologies.	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 7.0, 200mm casing to 18.5m, bentonite seal from 6.0-7.0m. 3) Two 50mm wells installed. screened from 14.5-18.5m and 8.5-13.5m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	CS	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH104D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	14/08/13	75.06maOD	E519902.757 N208776.232

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
10.00-10.00	B3									Brown and grey slightly to very sandy GRAVEL. Gravel is fine to coarse angular to rounded mixed lithologies. *(continued)*	
12.00-12.00	B4						58.66		(9.00) 16.40		
							56.46		(2.20) 18.60	White CHALK (recovered as cobbly gravels in a chalk silt matrix. Gravel is rounded to subround chalk and angular flint. Cobbles ae rounded to subrounded chalk)	
										Borehole complete at 18.60m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 7.0, 200mm casing to 18.5m, bentonite seal from 6.0-7.0m. 3) Two 50mm wells installed. screened from 14.5-18.5m and 8.5-13.5m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: CS	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH105S**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	14/08/13	79.87maOD	E520387.082 N209021.113

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							78.87		(1.00) 1.00	MADE GROUND - Very stiff brown slightly gravelly CLAY. Gravel is medium to coarse angular flint and chert.	
							78.77		1.10	MADE GROUND - Red COBBLES. Cobbles are angular brick.	
									(2.50) 3.60	Soft to stiff brown slightly gravelly CLAY. Gravel is medium to coarse angular flint and chert.	
							76.27		(1.10) 4.70	Soft to stiff brown slightly gravelly CLAY. Gravel is medium to coarse subangular chert and chalk.	
4.70-5.00	B1	0					75.17		5.10	Very soft brown to orange brown mottled grey very sandy CLAY.	
6.00-6.00	B2	0					74.77		(5.40)	Brown to orange brown slightly slity/clayey slightly gravelly fine to coarse SAND. Gravel is fine to medium subangular to subrounded flint and chalk.	
8.00-8.00	B3	0									

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm casing to 11m. 3) 50mm well installed. screened from 4.5-10.5m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	CS	PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH105S**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	14/08/13	79.87maOD	E520387.082 N209021.113

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							69.37		10.50	Brown to orange brown slightly slity/clayey slightly gravelly fine to coarse SAND. Gravel is fine to medium subangular to subrounded flint and chalk. *(continued)*	
							68.87		(0.50) 11.00	Firm to stiff grey CLAY.	
										Borehole complete at 11.00m	

11 12 13 14 15 16 17 18 19

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm casing to 11m. 3) 50mm well installed. screened from 4.5-10.5m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: CS	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH105SX**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	20/05/14	80.04maOD	E520385 N209021

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							79.94		0.10	Grass onto TOPSOIL (Brown sandy CLAY containing rootlets occasional coarse flinty gravel).	
									(1.10)	Soft orange brown slightly sandy slightly gravelly CLAY. Gravel is fine with rare coarse chert.	
1							78.84		1.20		
									(1.60)	Soft to firm orange brown and grey mottled slightly gravelly CLAY. Gravel comprises medium subangular flint.	
2							77.24		2.80		
									(1.90)	Stiff to very stiff light brown sandy gravelly CLAY. Gravel is fine chalk and fine to coarse subangular to subrounded flint, quartz and chert.	
3							75.34		4.70		
4							75.24		4.80	Orange to pale yellow slightly clayey fine SAND.	
									(5.70)	Orange to pale yellow brown gravelly fine to medium becoming coarse SAND. Gravel is fine to coarse subangular to rounded flint.	
5											
6											
7											
8											
9											

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) 50mm well installed, screened 4.5-10.5m.

All dimensions in metres Scale 1:62.5	Contractor: SLR Consulting Plant: Dando	Method: Cable Percussion Hole Size: 200mm	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH105SX**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	20/05/14	80.04maOD	E520385 N209021

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							69.54		10.50	Orange to pale yellow brown gravelly fine to medium becoming coarse SAND. Gravel is fine to coarse subangular to rounded flint. *(continued)*	
							68.94		(0.60) 11.10	Firm grey brown slightly sandy CLAY with flecks of chalk and fine to medium flint gravel.	
										Borehole complete at 11.10m	

11 12 13 14 15 16 17 18 19

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) 50mm well installed, screened 4.5-10.5m.

All dimensions in metres Scale 1:62.5	Contractor: SLR Consulting Plant: Dando	Method: Cable Percussion Hole Size: 200mm	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH105D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	13/08/13	79.86maOD	E520386.899 N209022.845

Project: **HATFIELD AERODROME**

Sheet: 1 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							78.86		(1.00) 1.00	MADE GROUND - Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is medium to coarse angular flint and subangular chert.	
							78.85		1.01	MADE GROUND - Black plastic membrane.	
							78.66		1.20	MADE GROUND - Red COBBLES. Cobbles are angular brick.	
									(2.40)	Soft to stiff brown slightly gravelly CLAY. Gravel is medium to coarse angular flint and chert.	
							76.26		3.60		
							75.16		(1.10) 4.70	Soft to stiff brown slightly gravelly CLAY. Gravel is medium to coarse subangular chert.	
4.70-5.00	B1						74.76		5.10	Brown to orange brown slightly clayey slightly gravelly coarse SAND. Gravel is fine occasionally medium, subangular to subrounded flint.	
									(5.40)	Brown slightly silty to very silty/clayey gravelly fine to coarse SAND. Gravel is fine to medium angular to subrounded flint and chalk.	
6.50-7.00	B2										
8.50-9.00	B3										

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.2m.
2) Bored 250mm casing to 11.5, 200mm casing to 21m, bentonite seal from 10.5-11.5m.
3) Two 50mm wells installed. screened from 17.7-21.0m and 13.7-16.3m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	CS	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH105D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	13/08/13	79.86maOD	E520386.899 N209022.845

Project: **HATFIELD AERODROME**

Sheet: 2 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							69.36		10.50	Brown slightly silty to very silty/clayey gravelly fine to coarse SAND. Gravel is fine to medium angular to subrounded flint and chalk. *(continued)*	
							68.36		(1.00) 11.50	Stiff grey slightly gravelly CLAY. Gravel is fine to coarse angular to subrounded chalk and rare flint.	
12.00-12.45	U100						66.26		(2.10) 13.60	Stiff brown sandy slightly gravelly CLAY. Gravel is medium to coarse angular flint.	
							65.36		(0.90) 14.50	Brown and grey slightly sandy GRAVEL. Gravel is fine to coarse angular to rounded mixed lithologies.	
							64.86		(0.50) 15.00	Stiff brown CLAY.	
15.50-16.00	B4						63.46		(1.40) 16.40	Brown and grey slightly sandy GRAVEL. Gravel is fine to coarse angular to rounded mixed lithologies.	
							61.86		(1.60) 18.00	White CHALK (recovered as slightly cobbly gravel. Gravel is coarse to medium subangular to subrounded chalk with rare black angular medium to coarse flint. Cobbles are subangular to subrounded chalk).	
									(3.00)	White CHALK (recovered as silty gravel. Gravel is medium to coarse subangular to subrounded chalk with rare black angular medium to coarse flint).	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 11.5, 200mm casing to 21m, bentonite seal from 10.5-11.5m. 3) Two 50mm wells installed. screened from 17.7-21.0m and 13.7-16.3m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: CS	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH105D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	13/08/13	79.86maOD	E520386.899 N209022.845

Project: **HATFIELD AERODROME**

Sheet: 3 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							58.86		21.00	White CHALK (recovered as silty gravel. Gravel is medium to coarse subangular to subrounded chalk with rare black angular medium to coarse flint). *(continued)*	
										Borehole complete at 21.00m	

21 22 23 24 25 26 27 28 29

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 11.5, 200mm casing to 21m, bentonite seal from 10.5-11.5m. 3) Two 50mm wells installed. screened from 17.7-21.0m and 13.7-16.3m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: CS	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH106S**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	08/08/13	73.82maOD	E520409.017 N208180.311

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							73.52		0.30	Grass onto: Firm orange brown sandy CLAY.	
							72.92		(0.60) 0.90	Brown slightly sandy CLAY.	
1.30-1.50	B1						71.32		(1.60) 2.50	Orange brown sandy GRAVEL. Gravel is fine to coarse rounded to subangular flint.	
3.30-3.50	B2						68.62		(2.70) 5.20	Yellow brown gravelly fine to coarse SAND. Gravel is fine to coarse rounded to subrounded flint.	
							68.32		5.50	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
										Borehole complete at 5.50m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 200mm to 5.5m. 3) 50mm well installed, creened from 2.3-5.3m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 200	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH106D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	07/08/13	73.82maOD	E520409.292 N208178.906

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							73.52		0.30	Grass onto: Firm orange brown sandy CLAY.	
							72.92		(0.60) 0.90	Brown slightly sandy CLAY.	
0.90-1.20	B1								(1.60)	Orange brown very sandy GRAVEL. Gravel is medium to coarse rounded to subangular flint.	
							71.32		2.50		
2.50-2.70	B2								(2.70)	Yellow brown gravelly coarse SAND. Gravel is medium to coarse rounded to subround flint.	
4.50-4.70	B3						68.62		5.20		
6.00-6.50	U100								(3.30)	Stiff grey slightly gravelly CLAY. Gravel is fine to medium subangular flint and rare chalk.	
							65.32		8.50		
8.60-8.90	B4								(2.10)	Orange brown sandy GRAVEL. Gravel is medium to coarse rounded to subrounded flint.	

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.2m.
2) Bored 250mm casing to 7.5m, 200mm casing to 19m, bentonite seal from 6.5-7.5m.
3) Two 50mm wells installed, screened from 9.0-12.0m & 15.0-19.0m.

All dimensions in metres	Contractor: Endeavour Ltd	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando 3000	Hole Size: 250/200	DH	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH106D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	07/08/13	73.82maOD	E520409.292 N208178.906

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							63.22		10.60	Orange brown sandy GRAVEL. Gravel is medium to coarse rounded to subrounded flint. *(continued)*	
							62.72	(0.50)	11.10	Soft yellow brown slightly gravelly CLAY. Gravel is fine rounded to subrounded flint and rare chalk.	
11.10-11.30	B5						62.22	(0.50)	11.60	Orange brown sandy GRAVEL. Gravel is fine to coarse rounded to subrounded flint.	
							61.92		11.90	Soft yellow brown sandy CLAY.	
							60.32	(1.60)	13.50	Orange brown slightly to very sandy fne to coarse GRAVEL. Gravel is rounded to subrounded flint.	
13.10-13.30	B6						58.82	(1.50)	15.00	White CHALK. (recovered silty gravel and cobbles. Gravel is angular medium flint and chalk. Cobbles are angular chalk).	
							54.82	(4.00)	19.00	White CHALK (recovered soft chalk silt)	
										Borehole complete at 19.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.2m. 2) Bored 250mm casing to 7.5m, 200mm casing to 19m, bentonite seal from 6.5-7.5m. 3) Two 50mm wells installed, screened from 9.0-12.0m & 15.0-19.0m.

All dimensions in metres Scale 1:62.5	Contractor: Endeavour Ltd Plant: Dando 3000	Method: Cable Percussion Hole Size: 250/200	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH108S**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	08/05/14	79.71maOD	E520303 N208927

Project: **HATFIELD AERODROME**

Sheet: 1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							79.31		0.40	Grass onto TOPSOIL (Brown clayey SAND containing rootlets).	
									(4.30)	Stiff orange grey brown mottled sandy slightly gravelly CLAY. Gravel comprises fine to medium rounded to subrounded flint.	
							75.01		4.70		
4.70-5.70	B1	<5							(5.80)	Orange to pale yellow slightly gravelly fine to medium grading into coarse SAND. Gravel comprises rounded to subrounded flint and occasional quartz with occasional pockets of clay at 10.1m.	
5.70-6.70	B2	<5									
6.70-7.70	B3	<5									
7.70-8.70	B4	<5									
8.70-9.70	B5	<5									
9.70-10.50	B6	<5									

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) 50mm well installed, screened 4.5 to 10.5m.

All dimensions in metres Scale 1:62.5	Contractor: SLR Consulting Plant: Dando	Method: Cable Percussion Hole Size: 200mm	Logged By: DH	Approved By: PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH108S**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	08/05/14	79.71maOD	E520303 N208927

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							69.21		10.50		
							68.71		(0.50) 11.00	Very stiff grey brown sandy gravelly CLAY. Gravel is fine rounded to subrounded flint and flecks of chalk.	
										Borehole complete at 11.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) 50mm well installed, screened 4.5 to 10.5m.

All dimensions in metres	Contractor: SLR Consulting	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando	Hole Size: 200mm	DH	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH108D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	19/05/14	79.71maOD	E520303 N208926

Project: **HATFIELD AERODROME**

Sheet: 1 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							79.31		0.40	Turf onto TOPSOIL (Brown sandy CLAY containing rootlets).	
									(4.30)	Soft to firm becoming stiff to very stiff orange brown and grey mottled slightly sandy slightly gravelly CLAY. Gravel is fine to medium rounded to subrounded flint with occasional coarse subrounded gravel.	
							75.01		4.70		
4.70-5.70	B1	<5							(5.90)	Orange yellow brown slightly gravelly fine to medium SAND. Gravel is fine to coarse rounded to subrounded flint and quartz, becoming more gravelly at 6.5m with clay pockets near base.	
5.70-6.70	B2	<5									
6.70-7.70	B3	<5									
7.70-8.70	B4	<5									
8.70-9.70	B5	<5									
9.70-10.50	B6	<5									

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) Bored 250mm to 11.9m and 200mm to base. 3) 50mm wells installed, screened 14.0-15.5m and 18.5-21.5m.

All dimensions in metres	Contractor: SLR Consulting	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando	Hole Size: 250/200mm	DH	PW

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LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH108D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	19/05/14	79.71maOD	E520303 N208926

Project: **HATFIELD AERODROME**

Sheet: 2 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							69.11		10.60	Orange yellow brown slightly gravelly fine to medium SAND. Gravel is fine to coarse rounded to subrounded flint and quartz, becoming more gravelly at 6.5m with clay pockets near base. *(continued)*	
							68.51	(0.60)	11.20	Very stiff grey brown sandy gravelly CLAY. Gravel is fine rounded to subrounded flint and flecks of chalk.	
							65.91	(2.60)	13.80	Stiff to very stiff brown sandy gravelly CLAY. Gravel is fine to medium rounded to subrounded flint, quartz and scattered fine chalk. With occasional rounded to subrounded flint cobbles.	
14.00-15.00	B7	<5					65.71		14.00	Firm to stiff becoming soft brown sandy gravelly CLAY with frequent coarse subangular to subrounded gravel and flint, chert and quartz cobbles.	
							65.01	(0.70)	14.70	Brown slightly sandy GRAVEL becoming clayey at base. Gravel is fine to coarse angular to rounded flint and chert with occasional rounded flint cobbles.	
15.00-16.00	B8	<5					64.61		15.10	Brown gravelly medium to coarse SAND. Gravel is fine to coarse subangular to rounded flint, chert and quartz.	
16.00-16.50	B9	<5					63.21	(1.40)	16.50	Brown slightly sandy GRAVEL. Gravel is fine to coarse angular to rounded flint, chert and quartz with occasional rounded to subrounded flint cobbles.	
							63.11		16.60	Gey white gravelly chalky CLAY. Gravel is coarse chalk and flint.	
							61.71	(1.40)	18.00	Grey white CHALK (Recovered as coarse gravel to cobble sized fragments of chalk with rare flint cobbles).	
							61.31		18.40	Flint GRAVEL and COBBLES	
										White CHALK. (Recovered as coarse gravel to cobble sized fragments of chalk).	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) Bored 250mm to 11.9m and 200mm to base. 3) 50mm wells installed, screened 14.0-15.5m and 18.5-21.5m.

All dimensions in metres Scale 1:62.5	Contractor: SLR Consulting Plant: Dando	Method: Cable Percussion Hole Size: 250/200mm	Logged By: DH	Approved By: PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No. **BH108D**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	19/05/14	79.71maOD	E520303 N208926

Project: **HATFIELD AERODROME**

Sheet: 3 of 3

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
									(3.10)	White CHALK. (Recovered as coarse gravel to cobble sized fragments of chalk). *(continued)*	
21							58.21		21.50		
										Borehole complete at 21.50m	
22											
23											
24											
25											
26											
27											
28											
29											

Boring Progress and Water Observations				Casing		Chiselling			Water Added	
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To

General Remarks

1) Hand dug inspection pit to 1.20m.
2) Bored 250mm to 11.9m and 200mm to base.
3) 50mm wells installed, screened 14.0-15.5m and 18.5-21.5m.

All dimensions in metres	Contractor: SLR Consulting	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando	Hole Size: 250/200mm	DH	PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

Project Name:	Hatfield Greenbelt	Stanger
Project No: 04507-01-01	Client: Arlington Property Developments Limited	Science and Environment

Co-ordinates (National):	Ground level (m AOD):	Method:		Record of Borehole No:
E 520,133.0 N 208,725.0	76.41	Shell and Auger Rig		BHA ~~BH G~~
Date:	**Depth of Hole:**	**Hole dia. (mm):**	**Casing dia. (mm):**	**Sheet:**
29/01/2001	8	150	150	1 of 2

Sample & Tests				Strata		Description of Strata	Legend	Geology	Water	Piezo Backfill
Depth (m)	No.	Type	SPT CPT N' Value	Depth (Thick.) (m)	Reduced Level (m)					
0.20		D		0.4	76.01	MADE GROUND: Brown and orange brown CLAY with fragments of brick and flint gravel				
0.40		D		0.7	75.71	Firm orange brown and blue-grey CLAY with a little flint gravel				
0.70		D		1.1	75.31	Soft black and grey very silty sandy CLAY				
1.10		D		(1.30)		Firm orange brown silty CLAY				
2.00		D		2.4	74.01					
2.40		D		2.7	73.71	Orange brown clayey SAND and fine to coarse flint GRAVEL				
2.70		B		(1.50)		Orange brown SAND and GRAVEL		Upper Glacial Deposits		
4.20		D		4.2	72.21	Green grey and orange brown SAND with a little fine flint gravel				
5.20		D		(1.90)						
6.10		D		6.1	70.31	Orange and yellow brown SAND				
7.00		D		(1.00)						
7.10		D		7.1	69.31	Stiff grey silty CLAY with a little fine flint gravel		Anglian Till		
				(0.90)						
				8	68.41					

Boring Progress & Water Obs.

Date/Time	Depth	Casing	Water	Rose	Sealed

Remarks

Groundwater encountered at 2.4m. Water added from 2.5m to 4.5m

For abbreviations & symbols see keysheet.

Scale	Logged in accordance with BS5930	Processed by:	Logged by:
1:50 All dimension in metres	Stanlog	E.Rogerson	L.A.Bond

Project Name:	Hatfield Greenbelt	Stanger Science and Environment
Project No: 04507-01-01	Client: Arlington Property Developments Limited	

Co-ordinates (National):	Ground level (m AOD):	Method:			Record of Borehole No:
E 520,133.0 N 208,725.0	76.41	Shell and Auger Rig			BHA ~~BH G~~
Date:	**Depth of Hole:**	**Hole dia. (mm):**	**Casing dia. (mm):**	**Sheet:**	
29/01/2001	8	150	150	2 of 2	

Sample & Tests				Strata		Description of Strata	Legend	Geology	Water	Piezo Backfill
Depth (m)	No.	Type	SPT CPT 'N' Value	Depth (Thick.) (m)	Reduced Level (m)					
7.90		D								

Boring Progress & Water Obs.					
Date/Time	Depth	Casing	Water	Rose	Sealed

Remarks

Groundwater encountered at 2.4m. Water added from 2.5m to 4.5m

For abbreviations & symbols see keysheet.

Scale	Logged in accordance with BS5930	Processed by:	Logged by:
1:50 All dimension in metres	Stanlog	E.Rogerson	L.A.Bond

BAE SYSTEMS

BAE Systems Environmental

Site	Borehole Number
Hatfield Green BHB L	~~BH15~~

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150 mm to m	77.70	Arlington Business Parks Partnership	A814/00
	Location	**Dates**	**Engineer**	**Sheet**
	520561 E 208637. N	05/03/2008-06/03/2008	Adam Williams	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.60)	MADE GROUND: Sandy topsoil with coarse angular gravel of brick			
0.60	B				77.10	0.60	Firm to moderately stiff brown sandy CLAY with fine to coarse angular to subangular gravel of flint (Upper Glacial Deposit)			
						(0.90)				
1.50	B				76.20	1.50	Orange brown fine to coarse SAND with some to occasional fine to coarse angular to subangular gravel of flint and quartz (Upper Glacial Deposit)			
3.50	B								▼1	
5.50	B			Water strike(1) at 5.50m, rose to 4.80m in 20 mins.		(7.80)			▽1	
									▼2	
7.50	B									
9.50	B				68.40	9.30	Soft to moderately firm blue grey sandy CLAY with some to occasional fine rounded gravel of chalk (Anglian Till)			

Remarks

Scale (approx)	Logged By
1:50	AW

Figure No. A814/00.BH15

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BAE SYSTEMS

BAE Systems Environmental

Site	Borehole Number
Hatfield Green BHB L	~~BH15~~

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150 mm to m	77.70	Arlington Business Parks Partnership	A814/00
	Location	**Dates**	**Engineer**	**Sheet**
	520561 E 208637. N	05/03/2008-06/03/2008	Adam Williams	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(3.70)				
11.50	B									
13.00	B				64.70	13.00	Orange brown sandy fine to coarse subangular to rounded GRAVEL of mixed lithology (Proto-Thames Gravels)			
						(3.00)				
15.00	B			Water strike(2) at 15.00m, rose to 6.00m in 20 mins.					▽2	
16.00	B				61.70	16.00	Soft to moderately firm greyi brown sandy CLAY with much fine gravel of mixed lithology (Proto-Thames Gravels)		▼3	
						(0.50)				
16.50	B				61.20	16.50	Orange brown fine to coarse SAND with much fine to coarse angular to rounded gravel of mixed lithology (Proto-Thames Gravels)			
						(3.10)				
18.50	B									
19.60	B				58.10	19.60	Highly weatherd CHALK recovered as sandy clayey fine to coarse gravel (Middle Chalk Formation)			
					57.70	(0.40) 20.00				

Remarks

Scale (approx)	Logged By
1:50	AW

Figure No. A814/00.BH15

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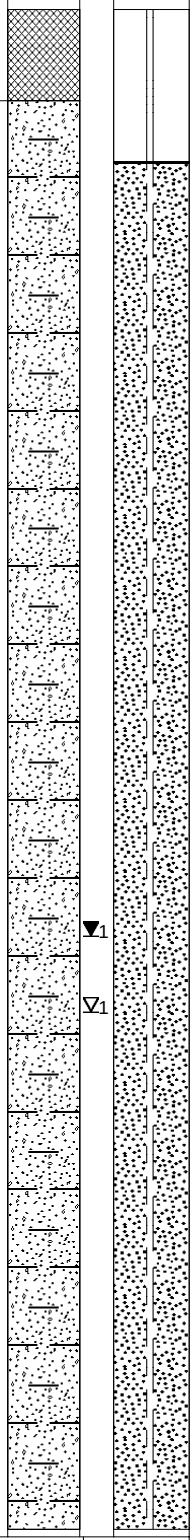
BAE SYSTEMS

BAE Systems Environmental

Site	Borehole Number
Hatfield Green BHC U	~~BH14~~

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150 mm to m	77.92	Arlington Business Parks Partnership	A814/00
	Location 520529 E 208617 N	**Dates** 06/03/2008	**Engineer** Adam Williams	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.60)	MADE GROUND: Sandy topsoil with coarse angular gravel of brick			
0.60	B				77.32	0.60	Orange brown slightly clayey SAND with very occasional angular to rounded gravel of flint and quartz (Upper Glacial Deposit)			
2.50	B									
4.50	B									
6.50	B			Water strike(1) at 6.50m, rose to 6.00m in 20 mins.					▼1 ▽1	
8.50	B									



Remarks

Scale (approx)	Logged By
1:50	AW

Figure No. A814/00.BH14

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BAE SYSTEMS

BAE Systems Environmental

Site	Borehole Number
Hatfield Green BHC U	~~BH14~~

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150 mm to m	77.92	Arlington Business Parks Partnership	A814/00
	Location 520529 E 208617 N	**Dates** 06/03/2008	**Engineer** Adam Williams	**Sheet** 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(9.90)				
10.50	B				67.42	10.50	Moderatley firm grey blue CLAY with some fine rounded gravel of chalk (Anglian Till)			
						(0.50)				
					66.92	11.00	Complete at 11.00m			

Remarks

Scale (approx)	Logged By
1:50	AW

Figure No. A814/00.BH14

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BAE SYSTEMS

BAE Systems Environmental

Site	Borehole Number
Hatfield Green BHD U	~~BH13~~

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150 mm to m	78.59	Arlington Business Parks Partnership	A814/00
	Location 520394 E 208765 N	**Dates** 10/03/2008	**Engineer** Adam Williams	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					78.39	0.20	TOPSOIL			
						(1.30)	Soft to firm orange brown sandy CLAY (Upper Glacial Deposit)			
1.50	B				77.09	1.50	Firm brown sandy CLAY with some to occasional fine to coarse angular to subangular gravel of flint and quartz (Upper Glacial Deposit)			
3.50	B					(3.80)				
5.30	B				73.29	5.30	Yellow brown fine to coarse SAND (Upper Glacial Deposit)		▼1	
7.30	B			Water strike(1) at 7.00m, rose to 6.30m in 20 mins.		(4.30)			▽1	
9.30	B									
9.60	B				68.99	9.60	Firm blue sandy CLAY (Anglian Till)			
					68.59	(0.40) 10.00				

Remarks

Scale (approx)	Logged By
1:50	AW

Figure No. A814/00.BH13

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BAE SYSTEMS

BAE Systems Environmental

Site	Borehole Number
Hatfield Green BHE U	~~BH16~~

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		75.40	Arlington Business Parks Partnership	A814/00
	Location 520394 E 208419. N	**Dates** 05/03/2008-06/03/2008	**Engineer** Adam Williams	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.50)	MADE GROUND: Sandy topsoil with coarse angular gravel of brick			
					74.90	0.50	Firm to moderately stiff brown sandy CLAY with fine to coarse angular to subangular gravel of flint (Upper Glacial Deposit)			
						(1.00)				
					73.90	1.50	Soft brown clayey very sandy fine to coarse angular to subrounded GRAVEL of flint and quartz (Upper Glacial Deposit)			
						(0.50)				
2.00	B				73.40	2.00	Orange brown fine to coarse SAND with very occasional fine angular to rounded gravel of flint. Gravel content increases with depth (Upper Glacial Deposit)			
2.50	B									
									▼1	
4.50	B			Water strike(1) at 4.50m, rose to 4.00m in 20 mins.		(5.00)			▽1	
6.50	B									
7.00	B				68.40	7.00	Firm blue grey sandy CLAY with some to occasional fine subangular gravel of chalk (Anglian Till)			
						(1.00)				
					67.40	8.00				
							Complete at 8.00m			

Remarks

Scale (approx)	Logged By
1:50	AW

Figure No. A814/00.BH16

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Project Name:	Hatfield Greenbelt	Stanger Science and Environment
Project No: 04507-01-01	Client: Arlington Property Developments Limited	

Co-ordinates (National):	Ground level (m AOD):	Method:		Record of Borehole No:
E 520,276.0 N 208,648.0	76.78	Shell and Auger Rig		BHJ ~~BH A~~
Date:	**Depth of Hole:**	**Hole dia. (mm):**	**Casing dia. (mm):**	**Sheet:**
23/01/2001	10.5	150	150	1 of 2

Sample & Tests				Strata		Description of Strata	Legend	Geology	Water	Piezo Backfill
Depth (m)	No.	Type	SPT CPT 'N' Value	Depth (Thick.) (m)	Reduced Level (m)					
0.20		B		(0.70) 0.7	76.08	MADE GROUND: Brown and dark brown sandy clay with brick and concrete fragments				
0.70		D		(0.90) 1.6	75.18	Firm brown and grey mottled silty CLAY				
1.60		D		(2.00) 3.6	73.18	Firm to stiff orange brown very sandy CLAY with a little fine flint gravel				
2.60		D								
3.60		D		(4.60)		Orange brown SAND with a little to some fine to medium flint gravel		Upper Glacial Deposits		
4.50		D								
5.50		D								
6.50		D								
7.50		D								

Boring Progress & Water Obs.

Date/Time	Depth	Casing	Water	Rose	Sealed

Remarks

No Groundwater Encountered. water added friom 5.0m to 7.5m

For abbreviations & symbols see keysheet.

Scale	Logged in accordance with BS5930	Processed by:	Logged by:
1:50 All dimension in metres	Stanlog	E.Rogerson	L.A.Bond

Project Name:	Hatfield Greenbelt	Stanger
Project No: 04507-01-01	Client: Arlington Property Developments Limited	Science and Environment

Co-ordinates (National):	Ground level (m AOD):	Method:		Record of Borehole No:
E 520,276.0 N 208,648.0	76.78	Shell and Auger Rig		BHJ ~~BH A~~
Date:	**Depth of Hole:**	**Hole dia. (mm):**	**Casing dia. (mm):**	**Sheet:**
23/01/2001	10.5	150	150	2 of 2

Sample & Tests				Strata						
Depth (m)	No.	Type	SPT CPT 'N' Value	Depth (Thick.) (m)	Reduced Level (m)	Description of Strata	Legend	Geology	Water	Piezo Backfill
				8.2	68.58					
8.20		D		(1.30)		Firm grey silty CLAY		Anglian Till		
9.20		D		9.5	67.28					
9.50		D		(1.00)		Firm to stiff brown grey silty CLAY with a little to some fine to coarse flint gravel				
10.50		D		10.5	66.28					

Boring Progress & Water Obs.

Date/Time	Depth	Casing	Water	Rose	Sealed

Remarks

No Groundwater Encountered. water added friom 5.0m to 7.5m

For abbreviations & symbols see keysheet.

Scale	Logged in accordance with BS5930	Processed by:	Logged by:
1:50 All dimension in metres	Stanlog	E.Rogerson	L.A.Bond

BOREHOLE LOG

BOREHOLE No.
BH201

Client:
BRETT AGGREGATES LTD

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	14/05/14	79.00maOD	E520233 N208856

Project:
HATFIELD AERODROME

Sheet:
1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							78.50		(0.50) 0.50	Grass onto TOPSOIL (Brown sandy CLAY containing rootlets).	
							74.70		(3.80) 4.30	Firm to stiff orange grey slightly sandy slightly gravelly CLAY. Gravel is fine flint with rare coarse fragments.	
							73.50		(1.20) 5.50	Stiff to very stiff brown grey gravelly CLAY. Gravel is fine to medium rounded to subrounded chalk with occasional fine to medium flint and occasional chalk cobbles.	
5.50-6.50	B1	<5					69.30		(4.20) 9.70	Orange brown fine to medium becoming coarse SAND.	
6.50-7.50	B2	<5									
7.50-8.50	B3	<5									
8.50-9.50	B4	<5									

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) Bored 250mm to 11.0m, 200mm to 15.5m, 150mm to base. 3) 50mm wells installed, screened 12.9-13.9m and 15.0-18.3m.

All dimensions in metres Scale 1:62.5	Contractor: SLR Consulting Plant: Dando	Method: Cable Percussion Hole Size: 250/200/150mm	Logged By: DH	Approved By: PW

Form SLR AGS3 UK BH File 140703_402.01009.00064_BH107TOBH201_2014_LCP_LOGS_PW.GPJ 07-07-14

BOREHOLE LOG

BOREHOLE No. **BH201**

Client: **BRETT AGGREGATES LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00064	14/05/14	79.00maOD	E520233 N208856

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							67.40		(1.90) 11.60	Stiff to very stiff grey to dark grey slightly sandy gravelly CLAY. Gravel is fine to coarse subangular to rounded chalk and rare flint. *(continued)*	
							66.10		(1.30) 12.90	Firm brown sandy gravelly CLAY. Gravel is medium to coarse rounded to subrounded flint with scattered fine chalk and occasional flint cobbles.	
12.90-13.90	B5	<5					65.10		(1.00) 13.90	Orange brown sandy coarse GRAVEL. Gravel is fine to coarse angular to rounded flint with occasional cobbles.	
							64.80		14.20	Firm to stiff orange brown slightly sandy slightly gravelly CLAY. Gravel is coarse subangular flint.	
							63.50		(1.30) 15.50	Soft orange brown grey mottled slightly gravelly CLAY. Gravel is medium to coarse subangular to rounded flint.	
15.50-16.50	B6	<5					61.60		(1.90) 17.40	Grey slightly clayey sandy GRAVEL. Gravel is fine to coarse angular to rounded flint and quartz with occasional flint cobbles.	
16.50-17.40	B7	<5					60.90		(0.70) 18.10	Soft brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded flint and quartz.	
							60.70		18.30	Brown coarse sandy GRAVEL with pockets of chalky clay. Gravel is subangular to subrounded flint with occasional cobbles.	
							60.40		18.60	Stiff light brown to white slightly gravelly CLAY. Gravel is fine chalk and coarse rounded to subangular flint.	
							60.10		18.90	Grey white CHALK. (Recovered as coarse gravel to cobble sized fragments of chalk).	
										Borehole complete at 18.90m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	1) Hand dug inspection pit to 1.20m. 2) Bored 250mm to 11.0m, 200mm to 15.5m, 150mm to base. 3) 50mm wells installed, screened 12.9-13.9m and 15.0-18.3m.

All dimensions in metres	Contractor: SLR Consulting	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:62.5	Plant: Dando	Hole Size: 250/200/150mm	DH	PW

SLR Consulting Ltd, 8 Stow Court, Stow-Cum-Quy, Cambridge, CB25 9AS, , Tel: 01223 813805, Fax: 01223 813783

LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930+A2

BOREHOLE LOG

BOREHOLE No.
BH 301 L&C

Client:
ROBERT BRETT & SONS LTD

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	27/09/16	76.67maOD	E519569.963 N208834.843

Project:
HATFIELD AERODROME

Sheet:
1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.50	E	<1							(0.80)	MADE GROUND: Light brown slightly gravelly SAND. Gravel is subangular to subrounded fine to coarse flint.	
0.80	E	<1					75.87		0.80	0.60 - 0.70 2" clay pipe, dry. NW-SE orientation.	
1 1.50	E	1							(0.80)	Light brown slightly clayey gravelly SAND. Gravel is fine to medium angular to subrounded flint, with localised pockets of firm light grey gravelly CLAY. Gravel is fine to medium angular to subrounded flint.	
2 2.00	E	1					75.07		1.60	Light brown fine GRAVEL of sub angular to angular flint and quartz, rare medium gravel.	
3 3.00	E	<1					73.87		(1.20) 2.80	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine subangular to angular flint.	
4 4.00	E	2									
5 5.00	E	<1							(4.20)	5.00 - 7.00 Becoming Stiff dark grey brown slightly gravelly CLAY. Gravel is fine rounded chalk.	
6 6.00	E	<1									
7 7.00	E	<1					69.67		7.00	Light brown/yellow fine SAND with occasional gravel. Gravel is fine to medium subangular to subrounded flint.	
8 8.00	E	<1					68.67		(1.00) 8.00	Light brown/orange sandy GRAVEL. Gravel is fine to medium angular to rounded flint and occasional flint cobbles with dark grey clay pockets (undefined layers).	
9 9.00	E	<1					67.07		(1.60) 9.60	Yellow/ light brown CHALK recovered as chalk silt with gravel of angular fine to medium flint, sub rounded medium off-white chalk gravel and occasional flint cobbles.	
10 10.00	E	<1									
11 11.00	E	<1									

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Dual well installed, screened 7.3m to 9.3m and 12.0 - 15.0m.

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 2000	Method: Cable Percussion Hole Size: 200mm	Logged By: CC	Approved By: JH

BOREHOLE LOG

BOREHOLE No.
BH 301 L&C

Client:
ROBERT BRETT & SONS LTD

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	27/09/16	76.67maOD	E519569.963 N208834.843

Project:
HATFIELD AERODROME

Sheet:
2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
12 12.00	E	<1								Yellow/ light brown CHALK recovered as chalk silt with gravel of angular fine to medium flint, sub rounded medium off-white chalk gravel and occasional flint cobbles. *(continued)*	
13 13.00	E	<1							(5.40)		
14 14.00	E	<1									
15							61.67		15.00		
										Borehole complete at 15.00m	
16											
17											
18											
19											
20											
21											
22											

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Dual well installed, screened 7.3m to 9.3m and 12.0 - 15.0m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 2000	Hole Size: 200mm	CC	JH

BOREHOLE LOG

BOREHOLE No.
BH302 L&C

Client:
ROBERT BRETT & SONS LTD

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	06/10/16	76.27maOD	E519374.23 N208616.749

Project:
HATFIELD AERODROME

Sheet:
1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.50	HS	<1					75.67		(0.60) 0.60	MADE GROUND: Light brown gravelly SAND. Gravel is angular to subangular fine to coarse flint, brick and concrete.	
1 1.00	HS	<1								Light brown sandy clayey GRAVEL. Gravel is subangular to rounded, fine to medium flint with occasional cobbles.	
										1.50 - 4.00 No longer clayey.	
2 2.00	HS	<1							(3.40)		
3 3.00	HS	<1									
4 4.00	HS	<1					72.27		4.00		
							71.77		4.50	Light brown slightly gravelly SAND. Gravel is angular to subangular fine flint.	
							71.67		4.60	Firm light brown mottled light grey slightly sandy CLAY.	
5 5.00	HS	<1							(1.60)	Firm dark grey CLAY. 5.00 rare gravels.	
6 6.00	HS	<1					70.07		6.20		
7 7.00	HS	<1								Light orange brown sandy GRAVEL. Gravel is rounded to angular fine to coarse flint, sandstone and quartz with occasional cobbles.	
8 8.00	HS	<1							(4.80)		
9 9.00	HS	<1									
10 10.00	HS	<1									
11 11.00	HS	<1					65.27		11.00		
										Firm brown grey slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to medium flint.	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Dual well installed, screened 15.3m to 16.0m and 18.0 - 22.0m.

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 2000	Method: Cable Percussion Hole Size: 200mm	Logged By: CC	Approved By: JH

Form SLR AGS3 UK BH File 161014_402.01009.00174_BH_LOGS_TW.GPJ 23-03-17

BOREHOLE LOG

BOREHOLE No. **BH302 L&C**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	06/10/16	76.27maOD	E519374.23 N208616.749

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
									(1.00)	Firm brown grey slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to medium flint. *(continued)*	
12 12.00	HS	<1					64.27		12.00	Stiff dark grey brown slightly gravelly CLAY. Gravel is subrounded to rounded fine chalk and subangular to subrounded fine to medium flint and siltstone.	
13 13.00	HS	<1							(3.00)		
14 14.00	HS	<1									
15 15.00	HS	<1					61.27		15.00		
							60.97		15.30	Stiff orange brown slightly gravelly CLAY. Gravel is subrounded to subangular fine to medium flint, quartz and siltstone.	
							60.27		(0.70) 16.00	Light brown sandy GRAVEL. Gravel is rounded to subangular fine to course flint, sandstone and quartz with occasional cobbles.	
16 16.00	HS	<1					59.97		16.30	Stiff orange brown slightly gravelly slightly sandy CLAY. Gravel is subrounded to angular fine to medium flint, sandstone and chalk.	
17 17.00	HS	<1								Yellow white CHALK recovered as weathered chalk silt with sub rounded to rounded fine to medium chalk gravel and fine to medium angular flint. 16.30 Recovered chalk gravel. 17.00 Sample recovered as chalk gravel.	
18 18.00	HS	<1								18.00 First sign of weathered chalk.	
19 19.00	HS	<1							(5.70)		
20 20.00	HS	<1									
21 21.00	HS	<1								21.00 Sample recovered as chalk gravel.	
22 22.00	HS	<1					54.27		22.00		
										Borehole complete at 22.00m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Dual well installed, screened 15.3m to 16.0m and 18.0 - 22.0m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 2000	Hole Size: 200mm	CC	JH

BOREHOLE LOG

BOREHOLE No.
BH305 L&C

Client:
ROBERT BRETT & SONS LTD

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	13/10/16	79.05maOD	E520049.621 N209317.092

Project:
HATFIELD AERODROME

Sheet:
1 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
							78.65		0.40	MADE GROUND: Grass over brown slightly gravelly slightly sandy SILT. Gravel comprises fine to coarse angular to rounded flint, brick and ceramic with frequent rootlets.	
0.50		<1								Firm orange brown slightly gravelly slightly sandy CLAY. Gravel comprises subangular to subrounded fine to coarse flint and chalk, sand is fine to coarse.	
1 1.20		<1							(2.40)		
2 2.00		<1					76.25		2.80		
2.80		<1								Firm to stiff brown mottled grey and white slightly sandy gravelly CLAY. Gravel comprises fine to medium subrounded to rounded chalk and flint, sand is fine to coarse. 3.00 - 4.80 Becoming stiff clay 3.50 - 4.80 No longer mottled grey and with fine to coarse gravel	
3 4 4.00		<1							(2.00)		
4.80		<1					74.25		4.80		
5 6 6.00		<1								Orange brown slightly gravelly SAND. Gravel comprises fine to coarse subrounded to rounded flint, sand is medium to coarse.	
7 7.20		<1							(2.40)		
8							71.85		7.20		
9 9.00		<1								Stiff dark brown mottled grey slightly sandy gravelly CLAY. Gravel comprises fine to coarse subangular to rounded flint, sand is fine to coarse. 7.40 - 10.50 Becoming dark grey	
10 10.00		<1							(3.80)		
										10.50 - 11.00 Becoming brown mottled grey	
11 11.00		<1					68.05		11.00		
										Firm soft orange brown sandy very gravelly CLAY. Gravel comprises fine to coarse subrounded to rounded flint, sand is fine to coarse.	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Dual well installed, screened 14.0-16.9m and 19.5-22.5m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 2000	Hole Size: 200mm	FC	JH

BOREHOLE LOG

BOREHOLE No. **BH305 L&C**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	13/10/16	79.05maOD	E520049.621 N209317.092

Project: **HATFIELD AERODROME**

Sheet: 2 of 2

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
									(1.00)	Firm soft orange brown sandy very gravelly CLAY. Gravel comprises fine to coarse subrounded to rounded flint, sand is fine to coarse. *(continued)*	
12 12.00		<1					67.05		12.00		
									(0.60)	Orange brown slightly gravelly clayey SAND. Gravel comprised fine to coarse subangular to rounded flint, sand is fine to coarse.	
12.60		<1					66.45		12.60	12.20 - 12.60 Becoming very gravelly	
13										Orange brown sandy GRAVEL. Gravel comprises fine to coarse subangular to rounded, sand is fine to coarse.	
13.50		2							(2.40)		
14										14.00 - 15.00 Becoming very sandy	
14.50	E	3									
15 15.00		1					64.05		15.00		
							63.95		15.10	Soft orange brown sandy CLAY. Sand is fine to coarse.	
15.50		1								Orange brown sandy GRAVEL. Gravel comprises fine to coarse subangular to rounded, sand is fine to coarse.	
16 16.00		1							(2.40)		
16.50		2									
17							61.55		17.50		
17.50		2								Soft white mottled brown slightly gravelly CLAY. Gravel is subangular/subrounded of chalk.	
18											
18.50		3							(2.00)		
19 19.00		3					59.55		19.50		
										Silty GRAVEL and COBBLES. Gravel and cobbles comprise subrounded to rounded flint within a silty chalk matrix.	
20											
21									(3.00)		
22											
							56.55		22.50		
										Borehole complete at 22.50m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Dual well installed, screened 14.0-16.9m and 19.5-22.5m.

All dimensions in metres	Contractor: Endeavour	Method: Cable Percussion	Logged By:	Approved By:
Scale 1:71.875	Plant: Dando 2000	Hole Size: 200mm	FC	JH

BOREHOLE LOG

BOREHOLE No. **BH306U**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	17/10/16	79.01maOD	E520234.233 N208855.845

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.40	HS	<1					78.51		0.50	Grass over brown very sandy CLAY containing rootlets and occasional sub angular to sub rounded fine to medium flint.	
1.00	HS	<1								Firm to stiff orange mottled grey CLAY with rare fine sub angular flint gravel.	
1.50	HS	<1									
2.00	HS	<1							(3.70)		
3.00	HS	<1									
4.00	HS	<1					74.81		4.20		
4.50	HS	<1								Stiff brown gravelly CLAY. Gravel comprises sub angular to sub rounded fine to medium off-white chalk, rare chalk cobbles and occasional sub angular to sub rounded fine to medium flint.	
5.00	HS	<1							(1.30)		
							73.51		5.50		
6.00	HS	<1								Orange brown fine to medium SAND.	
7.00	HS	<1									
8.00	HS	<1							(4.40)		
9.00	HS	<1									
							69.11		9.90		
10.00	HS	<1							(0.80)	Stiff to very stiff dark grey slightly gravelly CLAY. Gravel comprises angular to sub rounded fine to medium flint and chalk.	
							68.31		10.70		
										Borehole complete at 10.70m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 4.6m to 9.9m

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 3000	Method: Cable Percussion Hole Size: 200mm	Logged By: CB	Approved By: JH

Form SLR AGS3 UK BH File 161014_402.01009.00174_BH_LOGS_TW.GPJ 23-03-17

BOREHOLE LOG

BOREHOLE No. **BH307U**

Client: **ROBERT BRETT & SONS LTD**

Project No:	Date:	Ground Level:	Co-ordinates:
402.01009.00174	14/10/16	79.69maOD	E520132.067 N208917.503

Project: **HATFIELD AERODROME**

Sheet: 1 of 1

SAMPLES & TESTS							STRATA				
Depth	Type No	HS(ppm)	HV(kPa)	PP(kPa)	SPT-N	Water	Reduced Level	Legend (Thick-ness)	Depth	DESCRIPTION	Instrument/ Backfill
0.20	HS	<1					79.29		0.40	MADE GROUND: Brown clayey gravelly SAND. Gravel comprises fine to coarse angular to sub rounded flint and occasional fine red brick fragments. Sand is fine.	
1.00	HS	<1								Firm orange brown mottled grey gravelly CLAY. Gravel comprises fine to coarse angular to rounded flint and off-white chalk fragments.	
2.00	HS	<1							(3.20)		
3.00	HS	<1					76.09		3.60		
4.00	HS	<1								Firm orange brown mottled grey, slightly gravelly CLAY. Gravel comprises fine to medium sub angular to sub rounded flint.	
5.00	HS	<1									
6.00	HS	<1							(5.10)		
8.00	HS	<1									
8.50	HS	<1					70.99		8.70		
							70.49		9.20	Stiff dark grey slightly gravelly CLAY. Gravel comprises angular to sub rounded fine to medium flint and chalk.	
										Borehole complete at 9.20m	

Boring Progress and Water Observations				Casing		Chiselling			Water Added		General Remarks
Date	Time	Depth	Water Dpt	Depth	Dia. mm	From	To	Hours	From	To	Hand dug pit to 1.2m. Headspace measurements using a PID. Well installed, screened 3.6m to 8.6m.

All dimensions in metres Scale 1:71.875	Contractor: Endeavour Plant: Dando 3000	Method: Cable Percussion Hole Size: 200mm	Logged By: CB	Approved By: JH

APPENDIX 6-11

AFFINITY WATER PLC SCOPING QUESTION RESPONSE

1. Assessment of potential risks caused by the new method of extraction from dry Upper Mineral Horizon (UMH) and wet Lower Mineral Horizon (LMH)

Potential risks may include:

- **Cross contamination between the LMH/Chalk and the UMH aquifer**
- **Extreme scenarios influencing the migration of the bromate plume**
- **Alteration of LMH aquifer storage and its influence on surrounding groundwater levels**

Brett has always proposed excavation of the UMH using a 'dry' method and the LMH by a 'wet' method. The difference between the former and the new approach is that we no-longer propose the temporary lowering of groundwater levels in the LMA to facilitate 'wet' LMH extraction.

To clarify, the extraction of the LMH will be undertaken on a 'wet' campaign basis during periods of the year when the LMA is at its seasonal low and in accordance with an approach described in the Groundwater Management Plan (GWMP) in Appendix 6-10. The approach defines a pre-excavation preparation stage to determine which of three hydrogeological scenarios applies within the phase, each with a clear operational procedure:

(1) **LMA is Unconfined – piezometric surface is within the LMH –** Interburden (IB) and LMH excavation and concurrent backfilling/reinstatement can proceed
(2) **LMA is Confined – piezometric surface rests within the IB -** IB and LMH excavation concurrent backfilling/reinstatement can proceed
(3) **LMA is Confined – piezometric surface rests above the IB** – no IB or LMH excavation will proceed

The operational method for Scenarios 1 and 2 differs slightly because the LMA groundwater level is above the base of the IB in scenario 2. Detail is provided in the GWMP.

Risk of Cross contamination (LMA/Chalk to UMA)

Following mineral extraction and site reinstatement, the risk of cross contamination between the LMH/Chalk aquifer to the UMA is considered low because:

- The LMH will be removed to within 1m of the Chalk surface, and will be replaced by site won, low permeability fill material up to the level of the excavated IB
- A basal geological barrier will be installed above the site won fill at the level of the IB and will be tied into the sidewall geological barrier
- Placement of the basal and sidewall barrier material will be independently validated in accordance with a Construction Quality Assurance (CQA) plan
- The LMA is not impacted by bromate beneath the mineral extraction site
- The hydraulic relationship between the UMA and the LMA is such that a downward hydraulic gradient exists in which case upward contaminant flow between the two aquifers would not occur

- Design and operation of the infiltration lagoons will prevent LMA groundwater entering the UMA:
  - The UML will retain the IB at its base, whereas the IB in the LML will be removed during its construction
  - An engineered sidewall barrier separating the lagoons will key into the IB to prevent lateral connection between the lagoons
  - The highest interpreted groundwater level recorded in March 2014 was c.67mAOD just above the base of the IB but remains 3m below the IB's upper surface, so we do not expect the LMA water level to naturally rise above the IB surface
  - The maximum operational fill level in the operational LML will be set at 72mAOD, which is above the predicted IB surface but below the lowest UMA water level recorded in the location of the UML, therefore always maintaining a downward hydraulic head from UML to LML

Extreme Groundwater Level Scenarios

Scenarios that have the potential to influence the location of the bromate plume include:

- Seasonal groundwater level change
- Affinity's groundwater abstraction rate and consistency of abstraction at the Bishops Rise well field

Conceptually, high natural groundwater levels, or low groundwater abstraction rates at Bishops Rise would be expected to result in the bromate plume following its natural flow route to north and east of the mineral site.

Transducer based hydrographs from 3 aquifer intervals (UMA, LMA, Chalk) in 4 well clusters (BH101, BH102, BH104, BH106) have been recorded since 2013 (Appendix 6-3). A review of the hydrographs between 2013 and April 2021 indicate that:

- LMA/Chalk water levels are almost identical at any one time and location indicating hydraulic continuity between the two geological units.
- The site has experienced two years of high groundwater levels (2013/14 and 2020/21) separated by 5 years of lower water levels, also with a reduced annual range in water level change.

Affinity Water has been abstracting ground water from the chalk aquifer and discharging to sewer throughout this period of water level monitoring. Pumping rates have fluctuated over time but have been consistent since the 2nd quarter 2018.

SLR has undertaken quarterly groundwater sampling and analysis for bromate and bromide between 2013 and 2021 from the monitoring wells with transducers, plus other on-site and off-site wells to assess the concentration of bromate/bromide, if present.

The southern edge of the bromate plume in the chalk and LMA monitoring wells is typically defined by BH104 and BH301 located in the northern corner of the site, although is currently practically absent in the LMA at <1ug/l (April 2021). The centre of the plume is further north and beyond the eastern edge of the site, as illustrated on Drawing HQ6/9 and HQ6/10.

Bromate concentrations are lower in the LMA than the underlying chalk aquifer in all wells, both on site and off site.

Time-concentration changes indicate the most stable data in BH104 is from the 2nd quarter 2018 onward coinciding with a period of stable Affinity abstraction rates, during which time bromate in the chalk has been stable (c.2.5ug/l) and in the LMA has risen slightly, albeit to a maximum trace level concentration of 1.6ug/l. Trace level detections near laboratory detection limits should not be over-interpreted.

In conclusion, the fact that bromate concentrations have remained stable in BH104 Chalk and the LMA across a long period of low natural water levels across a period of stable pumping by Affinity, indicates that extreme scenarios are not a significant cause for concern in relation to bromate migration towards the site. This situation is safeguarded further by a proposed 100m standoff from BH104 for LMH excavation, and that LMA groundwater will not be pumped at the mineral site under any circumstance.

LMH Storage

Common groundwater levels recorded in monitoring wells installed individually in the LMH and chalk demonstrate that the two units are part of a single aquifer. The LMH represents a relatively thin (c.5m) uppermost layer resting upon the chalk surface, whereas the effective thickness of the combined aquifer is much greater at c.70m (discussed in greater detail in the pumping test report (Appendix 1 included in Appendix 6/10).

Mineral workings will remove the LMH leaving a minimum of 1m of mineral in place above the chalk surface and replacing it with site won low permeability fill. The fill will have different physical properties to the mineral being removed (lower porosity/storage and hydraulic conductivity), and this could impact on local groundwater levels. It is important to highlight that we are describing the deeper aquifer and is not a reference to the UMA which is a separate and higher groundwater unit.

The fill will replace a fraction of the combined aquifer so we conceptualise that the groundwater flow will approach the site from the west-northwest (Drawing HQ 6/10) and that groundwater level will rise locally and marginally on the hydraulically up gradient side of the filled area but will dissipate within a short distance as flow is directed eastward at the northern fill boundary, and southeast along the western fill boundary remaining within the groundwater catchment of Bishops Rise.

Groundwater levels fluctuate seasonally and on the western side of the site the LMH/Chalk water level has on occasion risen above the upper surface of the clay IB layer. In accordance with the GWMP, should groundwater head exceed the upper surface of the IB, then mineral working will cease until the conditions change.

2 Proposal for additional groundwater level and water quality monitoring to align with the renewed quarry plan in:

- **Both the UMH and LMH pre-, and post- and during operation**
- **Extreme scenarios that consider the new extraction methods and triggers associated with this**

Drawing 01, 02, 03 and 04 (included in ES Appendix 6-10) depict the location of monitoring wells on-site and off-site according to aquifer unit. A colour key indicates whether sampling is 1) a Permit requirement, 2) Additional Voluntary well sampling, or 3) New Wells yet to be installed.

- DWG-01 & 02 UMA & Surface Water (08/2019 and 04/2021)
- DWG-03 LMA (04/2021)
- DWG-04 Chalk (04/2021)

The drawings and the proposed monitoring schedule form part of the GWMP which documents a comprehensive suite of groundwater and surface water monitoring and analysis across the entire site, plus an increase in automated water level monitoring equipment from an existing 7 to 19 transducers in total.

Brett is willing to discuss the merits of additional monitoring or transducers, but at this stage we do not see any gaps in our coverage, so we suggest that this be reviewed and discussed at the initial GWMP stakeholder meeting. The new wells to be installed are proposed following joint discussions with Affinity.

Triggers

A low-level trigger has been set for the LMH/Chalk aquifer in BH102 following previous discussions with Affinity. This is designed to protect Roestock PWS as levels lower than this could result in the Roestock PWS capture radius extending across the site. Given that Brett is not going to abstract LMA groundwater there is no specific action to be taken other than inform Affinity of this trigger level being reached.

3 Reviewing the cumulative impact of recharge lagoons operated by both CEMEX and Brett quarries, and control mechanisms in place to ensure this does not exacerbate groundwater flood risk in the area

Brett is not fully appraised of CEMEX's surface water management system at Hatfield Quarry; however, we can describe the groundwater and surface water environment parallel to the site boundary with CEMEX, which represents the current background situation. This has been monitored for many years and has been taken into consideration in our proposed water management strategy across the site and in the vicinity of the proposed lagoons.

Background

To the north of the proposed Brett mineral processing site (Drawing HQ 6/6 and HQ 6/8) are a series of 4 silt lagoons that are filled and vegetated and do not appear to be in active use. East of the 4 lagoons and north of Home Covert is an active silt lagoon that was excavated pre-2000 and based on most recent Google Earth image contains silt and water and is an active lagoon. To the north of the silt lagoon is an open water body.

Drawings HQ6/6 and HQ 6/7 depict the piezometric surface for the shallow aquifer beneath the site. Contours depict a general easterly flow direction for Brett's mineral development site and beyond. The piezometric surface along Brett's northern boundary with CEMEX and across the CEMEX/Home Covert boundary indicates groundwater flow in a southerly direction suggesting leakage from the silt lagoons. Flow direction beneath the southeast part of Home Covert, however, reverts to an easterly flow direction.

Also shown on Drawings HQ6/6 and HQ 6/7 is a shallow ditch referenced on the drawing as Home Covert Ditch. The head of the ditch is approximately 20m from the CEMEX boundary (sampling point SW11 on drawings), into which CEMEX discharge water from a c.200mm diameter pipe. The exact source, dates and volumes being discharged is unknown, but it has been observed on several occasions.

Drawings HQ6/6 and HQ 6/7 also show a surface water channel (ephemeral flow, and frequently none) crossing the proposed Brett mineral processing site towards the southern corner of Home Covert. This channel (referred to as the Nast) and the Home Covert Ditch merge and continue south towards a culvert (SW9 on drawings) that passes beneath the former aircraft runway and ultimately links to the Ellenbrook on Ellenbrook Lane southeast of the site.

It has been noticed, however, that surface water flow does not reach the culvert at SW9 as water backs up due to blockage in the drainage course resulting in the local ground being fully saturated and local flooding occurs, for example in Autumn-Spring 2020/21.

A groundwater level hydrograph for BH104U (Appendix 6-3) located close to the Nast/Home Covert dich indicates an anomalous increase in shallow groundwater levels across a very short period which appears to be a result of the observations described above. Drainage improvement and channel maintenance as part of the proposed mineral works will improve the situation.

Water Management

Brett's proposal is to install two lagoons at the locations depicted on Drawings HQ 6/6 and HQ 6/7 on the hydraulically down gradient side of the site.

The UML will receive water from the UMA during the following site operations:

- Back drains flow
- Temporary UMA dewatering to facilitate installation of perimeter bunds, and
- Discharge of local incident rainfall occurring in each active phase

The water will be returned to the UMA and will flow in a northeast direction as implied by the groundwater contours on Drawing HQ 6/6. The Ellenbrook is located between 380m and 550m from the UML. The invert elevation of the Ellenbrook at SW3 located 550m from the lagoon is 74.25mAOD and we predict the groundwater elevation in April 2021 (a period of high UMA groundwater) would have been c.71mAOD. This is considerably lower than the Ellenbrook at SW3 implying that groundwater would not discharge to the Ellenbrook.

The LML will be installed adjacent to the UML as a precautionary option for water disposal during extreme scenarios or during planned maintenance of the UML. As stated previously, there will be no pumping of LMA groundwater on site and there will also be no direct discharge of water from the

UMA into the LML, it will only occur as a planned overflow from the UML, if required and authorised. It will not occur without Affinity and the Agency being made aware in advance and it will be subject to all management and approval procedures set out in the GWMP including testing (Appendix 6-10).

Water calculations are presented in the GWMP (Appendix 6-10) for all aspects of the operational plan. Paragraph 6.162 of the ES describes the scenario whereby the UML capacity could be exceeded, which would coincide with an extreme UMA water level and if three maximum water inputs occur simultaneously.

The back drain around the northern end of Phase B and any positive changes to the previous discussion regarding 1) Recharge of the UMA in the vicinity of Home Covert, 2) the need to improve maintenance of drainage channels adjacent to Home Covert, and 3) replacement of the existing culvert beneath the former runway will all help to manage and maintain local groundwater levels so the UML in this area of the site operates effectively during all scenarios.

4 Restoration of boulder clay layer (or similar of hydraulic properties) post- operation to ensure current hydraulic separation between UMH and LMH/Chalk is maintained

The methodology proposed to maintain hydraulic separation of the UMH and the LMH is based upon simultaneously excavating the LMH to 1m+ above the chalk and backfilling with site won material to the base of the IB. Based on experience from other sites in similar scenarios this material will self-consolidate to provide a suitable formation to support the placement of an engineered basal artificial geological barrier (AGB) at the level of the IB.

The AGB will form a continuous 1m+ layer across the site phases and will be keyed into the engineered sidewall barrier at the perimeter of the site to maintain lateral and vertical separation of the UMA and the LMA. Placement of the AGB will be monitored in accordance with a Construction Quality Assurance Plan (CQA) approved by the Environment Agency.

As stated, experience from previous sites suggest that end-tipped clay material in similar scenarios will consolidate under self-weight over time and essentially form a barrier that typically exceeds the minimum permeability ('k') requirement of less than or equal to 1×10^{-7} m/s^{-1} to accord with the Landfill Directive requirements for an inert landfill artificial geological barrier. Previous results have demonstrated permeability typically in the order of 1×10^{-10} m/s^{-1} for sub-aqueous placed clay material.

Boreholes will be retrospectively drilled through each restored phase to enable sampling and testing to verify that the minimum permeability of 1×10^{-7} m/s^{-1} has been achieved within the restoration of the IB layer.

5 General

The ES should provide as much information as possible to confirm the position of the bromate plume in relation to the proposed mineral working. Sufficient borehole data should be provided, to include additional boreholes and the levels of bromate and bromide recorded for as many boreholes as possible, where such data is available.

We have provided all the bromate and bromide data we have (Appendix 6-5) and have attached a regional plume map for the chalk (2019) encompassing available CEMEX data from late 2019

(Drawing 6/9) and Brett data of the same period. A current LMH bromate plan using Brett data has been produced for April 2021 (Drawing 6-8). Borehole data (logs) are provided in Appendix 6-1.

6 Additionally, the ES should include a Groundwater Management Plan to explain in detail how groundwater in the UMH and LMH will be managed during each phase of the mineral extraction and restoration

The GWMP encompassing all site activities reflect previous consultation with Affinity and the Agency but has been updated as part of this application and is included in Appendix 6-10.

Phase specific plans will be produced once detailed engineering designs are prepared. A phase specific GWMP will be developed in advance of each phase as outlined in Section 2.4 of the GWMP.

18774		ST ALBANS APRIL 2015								
Site	**Location**	**Direction**	**Start Date**	**End Date**	**Posted Speed Limit (PSL)**	**Total Vehicles**	**5 Day Ave.**	**7 Day Ave.**	**Average 85%ile Speed**	**Average Mean Speed**
Site No: 18774001	Hatfield Road, St Albans (TG Pole) TL 19753 07763	Channel: Eastbound	Sat 25-Apr-15	Fri 01-May-15	40	52343	8006	7478	40.0	35.2
		Channel: Westbound	Sat 25-Apr-15	Fri 01-May-15		60206	9222	8601	39.3	33.4

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Eastbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Sat 25-Apr-15											
00:00	**70**	1	1.4	64	91.4	1	1.4	4	5.7	0	0.0
01:00	**38**	2	5.3	33	86.8	3	7.9	0	0.0	0	0.0
02:00	**33**	0	0.0	30	90.9	2	6.1	1	3.0	0	0.0
03:00	**26**	0	0.0	23	88.5	2	7.7	1	3.9	0	0.0
04:00	**23**	0	0.0	19	82.6	0	0.0	4	17.4	0	0.0
05:00	**46**	0	0.0	42	91.3	0	0.0	4	8.7	0	0.0
06:00	**79**	0	0.0	68	86.1	6	7.6	5	6.3	0	0.0
07:00	**135**	3	2.2	112	83.0	11	8.2	6	4.4	3	2.2
08:00	**267**	3	1.1	239	89.5	16	6.0	8	3.0	1	0.4
09:00	**391**	2	0.5	356	91.1	18	4.6	13	3.3	2	0.5
10:00	**469**	3	0.6	429	91.5	17	3.6	18	3.8	2	0.4
11:00	**579**	4	0.7	541	93.4	18	3.1	15	2.6	1	0.2
12:00	**549**	2	0.4	512	93.3	17	3.1	18	3.3	0	0.0
13:00	**605**	5	0.8	566	93.6	12	2.0	21	3.5	1	0.2
14:00	**548**	6	1.1	519	94.7	11	2.0	12	2.2	0	0.0
15:00	**566**	5	0.9	539	95.2	9	1.6	11	1.9	2	0.4
16:00	**594**	1	0.2	563	94.8	14	2.4	14	2.4	2	0.3
17:00	**527**	4	0.8	499	94.7	12	2.3	11	2.1	1	0.2
18:00	**386**	2	0.5	367	95.1	6	1.6	11	2.9	0	0.0
19:00	**316**	0	0.0	295	93.4	9	2.9	11	3.5	1	0.3
20:00	**258**	3	1.2	246	95.4	4	1.6	4	1.6	1	0.4
21:00	**179**	1	0.6	163	91.1	10	5.6	4	2.2	1	0.6
22:00	**139**	4	2.9	127	91.4	2	1.4	6	4.3	0	0.0
23:00	**156**	1	0.6	142	91.0	8	5.1	3	1.9	2	1.3
12H,7-19	**5616**	**40**	**0.7**	**5242**	**93.3**	**161**	**2.9**	**158**	**2.8**	**15**	**0.3**
16H,6-22	**6448**	**44**	**0.7**	**6014**	**93.3**	**190**	**3.0**	**182**	**2.8**	**18**	**0.3**
18H,6-24	**6743**	**49**	**0.7**	**6283**	**93.2**	**200**	**3.0**	**191**	**2.8**	**20**	**0.3**
24H,0-24	**6979**	**52**	**0.8**	**6494**	**93.1**	**208**	**3.0**	**205**	**2.9**	**20**	**0.3**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Eastbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Sun 26-Apr-15											
00:00	**65**	0	0.0	63	96.9	0	0.0	2	3.1	0	0.0
01:00	**51**	0	0.0	51	100.0	0	0.0	0	0.0	0	0.0
02:00	**35**	1	2.9	33	94.3	1	2.9	0	0.0	0	0.0
03:00	**23**	0	0.0	23	100.0	0	0.0	0	0.0	0	0.0
04:00	**15**	1	6.7	12	80.0	1	6.7	1	6.7	0	0.0
05:00	**27**	1	3.7	23	85.2	1	3.7	2	7.4	0	0.0
06:00	**60**	0	0.0	55	91.7	2	3.3	3	5.0	0	0.0
07:00	**64**	2	3.1	59	92.2	2	3.1	1	1.6	0	0.0
08:00	**101**	1	1.0	89	88.1	6	5.9	5	5.0	0	0.0
09:00	**227**	8	3.5	210	92.5	2	0.9	6	2.6	1	0.4
10:00	**396**	6	1.5	365	92.2	11	2.8	12	3.0	2	0.5
11:00	**450**	3	0.7	423	94.0	13	2.9	11	2.4	0	0.0
12:00	**513**	5	1.0	486	94.7	10	2.0	11	2.1	1	0.2
13:00	**590**	3	0.5	569	96.4	11	1.9	7	1.2	0	0.0
14:00	**593**	4	0.7	566	95.5	14	2.4	8	1.4	1	0.2
15:00	**452**	2	0.4	436	96.5	8	1.8	6	1.3	0	0.0
16:00	**382**	1	0.3	367	96.1	6	1.6	7	1.8	1	0.3
17:00	**297**	2	0.7	283	95.3	5	1.7	5	1.7	2	0.7
18:00	**270**	2	0.7	258	95.6	7	2.6	3	1.1	0	0.0
19:00	**242**	2	0.8	231	95.5	5	2.1	3	1.2	1	0.4
20:00	**190**	1	0.5	182	95.8	0	0.0	7	3.7	0	0.0
21:00	**133**	2	1.5	125	94.0	3	2.3	3	2.3	0	0.0
22:00	**104**	2	1.9	94	90.4	5	4.8	3	2.9	0	0.0
23:00	**56**	0	0.0	53	94.6	1	1.8	1	1.8	1	1.8
12H,7-19	**4335**	**39**	**0.9**	**4111**	**94.8**	**95**	**2.2**	**82**	**1.9**	**8**	**0.2**
16H,6-22	**4960**	**44**	**0.9**	**4704**	**94.8**	**105**	**2.1**	**98**	**2.0**	**9**	**0.2**
18H,6-24	**5120**	**46**	**0.9**	**4851**	**94.8**	**111**	**2.2**	**102**	**2.0**	**10**	**0.2**
24H,0-24	**5336**	**49**	**0.9**	**5056**	**94.8**	**114**	**2.1**	**107**	**2.0**	**10**	**0.2**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Eastbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Mon 27-Apr-15											
00:00	**22**	1	4.6	19	86.4	0	0.0	2	9.1	0	0.0
01:00	**10**	0	0.0	9	90.0	1	10.0	0	0.0	0	0.0
02:00	**5**	0	0.0	5	100.0	0	0.0	0	0.0	0	0.0
03:00	**6**	0	0.0	5	83.3	1	16.7	0	0.0	0	0.0
04:00	**27**	3	11.1	10	37.0	2	7.4	12	44.4	0	0.0
05:00	**78**	2	2.6	69	88.5	1	1.3	6	7.7	0	0.0
06:00	**195**	4	2.1	156	80.0	16	8.2	15	7.7	4	2.1
07:00	**416**	6	1.4	365	87.7	18	4.3	23	5.5	4	1.0
08:00	**700**	7	1.0	645	92.1	19	2.7	28	4.0	1	0.1
09:00	**580**	10	1.7	498	85.9	41	7.1	29	5.0	2	0.3
10:00	**459**	7	1.5	378	82.4	37	8.1	36	7.8	1	0.2
11:00	**445**	3	0.7	365	82.0	31	7.0	41	9.2	5	1.1
12:00	**490**	7	1.4	419	85.5	29	5.9	29	5.9	6	1.2
13:00	**508**	1	0.2	435	85.6	44	8.7	25	4.9	3	0.6
14:00	**491**	3	0.6	418	85.1	31	6.3	33	6.7	6	1.2
15:00	**574**	11	1.9	493	85.9	40	7.0	28	4.9	2	0.4
16:00	**596**	6	1.0	537	90.1	31	5.2	18	3.0	4	0.7
17:00	**689**	7	1.0	636	92.3	32	4.6	12	1.7	2	0.3
18:00	**536**	4	0.8	503	93.8	12	2.2	16	3.0	1	0.2
19:00	**306**	4	1.3	279	91.2	16	5.2	5	1.6	2	0.7
20:00	**166**	0	0.0	153	92.2	8	4.8	4	2.4	1	0.6
21:00	**3**	2	66.7	1	33.3	0	0.0	0	0.0	0	0.0
22:00	**10**	3	30.0	4	40.0	3	30.0	0	0.0	0	0.0
23:00	**0**	0	-	0	-	0	-	0	-	0	-
12H,7-19	**6484**	**72**	**1.1**	**5692**	**87.8**	**365**	**5.6**	**318**	**4.9**	**37**	**0.6**
16H,6-22	**7154**	**82**	**1.2**	**6281**	**87.8**	**405**	**5.7**	**342**	**4.8**	**44**	**0.6**
18H,6-24	**7164**	**85**	**1.2**	**6285**	**87.7**	**408**	**5.7**	**342**	**4.8**	**44**	**0.6**
24H,0-24	**7312**	**91**	**1.2**	**6402**	**87.6**	**413**	**5.7**	**362**	**5.0**	**44**	**0.6**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Eastbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Tue 28-Apr-15											
00:00	**1**	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
01:00	**8**	1	12.5	5	62.5	2	25.0	0	0.0	0	0.0
02:00	**5**	0	0.0	4	80.0	1	20.0	0	0.0	0	0.0
03:00	**7**	0	0.0	5	71.4	1	14.3	1	14.3	0	0.0
04:00	**25**	2	8.0	12	48.0	0	0.0	11	44.0	0	0.0
05:00	**80**	1	1.3	74	92.5	1	1.3	4	5.0	0	0.0
06:00	**189**	10	5.3	137	72.5	20	10.6	19	10.1	3	1.6
07:00	**419**	6	1.4	364	86.9	22	5.3	24	5.7	3	0.7
08:00	**690**	2	0.3	647	93.8	15	2.2	21	3.0	5	0.7
09:00	**613**	6	1.0	536	87.4	36	5.9	30	4.9	5	0.8
10:00	**406**	10	2.5	334	82.3	31	7.6	29	7.1	2	0.5
11:00	**420**	2	0.5	341	81.2	39	9.3	35	8.3	3	0.7
12:00	**495**	2	0.4	415	83.8	40	8.1	35	7.1	3	0.6
13:00	**535**	4	0.8	461	86.2	36	6.7	31	5.8	3	0.6
14:00	**477**	5	1.1	400	83.9	36	7.6	33	6.9	3	0.6
15:00	**579**	6	1.0	507	87.6	39	6.7	23	4.0	4	0.7
16:00	**588**	5	0.9	530	90.1	27	4.6	24	4.1	2	0.3
17:00	**670**	7	1.0	629	93.9	25	3.7	8	1.2	1	0.2
18:00	**599**	10	1.7	559	93.3	10	1.7	19	3.2	1	0.2
19:00	**420**	5	1.2	384	91.4	16	3.8	15	3.6	0	0.0
20:00	**372**	5	1.3	351	94.4	4	1.1	11	3.0	1	0.3
21:00	**221**	1	0.5	208	94.1	6	2.7	6	2.7	0	0.0
22:00	**149**	1	0.7	138	92.6	4	2.7	5	3.4	1	0.7
23:00	**74**	1	1.4	65	87.8	2	2.7	6	8.1	0	0.0
12H,7-19	**6491**	**65**	**1.0**	**5723**	**88.2**	**356**	**5.5**	**312**	**4.8**	**35**	**0.5**
16H,6-22	**7693**	**86**	**1.1**	**6803**	**88.4**	**402**	**5.2**	**363**	**4.7**	**39**	**0.5**
18H,6-24	**7916**	**88**	**1.1**	**7006**	**88.5**	**408**	**5.2**	**374**	**4.7**	**40**	**0.5**
24H,0-24	**8042**	**92**	**1.1**	**7106**	**88.4**	**414**	**5.2**	**390**	**4.9**	**40**	**0.5**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Eastbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Wed 29-Apr-15											
00:00	**31**	1	3.2	28	90.3	0	0.0	2	6.5	0	0.0
01:00	**17**	0	0.0	17	100.0	0	0.0	0	0.0	0	0.0
02:00	**8**	0	0.0	6	75.0	1	12.5	1	12.5	0	0.0
03:00	**13**	0	0.0	11	84.6	1	7.7	1	7.7	0	0.0
04:00	**25**	2	8.0	13	52.0	0	0.0	10	40.0	0	0.0
05:00	**91**	1	1.1	78	85.7	3	3.3	9	9.9	0	0.0
06:00	**186**	6	3.2	151	81.2	11	5.9	15	8.1	3	1.6
07:00	**466**	5	1.1	403	86.5	23	4.9	32	6.9	3	0.6
08:00	**639**	7	1.1	596	93.3	18	2.8	16	2.5	2	0.3
09:00	**555**	3	0.5	486	87.6	33	6.0	30	5.4	3	0.5
10:00	**421**	3	0.7	365	86.7	27	6.4	24	5.7	2	0.5
11:00	**481**	1	0.2	403	83.8	36	7.5	39	8.1	2	0.4
12:00	**502**	2	0.4	411	81.9	41	8.2	43	8.6	5	1.0
13:00	**499**	3	0.6	422	84.6	38	7.6	31	6.2	5	1.0
14:00	**477**	2	0.4	417	87.4	24	5.0	31	6.5	3	0.6
15:00	**506**	6	1.2	447	88.3	27	5.3	22	4.4	4	0.8
16:00	**679**	4	0.6	615	90.6	34	5.0	23	3.4	3	0.4
17:00	**678**	5	0.7	627	92.5	23	3.4	22	3.2	1	0.2
18:00	**583**	8	1.4	550	94.3	12	2.1	13	2.2	0	0.0
19:00	**434**	4	0.9	401	92.4	13	3.0	14	3.2	2	0.5
20:00	**330**	2	0.6	316	95.8	3	0.9	9	2.7	0	0.0
21:00	**222**	7	3.2	205	92.3	8	3.6	2	0.9	0	0.0
22:00	**172**	2	1.2	157	91.3	8	4.7	5	2.9	0	0.0
23:00	**68**	3	4.4	57	83.8	4	5.9	2	2.9	2	2.9
12H,7-19	**6486**	**49**	**0.8**	**5742**	**88.5**	**336**	**5.2**	**326**	**5.0**	**33**	**0.5**
16H,6-22	**7658**	**68**	**0.9**	**6815**	**89.0**	**371**	**4.8**	**366**	**4.8**	**38**	**0.5**
18H,6-24	**7898**	**73**	**0.9**	**7029**	**89.0**	**383**	**4.9**	**373**	**4.7**	**40**	**0.5**
24H,0-24	**8083**	**77**	**1.0**	**7182**	**88.9**	**388**	**4.8**	**396**	**4.9**	**40**	**0.5**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Eastbound		

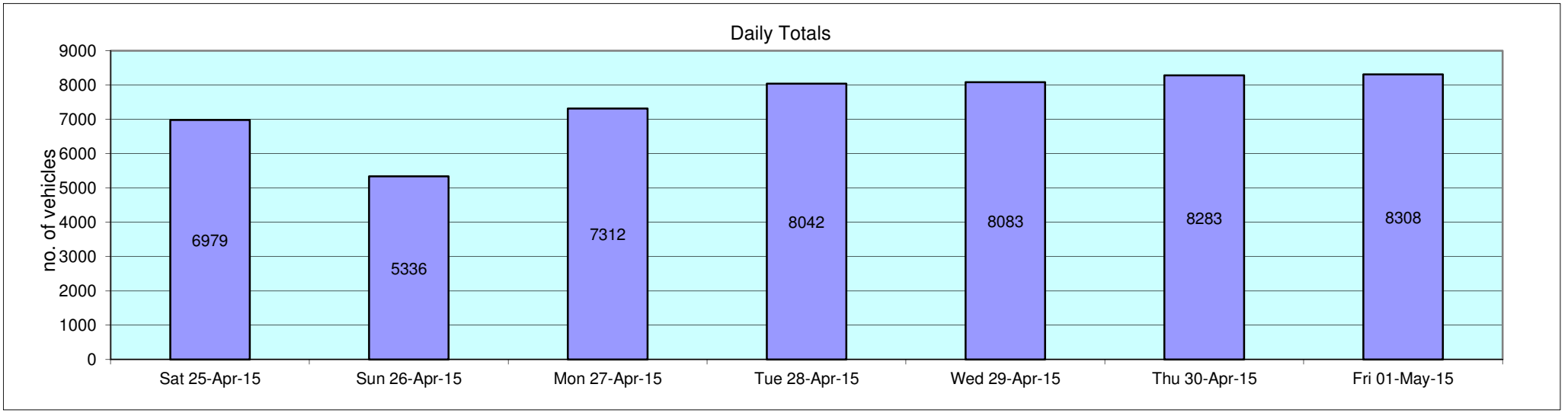
TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Thu 30-Apr-15											
00:00	**23**	0	0.0	21	91.3	0	0.0	1	4.4	1	4.4
01:00	**21**	1	4.8	20	95.2	0	0.0	0	0.0	0	0.0
02:00	**13**	0	0.0	12	92.3	0	0.0	1	7.7	0	0.0
03:00	**12**	1	8.3	9	75.0	1	8.3	1	8.3	0	0.0
04:00	**23**	2	8.7	11	47.8	1	4.4	9	39.1	0	0.0
05:00	**79**	2	2.5	69	87.3	1	1.3	7	8.9	0	0.0
06:00	**175**	6	3.4	137	78.3	14	8.0	14	8.0	4	2.3
07:00	**452**	13	2.9	388	85.8	19	4.2	27	6.0	5	1.1
08:00	**609**	12	2.0	545	89.5	29	4.8	22	3.6	1	0.2
09:00	**595**	3	0.5	507	85.2	42	7.1	39	6.6	4	0.7
10:00	**444**	3	0.7	379	85.4	31	7.0	30	6.8	1	0.2
11:00	**407**	1	0.3	344	84.5	26	6.4	30	7.4	6	1.5
12:00	**484**	5	1.0	424	87.6	20	4.1	32	6.6	3	0.6
13:00	**553**	4	0.7	484	87.5	29	5.2	30	5.4	6	1.1
14:00	**547**	7	1.3	473	86.5	33	6.0	26	4.8	8	1.5
15:00	**594**	12	2.0	510	85.9	38	6.4	28	4.7	6	1.0
16:00	**607**	8	1.3	534	88.0	30	4.9	33	5.4	2	0.3
17:00	**702**	5	0.7	645	91.9	35	5.0	16	2.3	1	0.1
18:00	**644**	5	0.8	591	91.8	29	4.5	15	2.3	4	0.6
19:00	**519**	4	0.8	479	92.3	23	4.4	12	2.3	1	0.2
20:00	**311**	1	0.3	288	92.6	11	3.5	10	3.2	1	0.3
21:00	**223**	0	0.0	208	93.3	10	4.5	5	2.2	0	0.0
22:00	**164**	1	0.6	151	92.1	5	3.1	7	4.3	0	0.0
23:00	**82**	1	1.2	73	89.0	2	2.4	5	6.1	1	1.2
12H,7-19	**6638**	**78**	**1.2**	**5824**	**87.7**	**361**	**5.4**	**328**	**4.9**	**47**	**0.7**
16H,6-22	**7866**	**89**	**1.1**	**6936**	**88.2**	**419**	**5.3**	**369**	**4.7**	**53**	**0.7**
18H,6-24	**8112**	**91**	**1.1**	**7160**	**88.3**	**426**	**5.3**	**381**	**4.7**	**54**	**0.7**
24H,0-24	**8283**	**97**	**1.2**	**7302**	**88.2**	**429**	**5.2**	**400**	**4.8**	**55**	**0.7**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Eastbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Fri 01-May-15											
00:00	**35**	1	2.9	31	88.6	0	0.0	3	8.6	0	0.0
01:00	**22**	1	4.6	19	86.4	0	0.0	2	9.1	0	0.0
02:00	**9**	0	0.0	8	88.9	1	11.1	0	0.0	0	0.0
03:00	**19**	0	0.0	17	89.5	0	0.0	2	10.5	0	0.0
04:00	**35**	1	2.9	21	60.0	2	5.7	11	31.4	0	0.0
05:00	**67**	1	1.5	55	82.1	1	1.5	10	14.9	0	0.0
06:00	**189**	7	3.7	150	79.4	14	7.4	14	7.4	4	2.1
07:00	**424**	7	1.7	372	87.7	19	4.5	24	5.7	2	0.5
08:00	**699**	8	1.1	646	92.4	20	2.9	23	3.3	2	0.3
09:00	**514**	4	0.8	455	88.5	31	6.0	19	3.7	5	1.0
10:00	**471**	5	1.1	392	83.2	31	6.6	38	8.1	5	1.1
11:00	**444**	2	0.5	366	82.4	34	7.7	39	8.8	3	0.7
12:00	**538**	3	0.6	451	83.8	45	8.4	34	6.3	5	0.9
13:00	**500**	5	1.0	428	85.6	39	7.8	24	4.8	4	0.8
14:00	**581**	9	1.6	506	87.1	31	5.3	31	5.3	4	0.7
15:00	**645**	10	1.6	565	87.6	36	5.6	32	5.0	2	0.3
16:00	**663**	4	0.6	606	91.4	31	4.7	19	2.9	3	0.5
17:00	**685**	7	1.0	631	92.1	28	4.1	18	2.6	1	0.2
18:00	**578**	3	0.5	547	94.6	13	2.3	15	2.6	0	0.0
19:00	**419**	3	0.7	384	91.7	15	3.6	15	3.6	2	0.5
20:00	**290**	3	1.0	268	92.4	8	2.8	10	3.5	1	0.3
21:00	**197**	1	0.5	182	92.4	7	3.6	7	3.6	0	0.0
22:00	**174**	4	2.3	157	90.2	5	2.9	8	4.6	0	0.0
23:00	**110**	0	0.0	102	92.7	2	1.8	6	5.5	0	0.0
12H,7-19	**6742**	**67**	**1.0**	**5965**	**88.5**	**358**	**5.3**	**316**	**4.7**	**36**	**0.5**
16H,6-22	**7837**	**81**	**1.0**	**6949**	**88.7**	**402**	**5.1**	**362**	**4.6**	**43**	**0.6**
18H,6-24	**8121**	**85**	**1.1**	**7208**	**88.8**	**409**	**5.0**	**376**	**4.6**	**43**	**0.5**
24H,0-24	**8308**	**89**	**1.1**	**7359**	**88.6**	**413**	**5.0**	**404**	**4.9**	**43**	**0.5**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Eastbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Daily Totals											
Sat 25-Apr-15	**6979**	52	0.8	6494	93.1	208	3.0	205	2.9	20	0.3
Sun 26-Apr-15	**5336**	49	0.9	5056	94.8	114	2.1	107	2.0	10	0.2
Mon 27-Apr-15	**7312**	91	1.2	6402	87.6	413	5.7	362	5.0	44	0.6
Tue 28-Apr-15	**8042**	92	1.1	7106	88.4	414	5.2	390	4.9	40	0.5
Wed 29-Apr-15	**8083**	77	1.0	7182	88.9	388	4.8	396	4.9	40	0.5
Thu 30-Apr-15	**8283**	97	1.2	7302	88.2	429	5.2	400	4.8	55	0.7
Fri 01-May-15	**8308**	89	1.1	7359	88.6	413	5.0	404	4.9	43	0.5
Total Vehicles											
[--]	**52343**	547	1.0	46901	89.9	2379	4.4	2264	4.2	252	0.5



18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Westbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Sat 25-Apr-15											
00:00	**80**	0	0.0	79	98.8	0	0.0	1	1.3	0	0.0
01:00	**66**	0	0.0	63	95.5	2	3.0	1	1.5	0	0.0
02:00	**27**	1	3.7	26	96.3	0	0.0	0	0.0	0	0.0
03:00	**34**	0	0.0	32	94.1	0	0.0	2	5.9	0	0.0
04:00	**27**	0	0.0	25	92.6	0	0.0	2	7.4	0	0.0
05:00	**60**	1	1.7	57	95.0	2	3.3	0	0.0	0	0.0
06:00	**132**	1	0.8	122	92.4	1	0.8	6	4.6	2	1.5
07:00	**193**	1	0.5	163	84.5	9	4.7	18	9.3	2	1.0
08:00	**381**	4	1.1	342	89.8	3	0.8	28	7.4	4	1.1
09:00	**517**	4	0.8	491	95.0	4	0.8	15	2.9	3	0.6
10:00	**574**	1	0.2	547	95.3	8	1.4	15	2.6	3	0.5
11:00	**650**	7	1.1	616	94.8	14	2.2	13	2.0	0	0.0
12:00	**725**	10	1.4	679	93.7	19	2.6	13	1.8	4	0.6
13:00	**620**	5	0.8	585	94.4	19	3.1	11	1.8	0	0.0
14:00	**647**	2	0.3	619	95.7	13	2.0	11	1.7	2	0.3
15:00	**598**	5	0.8	557	93.1	16	2.7	17	2.8	3	0.5
16:00	**587**	2	0.3	560	95.4	13	2.2	12	2.0	0	0.0
17:00	**573**	4	0.7	543	94.8	11	1.9	13	2.3	2	0.4
18:00	**431**	3	0.7	410	95.1	8	1.9	10	2.3	0	0.0
19:00	**316**	3	1.0	309	97.8	1	0.3	3	1.0	0	0.0
20:00	**290**	1	0.3	276	95.2	2	0.7	11	3.8	0	0.0
21:00	**212**	3	1.4	198	93.4	0	0.0	10	4.7	1	0.5
22:00	**159**	1	0.6	153	96.2	0	0.0	5	3.1	0	0.0
23:00	**159**	2	1.3	150	94.3	2	1.3	4	2.5	1	0.6
12H,7-19	**6496**	**48**	**0.7**	**6112**	**94.1**	**137**	**2.1**	**176**	**2.7**	**23**	**0.4**
16H,6-22	**7446**	**56**	**0.8**	**7017**	**94.2**	**141**	**1.9**	**206**	**2.8**	**26**	**0.4**
18H,6-24	**7764**	**59**	**0.8**	**7320**	**94.3**	**143**	**1.8**	**215**	**2.8**	**27**	**0.4**
24H,0-24	**8058**	**61**	**0.8**	**7602**	**94.3**	**147**	**1.8**	**221**	**2.7**	**27**	**0.3**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Westbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Sun 26-Apr-15											
00:00	**84**	1	1.2	78	92.9	0	0.0	5	6.0	0	0.0
01:00	**49**	1	2.0	48	98.0	0	0.0	0	0.0	0	0.0
02:00	**40**	0	0.0	37	92.5	0	0.0	3	7.5	0	0.0
03:00	**28**	0	0.0	27	96.4	1	3.6	0	0.0	0	0.0
04:00	**20**	0	0.0	19	95.0	1	5.0	0	0.0	0	0.0
05:00	**22**	0	0.0	22	100.0	0	0.0	0	0.0	0	0.0
06:00	**93**	2	2.2	86	92.5	0	0.0	5	5.4	0	0.0
07:00	**98**	2	2.0	90	91.8	1	1.0	5	5.1	0	0.0
08:00	**176**	3	1.7	154	87.5	3	1.7	15	8.5	1	0.6
09:00	**337**	3	0.9	311	92.3	5	1.5	18	5.3	0	0.0
10:00	**441**	8	1.8	414	93.9	4	0.9	15	3.4	0	0.0
11:00	**550**	6	1.1	527	95.8	9	1.6	8	1.5	0	0.0
12:00	**596**	3	0.5	577	96.8	7	1.2	8	1.3	1	0.2
13:00	**549**	8	1.5	523	95.3	4	0.7	14	2.6	0	0.0
14:00	**593**	2	0.3	574	96.8	8	1.4	8	1.4	1	0.2
15:00	**463**	4	0.9	445	96.1	8	1.7	6	1.3	0	0.0
16:00	**408**	2	0.5	393	96.3	8	2.0	5	1.2	0	0.0
17:00	**344**	3	0.9	332	96.5	3	0.9	6	1.7	0	0.0
18:00	**282**	3	1.1	275	97.5	1	0.4	2	0.7	1	0.4
19:00	**263**	1	0.4	254	96.6	2	0.8	6	2.3	0	0.0
20:00	**208**	1	0.5	198	95.2	0	0.0	9	4.3	0	0.0
21:00	**178**	2	1.1	170	95.5	0	0.0	5	2.8	1	0.6
22:00	**122**	3	2.5	112	91.8	2	1.6	5	4.1	0	0.0
23:00	**93**	3	3.2	88	94.6	0	0.0	2	2.2	0	0.0
12H,7-19	**4837**	**47**	**1.0**	**4615**	**95.4**	**61**	**1.3**	**110**	**2.3**	**4**	**0.1**
16H,6-22	**5579**	**53**	**1.0**	**5323**	**95.4**	**63**	**1.1**	**135**	**2.4**	**5**	**0.1**
18H,6-24	**5794**	**59**	**1.0**	**5523**	**95.3**	**65**	**1.1**	**142**	**2.5**	**5**	**0.1**
24H,0-24	**6037**	**61**	**1.0**	**5754**	**95.3**	**67**	**1.1**	**150**	**2.5**	**5**	**0.1**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Westbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Mon 27-Apr-15											
00:00	**26**	0	0.0	26	100.0	0	0.0	0	0.0	0	0.0
01:00	**12**	1	8.3	11	91.7	0	0.0	0	0.0	0	0.0
02:00	**7**	0	0.0	7	100.0	0	0.0	0	0.0	0	0.0
03:00	**26**	0	0.0	23	88.5	2	7.7	1	3.9	0	0.0
04:00	**16**	0	0.0	15	93.8	1	6.3	0	0.0	0	0.0
05:00	**106**	2	1.9	94	88.7	8	7.6	2	1.9	0	0.0
06:00	**290**	5	1.7	257	88.6	8	2.8	16	5.5	4	1.4
07:00	**628**	6	1.0	575	91.6	17	2.7	28	4.5	2	0.3
08:00	**828**	7	0.9	763	92.2	28	3.4	24	2.9	6	0.7
09:00	**514**	4	0.8	448	87.2	35	6.8	26	5.1	1	0.2
10:00	**468**	5	1.1	405	86.5	37	7.9	19	4.1	2	0.4
11:00	**479**	7	1.5	412	86.0	33	6.9	25	5.2	2	0.4
12:00	**545**	8	1.5	474	87.0	34	6.2	25	4.6	4	0.7
13:00	**567**	7	1.2	494	87.1	40	7.1	21	3.7	5	0.9
14:00	**552**	2	0.4	498	90.2	26	4.7	23	4.2	3	0.5
15:00	**609**	6	1.0	552	90.6	26	4.3	25	4.1	0	0.0
16:00	**704**	6	0.9	660	93.8	23	3.3	12	1.7	3	0.4
17:00	**835**	9	1.1	775	92.8	23	2.8	22	2.6	6	0.7
18:00	**646**	9	1.4	602	93.2	17	2.6	16	2.5	2	0.3
19:00	**450**	5	1.1	417	92.7	9	2.0	19	4.2	0	0.0
20:00	**142**	1	0.7	131	92.3	3	2.1	7	4.9	0	0.0
21:00	**7**	3	42.9	3	42.9	1	14.3	0	0.0	0	0.0
22:00	**5**	2	40.0	3	60.0	0	0.0	0	0.0	0	0.0
23:00	**3**	1	33.3	2	66.7	0	0.0	0	0.0	0	0.0
12H,7-19	**7375**	**76**	**1.0**	**6658**	**90.3**	**339**	**4.6**	**266**	**3.6**	**36**	**0.5**
16H,6-22	**8264**	**90**	**1.1**	**7466**	**90.3**	**360**	**4.4**	**308**	**3.7**	**40**	**0.5**
18H,6-24	**8272**	**93**	**1.1**	**7471**	**90.3**	**360**	**4.4**	**308**	**3.7**	**40**	**0.5**
24H,0-24	**8465**	**96**	**1.1**	**7647**	**90.3**	**371**	**4.4**	**311**	**3.7**	**40**	**0.5**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Westbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Tue 28-Apr-15											
00:00	**6**	1	16.7	4	66.7	1	16.7	0	0.0	0	0.0
01:00	**5**	0	0.0	3	60.0	1	20.0	1	20.0	0	0.0
02:00	**7**	0	0.0	6	85.7	1	14.3	0	0.0	0	0.0
03:00	**33**	0	0.0	30	90.9	2	6.1	1	3.0	0	0.0
04:00	**29**	0	0.0	26	89.7	1	3.5	2	6.9	0	0.0
05:00	**115**	3	2.6	101	87.8	4	3.5	5	4.4	2	1.7
06:00	**312**	4	1.3	282	90.4	4	1.3	21	6.7	1	0.3
07:00	**641**	6	0.9	591	92.2	8	1.3	33	5.2	3	0.5
08:00	**822**	4	0.5	770	93.7	18	2.2	29	3.5	1	0.1
09:00	**536**	6	1.1	488	91.0	22	4.1	17	3.2	3	0.6
10:00	**508**	3	0.6	443	87.2	31	6.1	28	5.5	3	0.6
11:00	**503**	1	0.2	443	88.1	33	6.6	21	4.2	5	1.0
12:00	**555**	3	0.5	474	85.4	41	7.4	31	5.6	6	1.1
13:00	**575**	4	0.7	508	88.4	36	6.3	18	3.1	9	1.6
14:00	**575**	5	0.9	522	90.8	22	3.8	22	3.8	4	0.7
15:00	**594**	1	0.2	531	89.4	33	5.6	26	4.4	3	0.5
16:00	**652**	1	0.2	607	93.1	25	3.8	19	2.9	0	0.0
17:00	**899**	9	1.0	844	93.9	15	1.7	28	3.1	3	0.3
18:00	**720**	8	1.1	680	94.4	15	2.1	16	2.2	1	0.1
19:00	**452**	4	0.9	434	96.0	2	0.4	12	2.7	0	0.0
20:00	**298**	3	1.0	280	94.0	2	0.7	12	4.0	1	0.3
21:00	**254**	4	1.6	241	94.9	1	0.4	8	3.2	0	0.0
22:00	**185**	3	1.6	171	92.4	1	0.5	10	5.4	0	0.0
23:00	**89**	2	2.3	80	89.9	3	3.4	4	4.5	0	0.0
12H,7-19	**7580**	**51**	**0.7**	**6901**	**91.0**	**299**	**3.9**	**288**	**3.8**	**41**	**0.5**
16H,6-22	**8896**	**66**	**0.7**	**8138**	**91.5**	**308**	**3.5**	**341**	**3.8**	**43**	**0.5**
18H,6-24	**9170**	**71**	**0.8**	**8389**	**91.5**	**312**	**3.4**	**355**	**3.9**	**43**	**0.5**
24H,0-24	**9365**	**75**	**0.8**	**8559**	**91.4**	**322**	**3.4**	**364**	**3.9**	**45**	**0.5**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Westbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Wed 29-Apr-15											
00:00	**34**	2	5.9	29	85.3	0	0.0	3	8.8	0	0.0
01:00	**34**	1	2.9	31	91.2	0	0.0	2	5.9	0	0.0
02:00	**8**	0	0.0	8	100.0	0	0.0	0	0.0	0	0.0
03:00	**27**	0	0.0	24	88.9	1	3.7	2	7.4	0	0.0
04:00	**40**	0	0.0	37	92.5	1	2.5	2	5.0	0	0.0
05:00	**105**	3	2.9	96	91.4	2	1.9	4	3.8	0	0.0
06:00	**294**	5	1.7	258	87.8	10	3.4	18	6.1	3	1.0
07:00	**660**	3	0.5	609	92.3	14	2.1	34	5.2	0	0.0
08:00	**895**	5	0.6	838	93.6	11	1.2	38	4.3	3	0.3
09:00	**515**	3	0.6	474	92.0	19	3.7	17	3.3	2	0.4
10:00	**543**	3	0.6	486	89.5	18	3.3	32	5.9	4	0.7
11:00	**477**	0	0.0	434	91.0	6	1.3	32	6.7	5	1.1
12:00	**606**	1	0.2	554	91.4	14	2.3	35	5.8	2	0.3
13:00	**553**	2	0.4	509	92.0	20	3.6	19	3.4	3	0.5
14:00	**586**	2	0.3	532	90.8	24	4.1	25	4.3	3	0.5
15:00	**558**	1	0.2	509	91.2	28	5.0	17	3.1	3	0.5
16:00	**637**	4	0.6	595	93.4	17	2.7	18	2.8	3	0.5
17:00	**818**	3	0.4	778	95.1	14	1.7	23	2.8	0	0.0
18:00	**667**	12	1.8	625	93.7	12	1.8	18	2.7	0	0.0
19:00	**470**	12	2.6	424	90.2	6	1.3	27	5.7	1	0.2
20:00	**329**	4	1.2	316	96.1	1	0.3	8	2.4	0	0.0
21:00	**240**	3	1.3	219	91.3	2	0.8	15	6.3	1	0.4
22:00	**221**	2	0.9	204	92.3	3	1.4	11	5.0	1	0.5
23:00	**105**	2	1.9	98	93.3	4	3.8	1	1.0	0	0.0
12H,7-19	**7515**	**39**	**0.5**	**6943**	**92.4**	**197**	**2.6**	**308**	**4.1**	**28**	**0.4**
16H,6-22	**8848**	**63**	**0.7**	**8160**	**92.2**	**216**	**2.4**	**376**	**4.3**	**33**	**0.4**
18H,6-24	**9174**	**67**	**0.7**	**8462**	**92.2**	**223**	**2.4**	**388**	**4.2**	**34**	**0.4**
24H,0-24	**9422**	**73**	**0.8**	**8687**	**92.2**	**227**	**2.4**	**401**	**4.3**	**34**	**0.4**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Westbound		

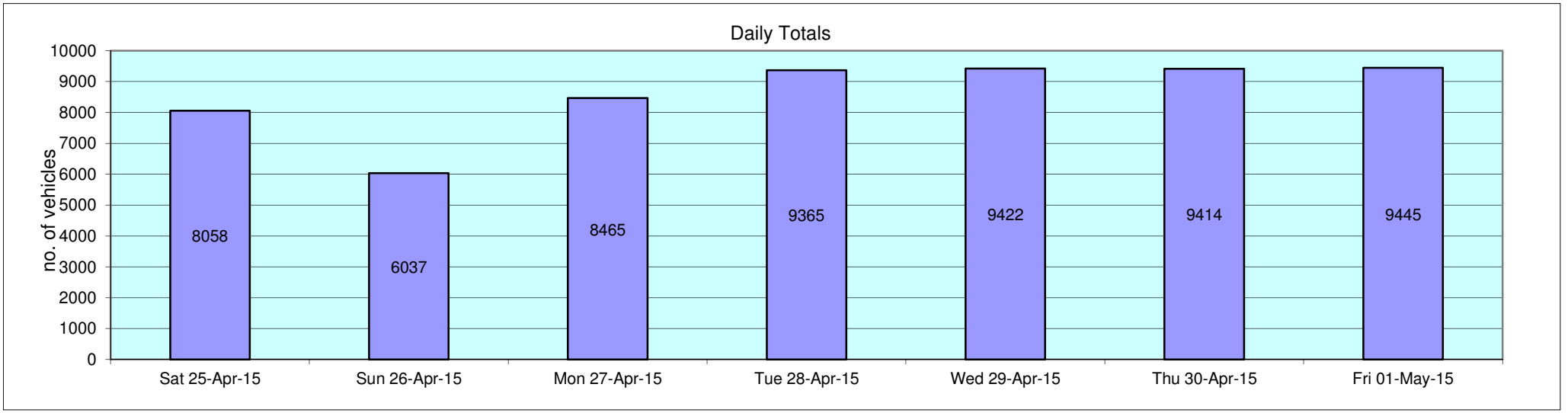
TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Thu 30-Apr-15											
00:00	**40**	1	2.5	36	90.0	1	2.5	2	5.0	0	0.0
01:00	**15**	0	0.0	14	93.3	1	6.7	0	0.0	0	0.0
02:00	**17**	0	0.0	17	100.0	0	0.0	0	0.0	0	0.0
03:00	**24**	0	0.0	23	95.8	1	4.2	0	0.0	0	0.0
04:00	**38**	1	2.6	32	84.2	3	7.9	2	5.3	0	0.0
05:00	**82**	3	3.7	71	86.6	6	7.3	2	2.4	0	0.0
06:00	**303**	5	1.7	266	87.8	16	5.3	14	4.6	2	0.7
07:00	**649**	3	0.5	604	93.1	13	2.0	29	4.5	0	0.0
08:00	**886**	11	1.2	808	91.2	29	3.3	32	3.6	6	0.7
09:00	**543**	6	1.1	470	86.6	34	6.3	31	5.7	2	0.4
10:00	**494**	7	1.4	422	85.4	46	9.3	19	3.9	0	0.0
11:00	**508**	4	0.8	444	87.4	31	6.1	26	5.1	3	0.6
12:00	**586**	4	0.7	526	89.8	29	5.0	25	4.3	2	0.3
13:00	**594**	6	1.0	529	89.1	31	5.2	24	4.0	4	0.7
14:00	**609**	4	0.7	539	88.5	37	6.1	27	4.4	2	0.3
15:00	**570**	5	0.9	503	88.3	35	6.1	22	3.9	5	0.9
16:00	**671**	9	1.3	616	91.8	22	3.3	22	3.3	2	0.3
17:00	**815**	7	0.9	771	94.6	15	1.8	18	2.2	4	0.5
18:00	**611**	12	2.0	575	94.1	13	2.1	11	1.8	0	0.0
19:00	**477**	2	0.4	459	96.2	11	2.3	5	1.1	0	0.0
20:00	**304**	2	0.7	289	95.1	6	2.0	6	2.0	1	0.3
21:00	**276**	3	1.1	254	92.0	8	2.9	11	4.0	0	0.0
22:00	**219**	9	4.1	202	92.2	0	0.0	7	3.2	1	0.5
23:00	**83**	2	2.4	74	89.2	1	1.2	5	6.0	1	1.2
12H,7-19	**7536**	**78**	**1.0**	**6807**	**90.3**	**335**	**4.5**	**286**	**3.8**	**30**	**0.4**
16H,6-22	**8896**	**90**	**1.0**	**8075**	**90.8**	**376**	**4.2**	**322**	**3.6**	**33**	**0.4**
18H,6-24	**9198**	**101**	**1.1**	**8351**	**90.8**	**377**	**4.1**	**334**	**3.6**	**35**	**0.4**
24H,0-24	**9414**	**106**	**1.1**	**8544**	**90.8**	**389**	**4.1**	**340**	**3.6**	**35**	**0.4**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Westbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Fri 01-May-15											
00:00	**44**	0	0.0	38	86.4	1	2.3	5	11.4	0	0.0
01:00	**21**	0	0.0	20	95.2	0	0.0	1	4.8	0	0.0
02:00	**16**	0	0.0	16	100.0	0	0.0	0	0.0	0	0.0
03:00	**29**	0	0.0	27	93.1	2	6.9	0	0.0	0	0.0
04:00	**45**	1	2.2	40	88.9	2	4.4	2	4.4	0	0.0
05:00	**108**	3	2.8	94	87.0	5	4.6	6	5.6	0	0.0
06:00	**325**	3	0.9	285	87.7	14	4.3	22	6.8	1	0.3
07:00	**648**	5	0.8	602	92.9	8	1.2	33	5.1	0	0.0
08:00	**817**	6	0.7	751	91.9	15	1.8	43	5.3	2	0.2
09:00	**534**	4	0.8	485	90.8	27	5.1	17	3.2	1	0.2
10:00	**488**	8	1.6	426	87.3	33	6.8	20	4.1	1	0.2
11:00	**532**	1	0.2	474	89.1	41	7.7	15	2.8	1	0.2
12:00	**561**	8	1.4	490	87.3	35	6.2	25	4.5	3	0.5
13:00	**597**	6	1.0	518	86.8	48	8.0	23	3.9	2	0.3
14:00	**572**	5	0.9	508	88.8	29	5.1	26	4.6	4	0.7
15:00	**625**	3	0.5	572	91.5	32	5.1	18	2.9	0	0.0
16:00	**828**	9	1.1	771	93.1	22	2.7	23	2.8	3	0.4
17:00	**756**	9	1.2	714	94.4	14	1.9	17	2.3	2	0.3
18:00	**582**	8	1.4	542	93.1	16	2.8	14	2.4	2	0.3
19:00	**455**	3	0.7	438	96.3	5	1.1	9	2.0	0	0.0
20:00	**306**	5	1.6	290	94.8	2	0.7	9	2.9	0	0.0
21:00	**244**	2	0.8	225	92.2	7	2.9	10	4.1	0	0.0
22:00	**176**	2	1.1	161	91.5	2	1.1	11	6.3	0	0.0
23:00	**136**	0	0.0	128	94.1	3	2.2	5	3.7	0	0.0
12H,7-19	**7540**	**72**	**1.0**	**6853**	**90.9**	**320**	**4.2**	**274**	**3.6**	**21**	**0.3**
16H,6-22	**8870**	**85**	**1.0**	**8091**	**91.2**	**348**	**3.9**	**324**	**3.7**	**22**	**0.3**
18H,6-24	**9182**	**87**	**1.0**	**8380**	**91.3**	**353**	**3.8**	**340**	**3.7**	**22**	**0.2**
24H,0-24	**9445**	**91**	**1.0**	**8615**	**91.2**	**363**	**3.8**	**354**	**3.8**	**22**	**0.2**

18774	ST ALBANS	Site No: 18774001	Location	Hatfield Road, St Albans (TG Pole)
Sat 25-Apr-15 to Fri 01-May-15		Channel: Westbound		

TIME PERIOD	TOTAL VEHICLES	MOTOR-CYCLES	MOTOR-CYCLES%	CARS	CARS %	LGV	LGV %	HGV	HGV %	BUS	BUS %
Daily Totals											
Sat 25-Apr-15	**8058**	61	0.8	7602	94.3	147	1.8	221	2.7	27	0.3
Sun 26-Apr-15	**6037**	61	1.0	5754	95.3	67	1.1	150	2.5	5	0.1
Mon 27-Apr-15	**8465**	96	1.1	7647	90.3	371	4.4	311	3.7	40	0.5
Tue 28-Apr-15	**9365**	75	0.8	8559	91.4	322	3.4	364	3.9	45	0.5
Wed 29-Apr-15	**9422**	73	0.8	8687	92.2	227	2.4	401	4.3	34	0.4
Thu 30-Apr-15	**9414**	106	1.1	8544	90.8	389	4.1	340	3.6	35	0.4
Fri 01-May-15	**9445**	91	1.0	8615	91.2	363	3.8	354	3.8	22	0.2
Total Vehicles											
[--]	**60206**	563	0.9	55408	92.2	1886	3.0	2141	3.5	208	0.3



A1057 Hatfield Road Smallford

Legend

Accidents by Severity from 1 Jan 2016 to 31 Dec 2020

- Fatal
- Serious
- Slight

Selection Boundary

N
W E
S

University of Hertfordshire Dehavilland Campus

Sports Facility

Bowling Club

ELLENBROOK

Radio Nursery

The Three Horseshoes

Wilkin's Green

Hertfordshire

Ref:25079			
	Prepared	Checked	Approved
Initials	AN	AN	
Date	14/06/2021	14/06/2021	

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Full Non Confidential Accident Report

Date Produced: *14-Jun-21*

Set Name (if saved) : 25079 **Set Total :** 10

Accident Details:

Acc Ref:	2019-410828884	**1st / 2nd Rd:**	A1057/5 C61/20	**Jun Detail:**	R/bout	**Weather:**	Fine	**Num Cas:**	1
Day of Week:	Fri	**Parish:**		**Jun Control:**	Giveway	**Light:**	Darklit	**Num Peds:**	0
Date:	01/03/2019 19:05:00	**District:**	StAlbs	**Spec Conditions:**	None	**Road Surface:**	Dry	**Num Vehicles:**	2
Acc Severity:	Slight	**Speed Limit:**	40mph	**C/way Hazard:**	None	**C/way Type:**	R/bout	**Ped Xing:**	Npernox
A1057 Hatfield Road Rbt Smallford J/w C61 Station Road								**On Site:**	Yes

Easting: 519530 **Northing:** 207652

Casualty Details

Acc Ref:	2019-410828884	**Cas Class:**	Driver	**Car Passenger:**	No	**Cas Severity:**	Slight	**Ped Movement:**	Notped
Veh Ref:	1	**Cas Age:**	71	**PSV Passenger:**	No	**Road User Class:**	Car Users	**Ped Location:**	Notped
Cas Ref:	1	**Cas Gender:**	Female	**Seat Belt:**	Wornnot	**School Pupil:**		**Ped Work on Rd:**	Notped

Vehicle Details

Acc Ref:	152636	**Maneouvre:**	Starting	**Skiding:**	None	**Impact Point:**	Offside	**Driver Breath Test:**	Notreq	**Driver Age:**	71
Veh Ref:	1	**Location:**	Carw	**Object in Cway:**	None	**From:**	Se	**Hit and Run:**	Nothtrun		
Veh Type:	Car	**Junction:**	Er/about	**Object off Cway**	None	**To:**	Nw	**Driver Gender:**	Female		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Other	**Driver Severity:**	Slight		
Acc Ref:		**Maneouvre:**	Starting	**Skiding:**	Skidded	**Impact Point:**	Front	**Driver Breath Test:**	Notreq	**Driver Age:**	45
Veh Ref:	2	**Location:**	Carw	**Object in Cway:**	None	**From:**	Ne	**Hit and Run:**	Nothtrun		
Veh Type:	Car	**Junction:**	Middle	**Object off Cway**	None	**To:**	Sw	**Driver Gender:**	Male		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Other	**Driver Severity:**	None		

Accident Details:

Acc Ref:	2016-410070241	**1st / 2nd Rd:**	A1057/5 C61/20	**Jun Detail:**	R/bout	**Weather:**	Fine	**Num Cas:**	1
Day of Week:	Sun	**Parish:**		**Jun Control:**	Giveway	**Light:**	Day	**Num Peds:**	0
Date:	01/05/2016 12:00:00	**District:**	StAlbs	**Spec Conditions:**	None	**Road Surface:**	Dry	**Num Vehicles:**	2
Acc Severity:	Slight	**Speed Limit:**	40mph	**C/way Hazard:**	None	**C/way Type:**	R/bout	**Ped Xing:**	Nperzebx
A1057 Hatfield Road Smallford On Smallford Rbt J/w C61 Station Road								**On Site:**	Yes

Easting: 519530 **Northing:** 207650

Casualty Details

Acc Ref:	2016-410070241	**Cas Class:**	Driver	**Car Passenger:**	No	**Cas Severity:**	Slight	**Ped Movement:**	Notped
Veh Ref:	2	**Cas Age:**	18	**PSV Passenger:**	No	**Road User Class:**	Motorcyclists	**Ped Location:**	Notped
Cas Ref:	1	**Cas Gender:**	Male	**Seat Belt:**	Notapp	**School Pupil:**		**Ped Work on Rd:**	Notped

Vehicle Details

Acc Ref:	146047	**Maneouvre:**	Ahead	**Skiding:**	None	**Impact Point:**	Front	**Driver Breath Test:**	Notreq	**Driver Age:**	59
Veh Ref:	1	**Location:**	Carw	**Object in Cway:**	None	**From:**	E	**Hit and Run:**	Nothtrun		
Veh Type:	Car	**Junction:**	Middle	**Object off Cway**	None	**To:**	W	**Driver Gender:**	Male		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Other	**Driver Severity:**	None		
Acc Ref:		**Maneouvre:**	Turnleft	**Skiding:**	None	**Impact Point:**	Front	**Driver Breath Test:**	Notreq	**Driver Age:**	18
Veh Ref:	2	**Location:**	Carw	**Object in Cway:**	None	**From:**	S	**Hit and Run:**	Nothtrun		
Veh Type:	Mc<=125	**Junction:**	Er/about	**Object off Cway**	None	**To:**	W	**Driver Gender:**	Male		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Other	**Driver Severity:**	Slight		

Accident Details:

Acc Ref:	2016-410066193	**1st / 2nd Rd:**	A1057/5 C61/20	**Jun Detail:**	R/bout	**Weather:**	Fine	**Num Cas:**	2
Day of Week:	Thu	**Parish:**		**Jun Control:**	Giveway	**Light:**	Darklit	**Num Peds:**	0
Date:	12/05/2016 20:46:00	**District:**	StAlbs	**Spec Conditions:**	None	**Road Surface:**	Dry	**Num Vehicles:**	2
Acc Severity:	Serious	**Speed Limit:**	40mph	**C/way Hazard:**	None	**C/way Type:**	R/bout	**Ped Xing:**	Npernox
A1057 Smallford Rbt St Albans J/w C161 Station Road								**On Site:**	Yes

Easting: 519534 **Northing:** 207653

Casualty Details

Acc Ref:	2016-410066193	**Cas Class:**	Driver	**Car Passenger:**	No	**Cas Severity:**	Slight	**Ped Movement:**	Notped
Veh Ref:	1	**Cas Age:**	68	**PSV Passenger:**	No	**Road User Class:**	Car Users	**Ped Location:**	Notped
Cas Ref:	1	**Cas Gender:**	Male	**Seat Belt:**	Unknown	**School Pupil:**		**Ped Work on Rd:**	Notped
Acc Ref:	2016-410066193	**Cas Class:**	Driver	**Car Passenger:**	No	**Cas Severity:**	Serious	**Ped Movement:**	Notped
Veh Ref:	2	**Cas Age:**	19	**PSV Passenger:**	No	**Road User Class:**	Motorcyclists	**Ped Location:**	Notped
Cas Ref:	2	**Cas Gender:**	Male	**Seat Belt:**	Notapp	**School Pupil:**		**Ped Work on Rd:**	Notped

Vehicle Details

Acc Ref:	146006	**Maneouvre:**	Ahead	**Skiding:**	None	**Impact Point:**	Offside	**Driver Breath Test:**	Negati	**Driver Age:**	68
Veh Ref:	1	**Location:**	Carw	**Object in Cway:**	None	**From:**	Se	**Hit and Run:**	Nothtrun		
Veh Type:	Car	**Junction:**	Middle	**Object off Cway**	None	**To:**	Nw	**Driver Gender:**	Male		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Unknown	**Driver Severity:**	Slight		
Acc Ref:		**Maneouvre:**	Ahead	**Skiding:**	None	**Impact Point:**	Front	**Driver Breath Test:**	Ntprov	**Driver Age:**	19
Veh Ref:	2	**Location:**	Carw	**Object in Cway:**	None	**From:**	Ne	**Hit and Run:**	Nothtrun		
Veh Type:	Mc<=125	**Junction:**	Middle	**Object off Cway**	None	**To:**	Sw	**Driver Gender:**	Male		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Unknown	**Driver Severity:**	Serious		

Accident Details:

Acc Ref:	2017-410248241	**1st / 2nd Rd:**	A1057/6 NONE	**Jun Detail:**	Notjunct	**Weather:**	Fine	**Num Cas:**	1
Day of Week:	Thu	**Parish:**		**Jun Control:**	Notjunct	**Light:**	Day	**Num Peds:**	0
Date:	16/11/2017 13:36:00	**District:**	StAlbs	**Spec Conditions:**	None	**Road Surface:**	Dry	**Num Vehicles:**	2
Acc Severity:	Serious	**Speed Limit:**	30mph	**C/way Hazard:**	None	**C/way Type:**	Single	**Ped Xing:**	Npernox

A1057 Hatfield Road St Albans Exact Location Not Given Gridded Approx 170m Ne Rbt J/w Station Road **On Site:** Yes

Easting: 519690 **Northing:** 207728

Casualty Details

Acc Ref:	2017-410248241	**Cas Class:**	Driver	**Car Passenger:**	No	**Cas Severity:**	Serious	**Ped Movement:**	Notped
Veh Ref:	2	**Cas Age:**	24	**PSV Passenger:**	No	**Road User Class:**	Goods Vehicles	**Ped Location:**	Notped
Cas Ref:	1	**Cas Gender:**	Male	**Seat Belt:**	Unknown	**School Pupil:**		**Ped Work on Rd:**	Notped

Vehicle Details

Acc Ref:	150266	**Maneouvre:**	Stopping	**Skiding:**	None	**Impact Point:**	Back	**Driver Breath Test:**	Notreq	**Driver Age:**	54
Veh Ref:	1	**Location:**	Carw	**Object in Cway:**	None	**From:**	Ne	**Hit and Run:**	Nothtrun		
Veh Type:	Goodsuk	**Junction:**	Notjunct	**Object off Cway**	None	**To:**	Sw	**Driver Gender:**	Male		
Foreign Veh:		**Towing;**	None	**velcwy**	Nearside	**J Purpose:**	Work	**Driver Severity:**	None		

Acc Ref:		**Maneouvre:**	Ahead	**Skiding:**	Skidded	**Impact Point:**	Front	**Driver Breath Test:**	Notcon	**Driver Age:**	24
Veh Ref:	2	**Location:**	Carw	**Object in Cway:**	None	**From:**	Ne	**Hit and Run:**	Nothtrun		
Veh Type:	Gdltwght	**Junction:**	Notjunct	**Object off Cway**	None	**To:**	Sw	**Driver Gender:**	Male		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Work	**Driver Severity:**	Serious		

Accident Details:

Acc Ref:	2019-410818811	**1st / 2nd Rd:**	A1057/7 0U617/1	**Jun Detail:**	T	**Weather:**	Fine	**Num Cas:**	1
Day of Week:	Wed	**Parish:**		**Jun Control:**	Giveway	**Light:**	Day	**Num Peds:**	0
Date:	23/01/2019 15:20:00	**District:**	WelHat	**Spec Conditions:**	None	**Road Surface:**	Dry	**Num Vehicles:**	3
Acc Severity:	Serious	**Speed Limit:**	40mph	**C/way Hazard:**	None	**C/way Type:**	Single	**Ped Xing:**	Npernox

A1057 St Albans Road West Hatfield At Bus Stop Approx 15m Ne J/w U617 St Albans Road West **On Site:** No

Easting: 520373 **Northing:** 208107

Casualty Details

Acc Ref:	2019-410818811	**Cas Class:**	Passenge	**Car Passenger:**	Frontsea	**Cas Severity:**	Serious	**Ped Movement:**	Notped
Veh Ref:	2	**Cas Age:**	10	**PSV Passenger:**	No	**Road User Class:**	Car Users	**Ped Location:**	Notped
Cas Ref:	1	**Cas Gender:**	Female	**Seat Belt:**	Wornnot	**School Pupil:**		**Ped Work on Rd:**	Notped

Vehicle Details

Acc Ref:	154105	**Maneouvre:**	Stopping	**Skiding:**	None	**Impact Point:**	Front	**Driver Breath Test:**	Negati	**Driver Age:**	29
Veh Ref:	1	**Location:**	Carw	**Object in Cway:**	None	**From:**	Sw	**Hit and Run:**	Nothtrun		
Veh Type:	Car	**Junction:**	Exit	**Object off Cway**	None	**To:**	Ne	**Driver Gender:**	Female		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Other	**Driver Severity:**	None		
Acc Ref:		**Maneouvre:**	Stopping	**Skiding:**	None	**Impact Point:**	Back	**Driver Breath Test:**	Negati	**Driver Age:**	18
Veh Ref:	2	**Location:**	Carw	**Object in Cway:**	None	**From:**	Sw	**Hit and Run:**	Nothtrun		
Veh Type:	Car	**Junction:**	Exit	**Object off Cway**	None	**To:**	Ne	**Driver Gender:**	Female		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Other	**Driver Severity:**	None		
Acc Ref:		**Maneouvre:**	Waitahea	**Skiding:**	None	**Impact Point:**	Back	**Driver Breath Test:**	Negati	**Driver Age:**	24
Veh Ref:	3	**Location:**	Carw	**Object in Cway:**	None	**From:**	Sw	**Hit and Run:**	Nothtrun		
Veh Type:	Gdhvwght	**Junction:**	Exit	**Object off Cway**	None	**To:**	Ne	**Driver Gender:**	Male		
Foreign Veh:		**Towing;**	Articula	**velcwy**	No	**J Purpose:**	Work	**Driver Severity:**	None		

Accident Details:

Acc Ref: 2018-410806883	**1st / 2nd Rd:** A1057/7 NONE	**Jun Detail:** Notjunct	**Weather:** Fine	**Num Cas:** 1
Day of Week: Thu	**Parish:**	**Jun Control:** Notjunct	**Light:** Day	**Num Peds:** 0
Date: 20/12/2018 08:24:00	**District:** WelHat	**Spec Conditions:** None	**Road Surface:** Wet	**Num Vehicles:** 3
Acc Severity: Slight	**Speed Limit:** 30mph	**C/way Hazard:** None	**C/way Type:** Single	**Ped Xing:** Npernox
A1057 St Albans Road West Hatfield At Bus Stop Approx 95m East J/w057 Ellenbrook Lane Rbt				**On Site:** Yes

Easting: 520715 **Northing:** 208196

Casualty Details

Acc Ref: 2018-410806883	**Cas Class:** Driver	**Car Passenger:** No	**Cas Severity:** Slight	**Ped Movement:** Notped
Veh Ref: 2	**Cas Age:** 19	**PSV Passenger:** No	**Road User Class:** Car Users	**Ped Location:** Notped
Cas Ref: 1	**Cas Gender:** Female	**Seat Belt:** Wornnot	**School Pupil:**	**Ped Work on Rd:** Notped

Vehicle Details

Acc Ref:	152177	**Maneouvre:**	Stopping	**Skiding:**	None	**Impact Point:**	Front	**Driver Breath Test:**	Negati	**Driver Age:**	26
Veh Ref:	1	**Location:**	Carw	**Object in Cway:**	None	**From:**	E	**Hit and Run:**	Nothtrun		
Veh Type:	Car	**Junction:**	Notjunct	**Object off Cway**	None	**To:**	W	**Driver Gender:**	Male		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Other	**Driver Severity:**	None		
Acc Ref:		**Maneouvre:**	Waitahea	**Skiding:**	None	**Impact Point:**	Back	**Driver Breath Test:**	Negati	**Driver Age:**	19
Veh Ref:	2	**Location:**	Carw	**Object in Cway:**	None	**From:**	E	**Hit and Run:**	Nothtrun		
Veh Type:	Car	**Junction:**	Notjunct	**Object off Cway**	None	**To:**	W	**Driver Gender:**	Female		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Tofrowrk	**Driver Severity:**	Slight		
Acc Ref:		**Maneouvre:**	Waitahea	**Skiding:**	None	**Impact Point:**	Back	**Driver Breath Test:**	Notcon	**Driver Age:**	48
Veh Ref:	3	**Location:**	Carw	**Object in Cway:**	None	**From:**	E	**Hit and Run:**	Nothtrun		
Veh Type:	Car	**Junction:**	Notjunct	**Object off Cway**	None	**To:**	W	**Driver Gender:**	Male		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Tofrowrk	**Driver Severity:**	None		

Accident Details:

Acc Ref:	2019-410917460	**1st / 2nd Rd:**	A1057/7 A1057/7	**Jun Detail:**	R/bout	**Weather:**	Fine	**Num Cas:**	1
Day of Week:	Fri	**Parish:**		**Jun Control:**	Giveway	**Light:**	Day	**Num Peds:**	0
Date:	08/11/2019 14:20:00	**District:**	WelHat	**Spec Conditions:**	None	**Road Surface:**	Dry	**Num Vehicles:**	2
Acc Severity:	Slight	**Speed Limit:**	30mph	**C/way Hazard:**	None	**C/way Type:**	R/bout	**Ped Xing:**	Npernox
A1057 Ellenbrook Road Rbt Hatfield J/w A1057 St Albans Road West								**On Site:**	Yes
Easting:	520799	**Northing:**	208217						

Casualty Details

Acc Ref:	2019-410917460	**Cas Class:**	Driver	**Car Passenger:**	No	**Cas Severity:**	Slight	**Ped Movement:**	Notped
Veh Ref:	2	**Cas Age:**	53	**PSV Passenger:**	No	**Road User Class:**	Cyclists	**Ped Location:**	Notped
Cas Ref:	1	**Cas Gender:**	Male	**Seat Belt:**	Notapp	**School Pupil:**		**Ped Work on Rd:**	Notped

Vehicle Details

Acc Ref:	154111	**Maneouvre:**	Ahead	**Skiding:**	None	**Impact Point:**	Front	**Driver Breath Test:**	Notreq	**Driver Age:**	67
Veh Ref:	1	**Location:**	Carw	**Object in Cway:**	None	**From:**	W	**Hit and Run:**	Nothtrun		
Veh Type:	Car	**Junction:**	Er/about	**Object off Cway**	None	**To:**	E	**Driver Gender:**	Female		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Unknown	**Driver Severity:**	None		
Acc Ref:		**Maneouvre:**	Ahead	**Skiding:**	None	**Impact Point:**	Nearside	**Driver Breath Test:**	Notap	**Driver Age:**	53
Veh Ref:	2	**Location:**	Carw	**Object in Cway:**	None	**From:**	S	**Hit and Run:**	Nothtrun		
Veh Type:	Bicycle	**Junction:**	Middle	**Object off Cway**	None	**To:**	E	**Driver Gender:**	Male		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Other	**Driver Severity:**	Slight		

Accident Details:

Acc Ref: 2019-410874714	**1st / 2nd Rd:** A1057/7 A1057/7	**Jun Detail:** R/bout	**Weather:** Fine	**Num Cas:** 1
Day of Week: Thu	**Parish:**	**Jun Control:** Giveway	**Light:** Day	**Num Peds:** 0
Date: 08/08/2019 15:50:00	**District:** WelHat	**Spec Conditions:** None	**Road Surface:** Dry	**Num Vehicles:** 2
Acc Severity: Slight	**Speed Limit:** 40mph	**C/way Hazard:** None	**C/way Type:** R/bout	**Ped Xing:** Npernox
A1057 Ellenbrook Rbt Hatfield J/w A1057 St Albans Road West				**On Site:** Yes
Easting: 520799	**Northing:** 208217			

Casualty Details

Acc Ref: 2019-410874714	**Cas Class:** Driver	**Car Passenger:** No	**Cas Severity:** Slight	**Ped Movement:** Notped
Veh Ref: 2	**Cas Age:** 47	**PSV Passenger:** No	**Road User Class:** Cyclists	**Ped Location:** Notped
Cas Ref: 1	**Cas Gender:** Male	**Seat Belt:** Notapp	**School Pupil:**	**Ped Work on Rd:** Notped

Vehicle Details

Acc Ref:	153276	**Maneouvre:**	Ahead	**Skiding:**	None	**Impact Point:**	Front	**Driver Breath Test:**	Negati	**Driver Age:**	51
Veh Ref:	1	**Location:**	Carw	**Object in Cway:**	None	**From:**	W	**Hit and Run:**	Nothtrun		
Veh Type:	Car	**Junction:**	Er/about	**Object off Cway**	None	**To:**	Se	**Driver Gender:**	Female		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Other	**Driver Severity:**	None		
Acc Ref:		**Maneouvre:**	Ahead	**Skiding:**	None	**Impact Point:**	Nearside	**Driver Breath Test:**	Notap	**Driver Age:**	47
Veh Ref:	2	**Location:**	Carw	**Object in Cway:**	None	**From:**	S	**Hit and Run:**	Nothtrun		
Veh Type:	Bicycle	**Junction:**	Middle	**Object off Cway**	None	**To:**	N	**Driver Gender:**	Male		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Tofrowrk	**Driver Severity:**	Slight		

Accident Details:

Acc Ref:	2018-410804057	**1st / 2nd Rd:**	A1057/7 A1057/8	**Jun Detail:**	R/bout	**Weather:**	Rain	**Num Cas:**	1
Day of Week:	Fri	**Parish:**		**Jun Control:**	Giveway	**Light:**	Darkunli	**Num Peds:**	0
Date:	07/12/2018 07:40:00	**District:**	WelHat	**Spec Conditions:**	None	**Road Surface:**	Wet	**Num Vehicles:**	2
Acc Severity:	Slight	**Speed Limit:**	30mph	**C/way Hazard:**	None	**C/way Type:**	R/bout	**Ped Xing:**	Npernox
A1057 Ellenbrook Lane Rbt Hatfield J/w A1057 St Albans Road West								**On Site:**	No
Easting:	520816	**Northing:**	208210						

Casualty Details

Acc Ref:	2018-410804057	**Cas Class:**	Driver	**Car Passenger:**	No	**Cas Severity:**	Slight	**Ped Movement:**	Notped
Veh Ref:	2	**Cas Age:**	21	**PSV Passenger:**	No	**Road User Class:**	Cyclists	**Ped Location:**	Notped
Cas Ref:	1	**Cas Gender:**	Male	**Seat Belt:**	Notapp	**School Pupil:**		**Ped Work on Rd:**	Notped

Vehicle Details

Acc Ref:	152164	**Maneouvre:**	Ahead	**Skiding:**	None	**Impact Point:**	Front	**Driver Breath Test:**	Notcon	**Driver Age:**	
Veh Ref:	1	**Location:**	Carw	**Object in Cway:**	None	**From:**	E	**Hit and Run:**	Hit&run		
Veh Type:	Car	**Junction:**	Er/about	**Object off Cway**	None	**To:**	W	**Driver Gender:**	Unknown		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Unknown	**Driver Severity:**	None		
Acc Ref:		**Maneouvre:**	Ahead	**Skiding:**	None	**Impact Point:**	Back	**Driver Breath Test:**	Notap	**Driver Age:**	21
Veh Ref:	2	**Location:**	Carw	**Object in Cway:**	None	**From:**	N	**Hit and Run:**	Nothtrun		
Veh Type:	Bicycle	**Junction:**	Middle	**Object off Cway**	None	**To:**	S	**Driver Gender:**	Male		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Other	**Driver Severity:**	Slight		

Accident Details:

Acc Ref:	2019-410843620	**1st / 2nd Rd:**	A1057/7 A1057/8	**Jun Detail:**	R/bout	**Weather:**	Fine	**Num Cas:**	1
Day of Week:	Thu	**Parish:**		**Jun Control:**	Giveway	**Light:**	Day	**Num Peds:**	0
Date:	25/04/2019 18:55:00	**District:**	WelHat	**Spec Conditions:**	None	**Road Surface:**	Dry	**Num Vehicles:**	2
Acc Severity:	Slight	**Speed Limit:**	40mph	**C/way Hazard:**	None	**C/way Type:**	R/bout	**Ped Xing:**	Nperzebx
A1057 Ellenbrook Lane Rbt Hatfield J/w A1057 St Albans Road West								**On Site:**	No
Easting:	520817	**Northing:**	208211						

Casualty Details

Acc Ref:	2019-410843620	**Cas Class:**	Driver	**Car Passenger:**	No	**Cas Severity:**	Slight	**Ped Movement:**	Notped
Veh Ref:	2	**Cas Age:**	24	**PSV Passenger:**	No	**Road User Class:**	Cyclists	**Ped Location:**	Notped
Cas Ref:	1	**Cas Gender:**	Female	**Seat Belt:**	Notapp	**School Pupil:**		**Ped Work on Rd:**	Notped

Vehicle Details

Acc Ref:	152809	**Maneouvre:**	Ahead	**Skiding:**	None	**Impact Point:**	Front	**Driver Breath Test:**	Notcon	**Driver Age:**	42
Veh Ref:	1	**Location:**	Carw	**Object in Cway:**	None	**From:**	E	**Hit and Run:**	Nothtrun		
Veh Type:	Car	**Junction:**	Er/about	**Object off Cway**	None	**To:**	W	**Driver Gender:**	Female		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Unknown	**Driver Severity:**	None		
Acc Ref:		**Maneouvre:**	Ahead	**Skiding:**	None	**Impact Point:**	Nearside	**Driver Breath Test:**	Notap	**Driver Age:**	24
Veh Ref:	2	**Location:**	Carw	**Object in Cway:**	None	**From:**	N	**Hit and Run:**	Nothtrun		
Veh Type:	Bicycle	**Junction:**	Middle	**Object off Cway**	None	**To:**	S	**Driver Gender:**	Female		
Foreign Veh:		**Towing;**	None	**velcwy**	No	**J Purpose:**	Tofrowrk	**Driver Severity:**	Slight		

AECOM **Transportation**

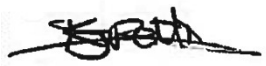
Brett Group

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Hatfield Aerodrome, Proposed Site Access Arrangements: Stage 1 Road Safety Audit

April 2016



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Rev No	Comments	Checked by	Approved by	Date
2	Final	MRW	CJB	25/04/16

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April 2016

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Appendix A. LIST OF DRAWINGS, DOCUMENTS AND DEPARTURES FROM STANDARDS
Appendix B. PROBLEM LOCATIONS PLAN

1 Introduction

This report results from a Stage 1 Road Safety Audit carried out for the proposed access arrangements for the proposed mineral working (quarry) and concrete batching plant at the Hatfield Aerodrome site on the A1057 Hatfield Road in Hertfordshire. The audit was carried out at the request of AECOM on behalf of the client: Brett Group.

The report indicates each of the problems identified together with recommendations to solve or mitigate the problems, the Audit Team Statement and a schedule of documents reviewed.

The members of the Audit Team were:

1) Mark Watson BA (Hons) MCIHT MSoRSA
   Audit Team Leader
   AECOM

2) Kimberley Pettingill BSc (Hons) MCIHT MSoRSA
   Audit Team Member
   AECOM

The audit took place at AECOM's Chelmsford office during April 2016. The audit comprised of an examination of the documents provided by the designers (see **Appendix A**). In addition to examining the documents supplied, the Audit Team visited the site of the proposed measures on 12 April 2016. The audit was undertaken during the morning off-peak traffic hours of 11:00 to 12:00. Weather conditions during the site visit were overcast with a dry carriageway surface.

No departures from standards have been notified to the Audit Team on the proposals.

The locations of problems are shown in conjunction with the scheme proposals in **Appendix B** where the reference numbers relate to the problems identified in this report.

The terms of reference of the Road Safety Audit are as described in HD 19/15. The advice issued in the Design Manual for Roads and Bridges (DMRB) applies to trunk road and motorway highway improvement schemes; however, it has been used in this report to define the scope of this audit. The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the designs to any other criteria. However, to clearly explain a safety problem or the recommendation to resolve a problem the Audit Team may, on occasion, have referred to a design standard without touching on technical audit.

An absence of comment relating to specific road users / modes in Section 4 of this report does not imply that they have not been considered; instead the Audit Team feels they are not adversely affected by the proposed changes.

This Safety Audit is not intended to identify pre-existing hazards which remain unchanged due to the proposals; hence they will not be raised in Section 4 of this report as they fall outside the remit of Road Safety Audit in general. Details which are considered to be outside the Terms of Reference, but which the Audit Team wishes to draw to the attention of the Client Organisation, have been sent to the overseeing organisation project sponsor in a covering letter to this Road Safety Audit Report.

Nothing in this Audit should be regarded as a direct instruction to include or remove a measure from within the scheme. Responsibility for designing the scheme lies with the designer and as such the Audit Team accepts no design responsibility for any changes made to the scheme as a result of this Audit.

In accordance with HD 19/15 Road Safety Audits must be repeated if the scheme design materially changes, if there are many changes which could together impact on road user safety, or if the previous finalised Road Safety Audit for the relevant stage is more than 5 years old.

All traffic sign and road marking diagram number references are made to The Traffic Signs Regulations and General Directions, 2002 (TSRGD).

2 Site Description

The A1057 Hatfield Road runs in an approximate east/west direction between Hatfield to the east and St Albans to the west. In the vicinity of the scheme the A1057 Hatfield Road is a single carriageway road which is subject to a 40mph speed limit and is street lit. A footway is provided on the southern side of the carriageway. Speed cameras are positioned on both the eastbound and westbound carriageways of the A1057 Hatfield Road within the vicinity of the scheme area.

Land use in the audit area is predominantly rural fields/ agricultural, with several residential properties located to the east and a garden centre, public house, petrol filling station, industrial uses and residential properties located to the west.

2.1 Proposed Scheme

A proposed mineral working quarry and concrete batching plant is proposed at the former Hatfield Aerodrome site located to the north of the A1057 Hatfield Road. A new priority site access T-junction is proposed directly onto the A1057 Hatfield Road with an associated ghost island right turn facility.

The site access road will be a two-way single carriageway road where, upon entry to the site, vehicles will be required to turn through approximately 90 degrees to the west, shortly followed by a 90 degree bend to the north.

It is understood that no pedestrian footway facilities are proposed at the site access.

The proposals that form the scope of this road safety audit are shown in drawing 402.01009.00064.14.H002 Rev R0 (referenced in **Appendix A**).

3 Matters Outstanding from Previous Road Safety Audits

The auditors have not been provided with any copies of previous Road Safety Audits or Exception Reports.

4 Matters Arising From This Stage 1 Road Safety Audit

The following problems have been identified from the documents submitted:

A GENERAL

No comments.

B LOCAL ALIGNMENT

B1 PROBLEM

Location: Site access road

Drawing No: 402.01009.00064.14.H002 Rev R0

Summary: Large vehicles may encroach onto opposing side of road as result of horizontal alignment of site access road and forward visibility around bends may be compromised

Swept path information has not been provided for the site access road and the audit team is concerned that, due to the horizontal alignment of the site access road, large vehicles may struggle to negotiate the bends without encroaching onto the opposing side of the carriageway. This may result in head-on/ side-swipe collisions between vehicles travelling in opposite directions.

In addition, the forward visibility splays around the bends on the site access road are likely to run through the land on either side of the access road. It is unclear whether any buildings/ landscaping/ signage etc. will be provided on this land and whether these may compromise forward visibility. Inadequate forward visibility around the bends may result in rear end shunt collisions between slowing, manoeuvring vehicles and those exiting the bend.

RECOMMENDATION

Undertake swept path analyses to ensure that opposing large vehicles will be able to safely negotiate the alignment of the site access road (particularly through the bends). Ensure that adequate forward visibility splays are achievable at the bends and that they are kept clear of signage/ street furniture/ landscaping etc.

Design Team/ Project Sponsor Response:

A swept-path analysis has been undertaken which considers the turning requirements of a maximum sized articulated vehicle. The site access design has been amended to demonstrate that two HGVs can pass without any issues. The revised site access plan also provides forward visibility splays which should be kept clear throughout the life of the site access road under the proposed arrangement.

C NON-MOTORISED USER PROVISION

C1 PROBLEM

Location: Proposed site access junction

Drawing No: 402.01009.00064.14.H002 Rev R0

Summary: No pedestrian crossing facilities proposed

It is unclear from the plan provided whether a footway or verge is proposed around the site access junction. If a footway is provided there do not appear to be any pedestrian crossing facilities (dropped kerbs or tactile paving) proposed either across the site access junction or across Hatfield Road (linking the proposed footway to the existing provision on the southern side of Hatfield Road). Pedestrians are likely to be at risk of being struck by vehicles when crossing in this area if suitable facilities are not provided.

RECOMMENDATION

If footway facilities are proposed, provide crossing facilities (dropped kerbs/tactile paving) across the site access road junction and across Hatfield Road to ensure pedestrians are able to safely navigate across the site access road, as well as access the existing footway facilities on the southern side of Hatfield Road.

Design Team/ Project Sponsor Response:

An island has now been included which facilitates pedestrian crossing and also prevents overtaking to protect the right turn lane.

D JUNCTIONS

D1 PROBLEM

Location: Proposed site access junction

Drawing No: 402.01009.00064.14.H002 Rev R0

Summary: Junction visibility splays obscured by vegetation/ road alignment west of junction

The plans provided show site access visibility splays of 4.5m x 120m however the splays to both the left and right appear to run through existing thick/established vegetation that currently lines the northern side of the carriageway. It is unclear from the plans provided whether (and to what extent) the vegetation on the northern side of the carriageway is to be removed/cut-back and therefore whether these visibility splays will be achievable in reality. The road alignment to the west of the proposed access junction may exacerbate this concern if the vegetation is not sufficiently cleared/cut-back and may jeopardise both emerging visibility for traffic exiting the site and forward visibility to the junction for eastbound traffic. Insufficient visibility could result in collisions between mainline and emerging traffic or rear end shunts on the western approach.

RECOMMENDATION

Remove/cut-back significant levels of vegetation (some of which appears to be mature, large trees etc.) to ensure that adequate visibility splays of 4.5m x 120m can be achieved. This is likely to constitute an ongoing maintenance issue.

Design Team/ Project Sponsor Response:

Junction visibility splays will be provided as shown on the proposed junction layout plan. The envelope of visibility will be cleared and maintained in order to meet the necessary requirements. A note has been included on the proposed junction layout plan.

E ROAD SIGNS, CARRIAGEWAY MARKINGS & LIGHTING

E1 PROBLEM

Location: Hatfield Road, northern side of carriageway

Drawing No: 402.01009.00064.14.H002 Rev R0

Summary: Unclear if lighting columns are to be re-provided within scheme

The scheme proposes to widen the A1057 Hatfield Road into the northern verge where a number of lighting columns are currently located. It is unclear from the plans provided whether these lighting columns are to be re-provided (and if so where they will be relocated) within the scheme. The likely set back of columns may impact on lighting levels at the junction. Insufficient lighting levels may result in collisions on this approach during the hours of darkness.

RECOMMENDATION

Ensure at detailed design that sufficient levels of lighting are provided at the junction.

Design Team/ Project Sponsor Response:

Lighting will be considered during the detailed design stage. The proposed design will ensure that the necessary lighting requirements are met.

5 Audit Team Statement

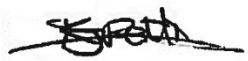
We certify that this Road Safety Audit has been carried out in accordance with HD 19/15.

No one on the Audit Team has been involved with the design of the measures.

AUDIT TEAM LEADER:

Name:	M Watson BA(Hons) MCIHT MSoRSA	Signed:	
Position:	Associate Director	Date:	25/04/16
Organisation:	AECOM		
Address:	Saxon House, 27 Duke Street, Chelmsford, Essex. CM1 1HT		

AUDIT TEAM MEMBER:

Name:	K Pettingill BSc(Hons) MCIHT MSoRSA	Signed:	
Position:	Senior Consultant	Date:	25/04/16
Organisation:	AECOM		
Address:	Saxon House, 27 Duke Street, Chelmsford, Essex. CM1 1HT		

AUDIT TEAM OBSERVERS:

There were no Audit Team Observers present during the site visit.

Appendix A.
LIST OF DRAWINGS, DOCUMENTS AND DEPARTURES FROM STANDARDS

The following documents were submitted as part of the road safety audit:

Drawings

402.01009.00064.14.H002 001	Proposed Site Access Arrangements Ghost Right Turn Lane Site Access Location Plan	October 2015 April 2015	Rev R0 -

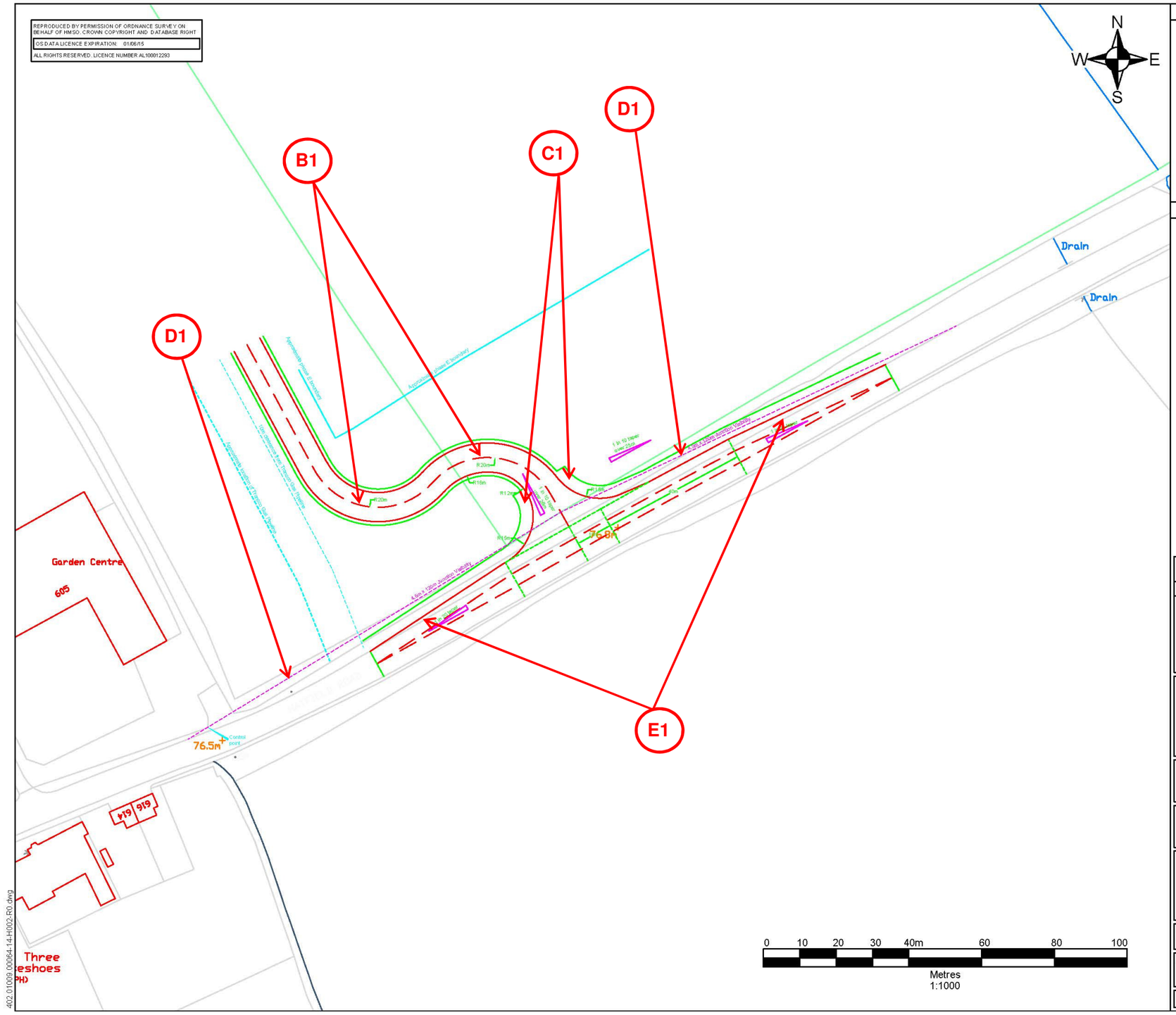
Documents

Environmental Statement (ES)	Section 7: Transport	SLR Consulting Limited	FINAL

Departures from Standard

None presented.

Appendix B.
PROBLEM LOCATIONS PLAN



402.01009.00064.14-H002-R0.dwg

NOTES

LEGEND

Revision	By	Chk'd By	Date	Comments

SLR

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Site
HATFIELD AERODROME

Project
PROPOSED MINERAL WORKING AND CONCRETE BATCHING PLANT

Drawing Title
PROPOSED SITE ACCESS ARRANGEMENTS GHOST RIGHT TURN LANE

Scale
1:1000 @ A3

Date
OCTOBER 2015

Drawing Number
402.01009.00064.14.H002

Revision
R0

DRAFT

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CRITERIA FOR ASSESSING SENSITIVITY AND MAGNITUDE OF CHANGE

Prediction of Landscape Effects

1. Landscape receptors that may be affected by the proposed development include overall character and key characteristics, individual elements or features and specific aesthetic or perceptual aspects (GLVIA3, paragraph 5.34).

2. These receptors are further explained in paragraph 5.4 of GLVIA 3, as follows:

- *Landscape elements include physical influences (geology, soils, landform, drainage and waterbodies), land cover (types of vegetation and patterns and types of tree cover) and influence of human activity (land use and management, character of settlements and buildings, pattern and types of fields and enclosure);*
- *Aesthetic and perceptual aspects include scale, complexity, openness, tranquillity or wildness; and*
- *Overall character relates to combinations of elements and aesthetic and perceptual aspects to make distinctive areas and types.*

3. GLVIA 3 describes opposite ends of the spectrum (paragraph 5.56) as:

- *Major loss or irreversible negative effects, over an extensive area, on elements and/or aesthetic and perceptual aspects that are key to the character of nationally valued landscapes are likely to be of the greatest significance; and*
- *Reversible negative effects of short duration, over a restricted area, on elements and/or aesthetic and perceptual aspects that contribute to but are not key characteristics of the character of landscapes of community value are likely to be of the least significance and may, depending on the circumstances, be judged as not significant.*

Sensitivity of Landscape Receptors

4. The sensitivity of landscape receptors to change, of the nature associated with mineral development, is defined as high, medium, low or negligible based on professional interpretation of the parameters set out in Table 1 and the examples below.

Table 1
Parameters influencing Landscape Sensitivity
(GLVIA 3, paragraphs 5.39 to 5.47)

Landscape Receptor	Susceptibility to Change	Value
Overall character and key characteristics	• Ability to accommodate the proposed development without undue consequences to the baseline situation and/or the achievement of landscape planning policies and strategies with reference to a range of	• Internationally valued landscapes ; • Nationally valued landscapes; • Locally valued landscapes; and • Landscapes not designated but judged to be of some value especially to local communities

Landscape Receptor	Susceptibility to Change	Value
	criteria relevant to mineral developments.	(also refer to Box 5.1 in GLVIA 3) and TGN 02-21

5. Thus an examination of the following characteristics is made for in order to determine susceptibility to change resulting from minerals development:

- Scale, where large scale indicates lower sensitivity and small scale and/or with human scale indicators indicate a higher sensitivity;
- Landform, where absence of strong topographical variety, featureless, convex or flat indicates a lower sensitivity and presence of strong topographical variety or distinctive landform features indicate a higher sensitivity;
- Pattern and complexity, where simple, regular or uniform indicates a lower sensitivity and complex, rugged and irregular indicates a higher sensitivity;
- Settlement and man-made influence, where concentrated settlement pattern, presence of contemporary structures (e.g. utility, infrastructure or industrial elements) indicate lower sensitivity and dispersed settlement pattern, absence of modern development, presence of small scale, historic or vernacular settlement indicates higher sensitivity;
- Skylines, where non-prominent/screened skylines, presence or existing modern man-made features indicate lower sensitivity and distinctive, undeveloped skylines, skylines that are highly visible over large areas or exert a large influence on landscape character, or skylines with historic landmark indicate higher sensitivity;
- Inter-visibility with adjacent landscapes, where little inter-visibility with adjacent sensitive landscapes or viewpoints indicates lower sensitivity and strong inter-visibility with sensitive landscapes, or forms an important part of a view from sensitive viewpoints indicates higher sensitivity; and
- Perceptual aspects (sense of remoteness or tranquillity), where close to visible or audible signs of human activity and development indicates lower sensitivity and physically remote or perceptually remote, peaceful or tranquil areas indicates higher sensitivity.

Magnitude of Landscape Change

6. The magnitude of landscape effect is defined as high, medium, low or negligible based on professional interpretation of the parameters set out in Table 2.

Table 2
Parameters influencing Magnitude of Landscape Change
(GLVIA 3, paragraphs 5.48 to 5.52)

Landscape Receptor	Size and Scale	Geographical Extent	Duration or Reversibility
Overall character and key characteristics	• Extent of existing landscape elements that will be lost, the	• Site level (within the development site itself); • Immediate setting	• Short term (0-5 years); • Medium term (5-10 years);

Landscape Receptor	Size and Scale	Geographical Extent	Duration or Reversibility
	proportion of the total extent that this represents and the contribution that element to the character of the landscape; • Degree of alteration to aesthetic or perceptual aspects (removal or addition); • Whether the effect changes the key characteristics of the landscape, which are critical to its distinctive character	of the site; • Landscape type or character area, within which the proposal lies; • Larger scale, influencing several landscape types or character areas	• Long term (10 to 25 years); • Prospect and practicality of effect being reversed, within a generation

7. Thus, the following examples of size and scale may apply to the types of change to the landscape resulting from minerals development:

- *Total loss or considerable alteration to key elements/ features/ aesthetic or perceptual aspects or characteristics, resulting in a high degree of change to the overall character of the baseline conditions;*
- *Partial loss or alteration to one or more key elements/ features/ aesthetic or perceptual aspects or characteristics, results in a medium degree of change to the overall character of the baseline conditions (Change perceived as a partial or localised change within a broader, unaltered context);*
- *Limited loss or small alteration to one or key elements/ features/ aesthetic or perceptual aspects or characteristics, results in a low degree of change to overall character of the baseline conditions (Change is discernible but underlying landscape character or view composition would be similar to baseline); and*
- *Very limited or imperceptible loss or alteration to one or more key elements/ features/ aesthetic or perceptual aspects or characteristics, resulting in a negligible degree of change to the overall character of the baseline conditions (Change may be barely distinguishable).*

Prediction of Visual Effects

8. Visual receptors are people living in the area, people who work there, people passing through on road, rail or other forms of transport, people visiting promoted landscapes or attractions, and people engaged in recreation of different types (GLVIA3, paragraph 6.13).

9. At opposite ends of the spectrum, GLVIA3 (paragraph 6.44) describes how the following may apply to visual effects:

- *Effects on people who are particularly sensitive to changes in views and visual amenity are more likely to be significant;*
- *Effects on people at recognised and important viewpoints or from recognised scenic routes are more likely to be significant; and*
- *Large-scale changes which introduce new, non-characteristic or discordant or intrusive elements into the view are more likely to be significant than small changes or changes involving features already present in the view.*

Visual Sensitivity

10. The sensitivity of visual receptors to change, of the nature associated with minerals development, is defined as high, medium, low or negligible based on professional interpretation of the parameters set out in Table 3 and the examples below.

Table 3
Parameters influencing Visual Sensitivity
(GLVIA 3, paragraphs 6.31 to 6.37)

Visual Receptor	Susceptibility to Change	Value
Residential	• The occupation or activity of people experiencing the view at particular locations; • The extent to which their attention or interest may be focused on the views and visual amenity they experience at particular locations	• Heritage assets or designations; • Visitor attractions, appearance in guidebooks or tourist maps, provision of facilities for their enjoyment, references in literature
Work		
Transport Users (Road, Rail, etc)		
Visitors to promoted landscape or attractions		
Recreational (of different types)		

11. Thus the following examples of sensitivity apply to the types change resulting from minerals development:

- *Highly sensitivity receptors may include users of outdoor recreational facilities including strategic recreational footpaths, cycle routes or rights of way, whose attention may be focused on the landscape; important landscape features with physical, cultural or historic attributes; views from residential buildings; beauty spots or picnic areas;*
- *Medium sensitivity receptors may include other footpaths; other views from residential properties, people travelling through the landscape on roads, trains or other transport routes (unless otherwise specifically linked to appreciation of landscape, such as scenic routes);*
- *Low sensitivity receptors may include people engaged in outdoor sports or recreation (other than appreciation of the landscape), commercial buildings, and other locations where people's attention may be focused on their work or activity; and*
- *Negligible sensitivity receptors may include people in commercial buildings, and other locations where people's attention may be focused on their work or activity.*

Magnitude of Visual Change

12. The magnitude of visual effect is defined as high, medium, low or negligible based on professional interpretation of the parameters set out in Table 4 below.

Table 4
Parameters influencing Magnitude of Visual Change
(GLVIA 3, paragraphs 6.38 to 6.41)

Visual Receptor	Size and Scale	Geographical Extent	Duration or Reversibility
Residential Work Transport Users (Road, Rail, etc) Visitors to promoted landscape or attractions Recreational (of different types)	• The scale of change in the view, with respect to loss or addition of features and changes in composition, proportion of the view occupied by the development; • The degree of contrast or integration of any new features or changes (form, scale and mass, line, height, colour and texture) • The nature of the view of the proposed development, in terms of the relative amount of time over which it will be experienced and whether views will be full, partial or glimpses	• The angle of view in relation to the main activity or the receptor; • the distance of the viewpoint from the proposed development; • The extent of the area over which the changes would be visible (or length of the route affected)	• Short term (0-5 years); • Medium term (5-10 years); • Long term (10 to 25 years); • Prospect and practicality of effect being reversed, within a generation

13. Thus the following examples of size and scale may apply to the types of change to views resulting from minerals development:

- *Total loss or considerable alteration to key elements/ features/ characteristics of the view, resulting in a high degree of change to the baseline condition;*
- *Partial loss or alteration to one or more key elements/ features/ characteristics of the view, results in a medium degree of change to the baseline conditions (Change perceived as a partial or localised change within a broader, unaltered context);*
- *Limited loss or small alteration to one or more key elements/ features/ characteristics of the view resulting in a small degree of change to the baseline condition (Change is discernible but underlying landscape character or view composition would be similar to baseline); and*

- *Very limited or imperceptible loss or alteration to one or more key elements/ features/characteristics of the view, resulting in a negligible degree of change to the baseline condition (Change may be barely distinguishable).*

Prediction of Cumulative Effects

14. The purpose of the cumulative assessment is to describe, visually represent and assess the ways in which the proposed development would have additional impacts when considered together with other operational, under construction, consented and, where required, proposed (i.e. those for which applications have been submitted to the relevant authority) developments of a similar nature (in this case mineral projects).

15. As described in paragraph 7.3 of GLVIA 3, the definitions widely used for assessing cumulative effects are as follows:

- *Cumulative effects as 'the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments, taken together' (SNH, 2012);*
- *Cumulative landscape effects as effects that 'can impact on either the physical fabric or character of the landscape, or any special values attached to it '(SNH, 2012); and*
- *Cumulative visual effects as effects that can be caused by combined visibility, which 'occurs where the observer is able to see two or more developments from one viewpoint' and/or sequential effects which 'occur when the observer has to move to another viewpoint to see different developments' (SNH, 2012).*

Cumulative Landscape Effects

16. As described in paragraph 7.19 of GLVIA 3, "*cumulative landscape effects may result from adding new types of change or from increasing or extending the effects of the main project when it is considered in isolation. For example, the landscape effects of the main project may be judged of relatively low significance when taken on its own, but when taken together with the effects of other schemes, usually of the same type, the cumulative landscape effects may become more significant*."

17. At paragraph 7.27 of GLVIA 3, it is further stated that: "*The approach to assessing the significance of cumulative landscape effects should be guided by the same principles as the approach to the initial project assessment*." In summary this includes consideration of susceptibility and value of the receptor under consideration (e.g. individual elements, aesthetic and perceptual aspects and overall character and key characteristics) and the size or scale, geographical extent and duration of the cumulative effect (and in particular, as noted in paragraph 7.27 "*possible creation of new landscape character if the changes are substantial enough*").

18. In respect of significant cumulative effects paragraph 7.2 of GLVIA 3 states: "*The most significant landscape effects are likely to be those that would give rise to changes in the landscape character of the study area of such an extent as to have major effects on its key characteristics and even, in some cases, to transform it into a different landscape type. This may be the case where the project being considered*

itself tips the balance through its additional effects. The emphasis must always remain on the main project being assessed and how or whether it adds to or combines with the others being considered to create a significant cumulative effect."

Cumulative Visual Effects

19. In respect of cumulative visual effects, paragraph 7.29 of GLVIA 3 states, *"Cumulative visual effects, are the effects on views and visual amenity enjoyed by people, which may result either from adding the effects of the project being assessed to the effects of the other projects on the baseline conditions or from their combined effect. This may result from changes in the content and character of the views experienced in particular places due to the introduction of new elements or removal of or damage to existing ones."*

20. Types of cumulative visual effect are described in Table 7.1 of GLVIA 3 (summary based on SNH, 2012). This includes combined and/or sequential visibility:

- *Combined visibility occurs where it is possible to see two or more wind energy projects from a single location/viewpoint. Combined visibility may either be in combination (where several wind energy projects are within a single arc of vision i.e. approximately 90°) or in succession (where wind energy projects occur in several arcs of vision at the same location).*
- *Sequential effects occur where there is visibility of one and more wind energy projects from any route through the landscape: for example, roads or footpaths. Sequential effects may be frequent (where the features appear regularly and with short time lapses between instances depending on speed and distance) and occasionally (where longer time lapses between appearances would occur because the observer is moving very slowly and/or there are larger distances between the viewpoints).*

21. Paragraph 7.37 of GLVIA describes how "*The approach to assessing the significance of cumulative visual effects should be guided by the same principles as the approach to the initial project assessment*."

22. In summary this includes consideration of susceptibility and value of the receptor or views under consideration (e.g. residential, recreational, etc) and the size or scale, geographical extent and duration of the cumulative effect.

23. As described in paragraph 7.38 of GLVIA 3, "*Higher levels of significance may arise from cumulative visual effects related to:*

- *Developments that are in close proximity to the main project and are clearly visible together in views from selected viewpoints;*
- *Developments that are highly inter-visible, with overlapping ZTVs – even though individual developments may be at some distance from the main project and from individual viewpoints, and when viewed individually not particularly significant, the overall combined cumulative effect on a viewer at a particular viewpoint may be more significant."*

LANDSCAPE PLANNING POLICIES

1. The following planning documents are considered relevant to the landscape of the review site and surrounding areas:

- National Planning Policy Framework (February 2019);
- Planning Practice Guidance: Minerals (2014);
- Hertfordshire Minerals Local Plan Review 2002-2016 (adopted 2007);
- Waste Core Strategy and Development Management Policies Document (adopted November 2012);
- City and District of St Albans District Local Plan Review (adopted 1994); and
- Welwyn Hatfield District Plan (adopted 2005)

The National Planning Policy Framework

2. The Paragraph 11 sets out the fundamental principle of this document: that there is a presumption in favour of sustainable development. All development that is in accordance with the development plan should be approved "*without delay*" and that "*where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date*" permission should be granted for development "*unless any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in the Framework taken as a whole*."

3. In relation to landscape, the NPPF defines sustainability as including the protection and enhancement of the "*natural, built and historic environment*" (paragraph 8).

4. Paragraph 38 states that "*local planning authorities should approach decisions on proposed development in a positive and creative way. They should use the full range of planning tools available'*. They should also '*work proactively with applicants to secure developments that will improve the economic, social and environmental conditions of the area*".

5. Paragraph 98 relates to rights of way and access, stating that these should be "*protected and enhanced*". It is noted that better facilities should be provided for users of rights of way, for example by "*adding links to existing rights of way*".

6. Paragraphs 124, 128 and 130 relate to the need for good design in new developments. Paragraph 124 states that "*good design is a key aspect of sustainable development, creates better places in which to live and work and helps make development acceptable to communities*". Paragraph 128 states that applicants should work closely "*with those directly affected by their proposals to evolve designs which take account of the views of the community*". Paragraph 130 states that "*permission should be refused for development of poor design that fails to take the opportunities available for improving the character and quality of an area and the way it functions*".

7. Paragraph 170 of the NPPF states that the planning system, "*should contribute to and enhance the natural and local environment by [inter alia] …protecting and enhancing valued landscapes*" and by "*recognising the intrinsic character and beauty of the*

countryside". Paragraph 171 states that the planning system should "*distinguish between the hierarchy of international, national and locally designated sites*".

8. In paragraph 172 it is stated that "*great weight should be given to conserving and enhancing landscape and scenic beauty in National Parks, the Broads and Areas of Outstanding Natural Beauty, which have the highest status of protection in relation to landscape and scenic beauty*".

9. The National Planning Policy Framework (NPPF) states that the essential characteristics of Green Belts are their openness and their permanence (paragraph 133). The purposes of the Green Belt are as follows (paragraph 134):
   - To check the unrestricted sprawl of large built up areas;
   - To prevent neighbouring towns from merging one into another;
   - To assist in safeguarding the countryside from encroachment;
   - To preserve the setting and special character of historic towns; and
   - To assist in urban regeneration.

10. The NPPF states that "*The Government attaches great importance to Green Belts. The fundamental aim of Green Belt policy is to prevent urban sprawl by keeping land permanently open; the essential characteristics of Green Belts are their openness and their permanence*." (paragraph 134). It goes on to say that "once established, Green Belt boundaries should only be altered where exceptional circumstances are fully evidenced and justified" (paragraph 136). Green Belt boundaries must take account of the need for sustainable development, including provision of safeguarded land between the urban area and the Green Belt. Green Belt boundaries should follow "*physical features that are readily recognisable and likely to be permanent*" (paragraph 139).

11. In addition, NPPF states in paragraph 138 that;

12. "*Where it has been concluded that it is necessary to release Green Belt land for development, plans should give first consideration to land which has been previously-developed and/or is well-served by public transport. They should also set out ways in which the impact of removing land from the Green Belt can be offset through compensatory improvements to the environmental quality and accessibility of remaining Green Belt land*."

13. NPPF states in paragraph 141 that;

14. "*Once Green Belts have been defined, local planning authorities should plan positively to enhance their beneficial use, such as looking for opportunities to provide access; to provide opportunities for outdoor sport and recreation; to retain and enhance landscapes, visual amenity and biodiversity; or to improve damaged and derelict land*."

15. NPPF states in paragraph 146 that;

16. "Certain other forms of development are also not inappropriate in the Green Belt provided they preserve its openness and do not conflict with the purposes of including land within it. These are:

a) mineral extraction;…."

Planning Practice Guidance: Minerals

17. Planning Practice Guidance: Minerals (PPGM) states that with regard to the restoration and aftercare of minerals sites;

> "*The level of detail required on restoration and aftercare will depend on the circumstances of each specific site including the expected duration of operations on the site. It must be sufficient to clearly demonstrate that the overall objectives of the scheme are practically achievable, and it would normally include:*
>
> - *an overall restoration strategy, identifying the proposed after use of the site;*
> - *information about soil resources and hydrology, and how the topsoil/subsoil/overburden/soil making materials are to be handled whilst extraction is taking place;*
> - *where the land is agricultural land, an assessment of the agricultural land classification grade; and*
> - *landscape strategy*."

18. With regards the landscape strategy PPGM states;

> "*A site-specific landscape strategy to accompany applications for either a new site or any significant extension to an existing working site should include:*
> - *defining the key landscape opportunities and constraints;*
> - *considering potential directions of working, significant waste material locations, degrees of visual exposure etc;*
> - *identifying the need for additional screening during operations;*
> - *identifying proposed after uses and options for the character for the restored landscape*."

Hertfordshire Minerals Local Plan Review 2002-2016 (adopted 2007)

19. The application site covers the south-western part of the Preferred Area No.1 (Land at BAe) as shown on Inset Map No 6 in Hertfordshire Minerals Local Plan Review 2002-2016. This map also shows Hatfield Quarry covering land immediately to the north of the application site and Suttons Farm extending for a further 2km.

20. This is covered by Minerals Policy 3, with Preferred Areas defined as "*parcels of land likely to be required to make up the balance of the County's contribution to the regional apportionment for the plan period (to 2016) and the landbank period beyond."*

21. Within Appendix 8, the Land at former British Aerospace, Hatfield it is stated that "*the land should ideally be worked very early in the Plan period"* and also that:

> - *The Ellenbrook Linear Park is excluded from the preferred area but any reclamation proposals should clearly demonstrate how the Park is to be*

integrated in the overall scheme. The reclamation of any extraction area should clearly demonstrate that it is consistent with the principles set out in the Supplementary Planning Guidance and planning permission ref S6/1999/1064/OP for the BAe site as a whole to deliver the proposed Country Park

- *Appropriate buffer zones will be required to protect the amenity of residents at Ellenbrook, Smallford and Popefield Farm.*
- *A landscaped buffer zone incorporating Ellenbrook Linear Park shall be provided to the eastern part of the site with the boundary to the redeveloped area of the BAe site (non-Green Belt land) and the niversity playing fields.*
- *The site lies within the Watling Chase Community Forest, and so there is potential for restoration to include extensive new woodland combined with suitable amenity use.*

22. Minerals Policy 9 requires *"Proposals for mineral development should, where appropriate, provide opportunities to contribute to the delivery of the national, regional, and local biodiversity action plan targets. Additionally, proposals that prejudice the delivery of these targets or would result in the loss of, or damage to habitats and/or species will not be supported. Where appropriate, the minerals planning authority will seek long-term overall enhancement to local biodiversity through restoration or by other means such as by the attachment of conditions or planning obligations"*

23. Minerals Policy 12 requires "*All mineral extraction and related development proposals will be required to take account of existing and, where appropriate, historic landscape character and maintain its distinctiveness. Planning applications may be refused where there is significant local landscape intrusion and loss of important landscapes or distinctive landscape features. Development proposals will be expected to:*

i) respect landscape character both during operations and in proposals for reclamation;

ii) ensure that any distinctive landscape features are protected from the impact of development;

iii) be accompanied by landscape conservation, design and management measures that both strengthen the character and enhance the condition of the landscape.

The County Council will have regard to the visual impact of proposals (including any proposed mitigation measures to minimise visual or other intrusion) on sensitive landuses, including areas of public access. Particular regard will be had to the Hertfordshire Landscape Strategy in assessing proposals. "

24. Minerals Policy 13 states that "*The County Council will refuse applications for mineral working if:…ii) the proposed form of restoration or afteruse is inconsistent with the landscape character of the area or would involve detrimental environmental impact, including the impact on the highway network;"*

25. Minerals Policy 18 requires mineral extraction and related development to, where appropriate *"iv) include measures to minimise visual intrusion and any adverse impact on the local landscape;"*

26. Paragraph A2.4 also states that *"The settlement pattern of the sand and gravel belt is such that remaining known resources are often in close proximity to the urban areas. If these resources are to be extracted, it is essential that the afteruse takes account of the proximity of the urban area. Most of the gravel belt outside the towns is designated Green Belt. Although not a constraint in terms of national policy, in Green Belt situations the overriding consideration must be the appropriate afteruse and the restoration process which leads to it."*

City and District of St Albans District Local Plan Review (adopted 1994)

27. The application site straddles the boundary between the districts of St Albans and Welwyn Hatfield, with St Albans lying to the west of the line.

28. The area of St Albans on its eastern boundary is identified as Landscape Development Site in Figure 14 of the local plan.

"*12.19 - The County Structure Plan expresses' concern that significant visual and environmental problems are accumulating in many valuable parts of the Green Belt, especially along the main communication corridors and around the urban fringes. These areas are in need of attention. Structure Plan Policy 7 therefore seeks to guide long-term change, secure renewal, improvement and management of landscapes, and create new landscapes. Priority is to be given generally to the urban fringe, particularly to the areas defined as Landscape Development Areas on the Key Diagram.* "

And

"*12.21 - Whilst supporting the County Council's landscape action programme for landscape conservation and enhancement wherever it is applied, the Council will give priority to landscape improvement in the landscape development area (see Figure 14). Similarly, leisure and tourist developments appropriate to the Green Belt can bring about landscape improvement and should be channelled to those areas with the worst environmental problems.*"

29. The St Albans District Local Plan has also carried out a boundary study for the eastern edge of St Albans which considers land up to Oaklands Lane. The study provides for a strong buffer of Green Belt land between potential expansion on the eastern side of St Albans Oaklands Lane. Additional, development is present to the east of Oaklands Lane and this area includes the site within St Albans and falls within the landscape development area.

30. The Loacl Plan refers to mineral developments as follows;

"13.6 - New planning permissions for mineral extraction are subject to strict conditions about methods of working, subsequent filling, restoration and afteruse of

the land. There are several sites in the District where restoration is inadequate by modern standards and further infilling, contouring, drainage or other works are necessary. The County Council is renegotiating such unsatisfactory restoration under existing planning permissions in accordance with D.o.E minerals planning guidance."

31. The application site lies within the Green Belt, as defined in the St Albans District Local Plan and which covers 130sq.km.

Welwyn Hatfield District Local Plan (adopted 2005)

32. The application site straddles the boundary between the districts of St Albans and Welwyn Hatfield, with Welwyn lying to the east of the line. The Welwyn Hatfield District Local Plan defines its policies on the Green Belt as follows:

"*The main objectives of the Plan in respect of the district's Green Belt and settlement pattern are:*
(a) To maintain the Green Belt as the principal means of restraining the physical expansion of the district's urban areas;
(b) To maintain the existing settlement pattern in the district;
(c) To concentrate development into the district's main towns and settlements;
(d) To maintain areas of special restraint between the urban area and the Green Belt, to be safeguarded to meet future growth needs beyond the Plan period and thereby ensure the permanence of the Green Belt boundaries."

"*In addition, PPG2 states that the Green Belt has a positive role to play in fulfilling the following purposes:*

- *To provide opportunities for access to the open countryside for the*
- *urban population;*
- *To provide opportunities for outdoor sport and outdoor recreation near*
- *urban areas;*
- *To retain attractive landscapes, and enhance landscapes, near to where*
- *people live;*
- *To improve damaged and derelict land around towns;*
- *To secure nature conservation interest; and*
- *To retain land in agricultural, forestry and related uses."*

33. The local plan identifies the importance of hedgerow and trees as follows;

"Policy R17 - Trees, Woodland and Hedgerows
The Council will seek the protection and retention of existing trees, hedgerows and woodland by the use of planning conditions, section 106 agreements, hedgerow retention notices and tree preservation orders where applicable. New development will be required to incorporate wherever appropriate new planting with locally native species and should be in accordance with Policy D8 Landscaping."

34. Landscape character is considered in Policy D2 as follows;

"*Policy D2: Character and Context*

The Council will require all new development to respect and relate to the character and context of the area in which it is proposed. Development proposals should as a minimum maintain, and where possible, should enhance or improve the character of the existing area."

35. The application site lies within the Green Belt, as defined in the Welwyn Hatfield Local Plan and which covers 102sq.km.

PUBLISHED LANDSCAPE CHARACTER ASSESSMENTS

1. This appendix presents a summary of the relevant published assessments relating to the site and surrounding area. These wider character assessments are then used to provide the context for the local scale landscape assessment for the application site, which is based on additional desk-based analysis and fieldwork.

National Character Areas

2. The application site lies within National Character Area NCA 111 – Northern Thames Basin, "*a diverse area which extends from Hertfordshire in the west to the Essex coast in the east.*" It has the following key characteristics:

- *The landform is varied with a wide plateau divided by river valleys. The prominent hills and ridges of the 'Bagshot Hills' are notable to the northwest and extensive tracts of flat land are found in the south.*
- *Characteristic of the area is a layer of thick clay producing heavy, acidic soils, resulting in retention of considerable areas of ancient woodland.*
- *Areas capped by glacial sands and gravels have resulted in nutrient-poor, free-draining soils which support remnant lowland heathlands, although these are now small. Areas that have alluvial deposits present are well drained and fertile.*
- *The water bearing underlying Chalk beds are a main source of recharge for the principal London Basin Chalk aquifer.*
- *A diverse landscape with a series of broad valleys containing the major rivers Ver, Colne and Lea, and slightly steeper valleys of the rivers Stour, Colne and Roman. Numerous springs rise at the base of the Bagshot Beds and several reservoirs are dotted throughout the area*
- *The pattern of woodlands is varied across the area and includes considerable ancient semi-natural woodland. Hertfordshire is heavily wooded in some areas as are parts of Essex, while other areas within Essex are more open in character. Significant areas of wood pasture and pollarded veteran trees are also present.*
- *The field pattern is very varied across the basin reflecting historical activity. Informal patterns of 18th-century or earlier enclosure reflect medieval colonisation of the heaths. Regular planned enclosures dating from the Romano-British period are a subtle but nationally important feature on the flat land to the south-east of the area. In the Essex heathlands 18th- and 19th-century enclosure of heathlands and commons followed by extensive 20th-century field enlargement is dominant.*
- *Mixed farming, with arable land predominating in the Hertfordshire plateaux, parts of the London Clay lowlands and Essex heathlands. Grasslands are characteristic of the river valleys throughout. Horticulture and market gardening are found on the light, sandy soils of former heaths in Essex, particularly around Colchester, along with orchards, meadow pasture and leys following numerous narrow rivers and streams.*

- *The diverse range of semi-natural habitats include ancient woodland, lowland heath and floodplain grazing marsh and provide important habitats for a wide range of species including great crested newt, water vole, dormouse and otter.*
- *Rich archaeology including sites related to Roman occupation, with the Roman capital at Colchester and City of St Albans (Verulamium) and links to London. Landscape parklands surrounding 16th- and 17th-century rural estates and country houses built for London merchants are a particular feature in Hertfordshire.*
- *The medieval pattern of small villages and dispersed farming settlement remains central to the character of parts of Hertfordshire and Essex. Market towns have expanded over time as have the London suburbs and commuter settlements, with the creation of new settlements such as the pioneering garden city at Welwyn and the planned town at Basildon.*
- *Brick-built dwellings are characteristic from the late 17th century onwards. Prior to this dwellings and farm buildings tended to be timber built with weatherboarding, now mainly painted white but traditionally black or tarred, and whitewashed plaster walls*

Welwyn Hatfield Landscape Character Assessment (Hertfordshire Landscape Strategy)

3. The Welwyn Hatfield Landscape Character Assessment (Hertfordshire Landscape Strategy) was published by Welwyn Hatfield Council and Hertfordshire Council (prepared by The Landscape Partnership Ltd) in April 2005). This document is more recent that the Hertfordshire Landscape Strategy volumes 1 & 2, 1997 and 2001 and Landscape Character Assessment, evaluation and guidelines for Southern Hertfordshire. Supplementary report on the suitability of landscape character areas for mineral extraction by the Landscape Partnership, October 2001 and has therefore been used for this study.

4. It describes the application site as located within "Area 31 De Havilland Plain", which extends from Cromerhyde in the north, southwards across Hatfield Aerodrome and up to the ground of Oaklands College on the edge of St Albans. The key characteristics described in the document are as follows:

- *An extensive level plain;*
- *Large open arable landscape to the north on high quality agricultural land*
- *Disused Hatfield aerodrome with associated industrial and commercial development and aeronautical structures*
- *Parkland and horticultural landscape of Oaklands College*
- *Existing and restored mineral workings*
- *Urban-fringe development and glasshouses*
- *Incoherent and jumbled landscape, particularly to the south and centre*

5. Distinctive features of Area 31 De Havilland Plain include "*Oaklands College house, restored arable fields and mineral extraction plant.*"

Landscape Attributes of the Existing Site and Immediate Surroundings

6. The landscape attributes of the application site and the immediate surroundings have been examined below. A detailed site description is provided in Chapter 2 of the ES.

Natural Characteristics

7. The existing topography within the application site falls very gently from northwest to southeast as illustrated on Drawing HF 2/3 and described below:

- ground elevations are at their lowest between 74m AOD and 76m AOD adjacent to the A1057 at the southern edge of the application site;
- levels rise to between 77mAOD and 78mAOD) in the northwest and northeast corners of the application site; and
- ground elevations are approximately 75mAOD to 76mAOD adjacent to the southwest side of Home Covert.

8. The broader area is also typically flat to gently sloping; "Area 31 De Havilland Plain", describes how it "*represents a subtle watershed between the Colne and the Lea. Levels vary by as little as 2-3m over 6km. The land rises locally to the west and south*". The altitude range is described as "*Typically around the 80m contour but falling to 70m at Ellenbrook and rising to 100m within the undulating grounds of Oakland College on the edge of St Albans*."

9. The Ellen Brook runs in a north to south direction approximately 300m east of the proposed mineral extraction area. The River Nast currently runs in a culvert across the application site.

10. The application site comprises a broadly rectangular area of unoccupied land that is partly used as an informal public open space and partly for grazing. There are some remnant hedgerows that cross the site although the current field pattern is less defined than shown on more historic maps (such as 1888). There is also naturally regenerating scrub over much of the site, with a number of small ponds.

11. A number of earth bunds and banks are present on site from the earlier aerodrome. There is also a concrete roadway that extends from east to west into the centre of the application site from Albatross Way and a number of other tracks also cross the application site.

12. The application site is bounded by the A1057 (Hatfield Road) to the south, the boundary of which is characterised by a mature hedgerow. To the north lies CEMEX's Hatfield Quarry, and more specifically a set of silt lagoons. "Area 31 De Havilland Plain", describes how it "*Mineral extraction has lead to the creation of a number of larger waterbodies, some with wildlife interest*."

13. To the west the boundary is predominantly formed by a mature hedgerow, particularly in the vicinity of the garden centre and nursery, with the northern section being more open in aspect. At the north eastern corner is Home Covert, a small area of broadleaf woodland. The eastern boundary cuts across the former

aerodrome to join up with the University sports pitches located at the south eastern corner of the application site.

14. There are other blocks of woodland to the north including Cut Field Wood and Ball's Covert and areas of ancient woodland within 5km of the application site: Symondshyde Great Wood; Home Wood; Oak Wood; Hazel Grove; and Hooks Wood and also a Local Nature Reserve at Colney Heath.

15. "Area 31 De Havilland Plain", describes how there is very limited woodland cover, few hedgerows (except to some of the roads) and few isolated trees. The vast majority of the land has been disturbed over the last century. Some of the former mineral workings support a mix of flooded gravel pits, scrub and marshland habitats.

16. The application site is located within the Watling Chase Community Forest, one of 12 Community Forests in England. The WCCF covers an area of 18,840 ha2 (72 square miles) in south Hertfordshire and north London. The aims of the Watling Chase Community Forest, as set out in the Watling Chase Community Forest Plan 1995 and the 2001 review, are to achieve major environmental improvements around towns and cities through the creation of a mosaic of wooded landscapes, leisure enterprises, areas for nature and public open spaces and for much of the area to be under positive and appropriate management by 2025. This will include a substantial increase in trees and woodland, achieved through management of existing woodlands and new planting.

Cultural and Social Aspects

17. The application site is located on the north-western edge of Hatfield and to the east of St Albans on informal recreational land known locally as "Ellenbrook Fields" associated with the former Hatfield Aerodrome (western part).

18. In the document produced by Goodmans, titled "Welcome to Ellenbrook Fields" it describes *"A series of linking permissive footpaths, suitable for walkers and cyclists have been created through the areas of open grassland and cattle grazing"* and includes a plan of the area and additional historical information; "*The aerodrome was closed in 1993 and the land and industrial buildings lay abandoned…Goodman began the process of clearing and making safe the land for use by the public and its management as a natural resource in 2009."*

19. The old taxiway remains in areas and new footpaths formed. Natural regeneration has been left as wildlife habitat and parts of the site are grazed, with other parts cut as hay crop.

20. The application site lies within an area bounded by the A1057 (Hatfield Road/St Albans Road) to the south, Oaklands Lane to the west, Coopers Green Lane to the north and the western fringe of Hatfield to the east.

21. To the south of the application site the area is interspersed with small settlements, areas of woodland and the highway network; clusters of housing can be found fronting the highway network, often being developing around road junctions. An

area of industrial development lies to the south of the A1057, west of Station Road (in the vicinity of Smallford). To the southwest of the application site are a garden centre, a public house, a petrol station, some large glass houses (nurseries) and a small residential area.

22. Immediately to the north are a series of lagoons associated with an existing mineral working (Hatfield Quarry, CEMEX); the processing plant lies to the northwest of the application site, having its access off Oaklands Lane and a conveyor transports mineral from the working area located further north.

23. To the east of the application site is the urban area of Hatfield, with an industrial/distribution estate, residential development and the University of Hertfordshire campus. The remainder of the former aerodrome, surface water drainage infrastructure (an open drain and series of lagoons, known as Ellenbrook Linear Park) and some sports pitches and associated pavilion. Lie between the application site and Hatfield.

24. The nearest property to the application site is Popefield Farm, which fronts the northern side of the A1057. Further to the south is Wilkinsgreen Farm, beyond which is a small cluster of properties.

25. To the southwest are a number of properties on the south side of Hatfield Road and east of Station Road, with a further small row of properties located off Oaklands Lane to the west of the application site.

26. A small residential area lies to the southeast of the application site centred on Poplars Close, Poplar Avenue and Bramble Road (known as Ellenbrook). Other residential properties front the northern side of Wilkins Green Lane to the south of this area. A larger residential area can be found on the western edge of Hatfield, with the nearest properties being on Nimrod Drive, Flamingo Close and Walker Grove (all off Cunningham Avenue).

27. There are several listed buildings in the vicinity of the Site, with the closest (being a cluster of three) located at Popefield Farm on the southern boundary. Two more are located close to the southwestern corner of the application site including the Milepost approximately 70 metres east north east of the Three Horseshoes public house and Three Horseshoes Public House. Seven more listed buildings are located along Wilkins Green Lane.

28. In addition to the permissive access described above, a public right of way crosses the western part of the application site. There are other rights of way in the surrounding area and the Alban Way and Watling Chase Trails c0.5km to the south.

Aesthetic and Perceptual Aspects

29. The aesthetic qualities of the application site and local area are summarised in Table 1, being divided into the main categories identified within recognised guidance[1].

1 Landscape Character Assessment – Countryside Agency and Scottish Natural Heritage (2002) – Paragraph 5.12

30. In summary the following application site is large scale and open, generally simple, textured and flat. The muted colours of the grassland dominate, but are broken by the former aerodrome trackways and new footpaths, which are white/grey in colour and this mixture of remnant gappy hedgerows, scattered scrub and more modern straight hardstanding is unbalanced.

31. This is similar to the published description of "Area 31 De Havilland Plain" as a whole, which is an extensive plain, with a diverse mixture of uses (including open arable, few woodlands, sparse settlement), with an incoherent pattern.

Table 1
Aesthetic Attributes of Application Site and Study Area

Generic Aesthetic Attributes	Description of Attributes for Site and Study Area
Scale	The application site is medium to large scale, being part of a former aerodrome. As described in "Area 31 De Havilland Plain", the surrounding areas are typically characterised by an extensive level plain and large open arable landscape, especially to the north, with a mixture elsewhere including areas of sand and gravel extraction, pasture and parkland. There is a dispersed estate settlement pattern with a number of isolated farmsteads, although to the east the area is defined by the western edge of Hatfield including the large aircraft hangars.
Enclosure	The grassland cover of the application site results in a generally open character, with localised enclosure provided by remnant hedgerows and scattered scrub, especially associated with vegetation around its perimeters. As described in "Area 31 De Havilland Plain", the surrounding areas include arable cropping with open views in the north and generally very limited woodland cover (although Home Covert is immediately adjacent to the site). The presence of built development such as Hertfordshire University, Ellenbrook, Hatfield Business Park and new development at Smallford result in an urban fringe character to the application site.
Diversity	The application site is generally quite simple and "Area 31 De Havilland Plain" as a whole is described as being "..*as empty as it is flat*". However it does have a diverse mix of uses, such as sand and gravel extraction (introduce areas of diversity, with a mix of restored habitats) amongst the farmland, crossed by a modest number of sinuous secondary roads and dispersed settlement pattern, albeit between built up areas of Hatfield and St Albans.
Texture	The mainly grassland cover of the application site is textured, with some roughness provided by vegetation or hardstanding. The arable farmland in the surrounding area will be smooth, but with textural woodland blocks, hedgerow vegetation and waterbodies associated with restored mineral workings.
Form and Line	The application is mainly flat with straight road/trackways and remanent hedgerows. As described in "Area 31 De Havilland Plain", the surrounding area is also flat, with few hedgerows, but with sinuous secondary roads. The limited woodland cover is nevertheless typically in blocks with a regular form and line. Waterbodies associated with restored mineral workings are more irregular. Mineral extraction plant and the Hatfield Business Park is rectangular buildings and serviced by improved roads. The conveyor at Hatfield Quarry to the north is long and straight.
Colour	The application site has muted colours of the grassland, but broken by the former aerodrome trackways or new footpaths, which are white/grey in colour. Traffic on the road network and the built up areas and mineral extraction plant provides more colourful elements in this landscape.

Generic Aesthetic Attributes	Description of Attributes for Site and Study Area
Balance	The application site unbalanced, being a mixture of remnant gappy hedgerows and more modern trackways of the former aerodrome (partly removed). Although unified by the level topography "Area 31 De Havilland Plain" is considered to be an *"incoherent and jumbled landscape, particularly to the south and centre."*
Movement	The disused former aerodrome is generally still, albeit with movement from visitors to the Ellenbrook Fields greenspace, grazing cattle of occasional machinery carrying out maintenance. The surrounding landscape varies from dispersed settlements with poor access and quiet, but with busier urban-edge settlement to the east. The nearby road network of the A1057 to the south is busy with regular vehicle movements, as are the mineral extraction areas, during working hours.
Pattern	The application site does not have a recognisable pattern, being a mixture of remnant hedgerows, scattered / naturally regenerating scrub and more regular trackways of the former aerodrome (again partly removed) and footpaths. The "Area 31 De Havilland Plain" is considered to have an *"incoherent pattern."*

Classification of the Existing Site and Immediate Surroundings

32. The analysis of existing landscape attributes has concluded that the study area is generally consistent with the published key characteristics for "Area 31 De Havilland Plain" as described in The Welwyn Hatfield Landscape Character Assessment (*op cit*). The only exception being that mineral extraction plant (other than conveyors), was not a distinctive feature in any of the views/locations around the application site, other than conveyors. Analysis of relatively recent aerial photography has identified that much mineral extraction has been replaced by restored areas over the past 10 years.

33. At a local level, the application site can be classified as "medium to large-scale greenspace plain/former aerodrome".

METHOD STATEMENT FOR ZTVS

1. Comparative zones of theoretical visibility (ZTV) were calculated for the following aspects of the proposed development using 3D digital terrain model in using LSS software (McCarthy Taylor):

   - Plant Site (based on a 10m high pinnacle with perimeter bunds formed during site establishment as screening features) – Drawing HQ 8/2;
   - Phase A extraction area (with perimeter bunds formed during site establishment as screening features) – Drawing HQ 8/3; and
   - Maximum extraction void (with perimeter bunds formed during site establishment as screening features) – Drawing HQ 8/4.

2. The ZTV results are based on topography only and do not take account of the screening effects of any buildings or vegetation. The topography is purchased Landform Profile DTM data.

3. The receptor point grid interval was set to 25m, with a 1.8m eye height (above the digital terrain model) and covered an area of approximately 5km radius centred on the site.

4. The following representative target points were set for the ZTV calculations for the Plant Site (with perimeter bunds formed during site establishment as screening features):

   - E 519605.418, N 208642.549, 80.167m AOD;
   - E 519611.118, N 208644.310, 79.662m AOD;
   - E 519607.741, N 208647.699, 78.447m AOD;
   - E 519613.205, N 208649.113, 82.510m AOD;
   - E 519604.576, N 208644.658, 86.000m AOD;
   - E 519614.204, N 208647.026, 86.000m AOD;
   - E 519611.825, N 208649.854, 86.000m AOD; and
   - E 519606.798, N 208642.335, 86.000m AOD.

5. The following representative target points were set for the ZTV calculations for the Phase A extraction area (with perimeter bunds formed during site establishment as screening features):

   - E 520161.834, N 208705.917, 74.054m AOD;
   - E 520457.756, N 208431.768, 74.568m AOD;
   - E 520195.484, N 208047.762, 73.438m AOD;
   - E 520129.173, N 208250.652, 72.224m AOD;
   - E 520193.504, N 208601.008, 70.000m AOD;
   - E 520306.331, N 208484.223, 61.382m AOD; and
   - E 520268.722, N 208250.652, 69.650m AOD.

6. The following representative target points were set for the ZTV calculations for the maximum extraction void (with perimeter bunds formed during site establishment as screening features) :

- E 519465.232, N 208394.332, 73.679m AOD
- E 519957.916, N 208744.997, 71.767m AOD;
- E 520219.162, N 208364.525, 69.918m AOD;
- E 520348.908, N 208169.906, 68.966m AOD;
- E 520084.156, N 208147.113, 74.054m AOD;
- E 519880.770, N 207899.894, 69.831m AOD;
- E 519658.098, N 208020.874, 71.026m AOD;
- E 519652.838, N 208366.279, 62.936m AOD;
- E 519971.943, N 208606.484, 62.140m AOD;
- E 520219.162, N 208241.793, 62.989m AOD;
- E 519815.897, N 208017.367, 61.772m AOD; and
- E 519875.510, N 208325.952, 61.752m AOD.

INDIVIDUAL VIEWPOINT ASSESSMENT

1. This appendix provides a detailed analysis of the individual representative viewpoints.

Viewpoint 1 - View south from public right of way to the north near conveyor crossing point

2. Viewpoint 1 is looking south from the public right of way to the north of the application site near to the CEMEX conveyor crossing point. It is located at an elevation of 79.2m AOD at 207m north of the application site boundary.

3. It is located within "Area 31 De Havilland Plain" as described in The Welwyn Hatfield Landscape Character Assessment (*2005*) and designated Green Belt.

4. This viewpoint represents the recreational users of this route in a broadly rural context (of which current quarrying operations are apparent).

5. The existing view as shown on Drawing HQ 8/5 has a framed, long distance view over extensive level plain, which is a key characteristic of the area. The distant skyline is horizontal and generally vegetated but with some buildings in the centre of Hatfield visible. There is localised enclosure to the rough grassland and scattered scrub, by linear hedgerows and trees and the quarry conveyor is adjacent.

6. The proposed plant site would be approximately 360m away from the viewpoint, with the mineral extraction area at 460m at its nearest point. However a soil storage and screening bund would be constructed as part of site establishment at 224m away and this would obscure much of the low-level aspects of the development.

7. In terms of size and scale of change:

- the erection of the processing plant would alter a small part of horizontal skyline and introduce a new industrial element. Colour treatment using a recessive colour will ensure beneficial mitigation;
- the lower parts of the plant site and stocking area would be screened by the perimeter bund which would be broad and relatively low and would not break the skyline. It would be grass seeded to further ensure visual integration with the surroundings;
- there would be short-term visibility of the earthmoving plant and machinery carrying out the bund formation works;
- temporary mineral stockpiles may be visible at certain times, as the heaps are surcharged on a campaign basis and then reduced in size as processed and sold from site;
- the proportion of the view occupied by the plant site and bund would relatively be small;

- advance planting of native tree and shrub species would be included around the northern site boundary and the toe of the bund as part of an ecological corridor, to soften views of the plant and bund;
- the existing intervening and framing trees are anticipated to continue to grow and mature over the subsequent period, resulting in likely increased level of screening; and
- the nature of the views of the proposed development would be transitory (passing visitors) and will be partial or glimpses only (being framed through the deciduous vegetation).

8. In terms of geographical extent:

- the application site is in the line of the main direction of travel for those heading southwards, albeit partially screened by intervening vegetation (for those heading north it would be positioned behind the direction of travel);
- the viewpoint is some distance from the proposed development and the broader views and character remains unchanged; and
- the very limited extent over which the changes would be visible, as the views become completely screened / not visible nearer further north of this location on the section around Beech Farm and up to Oak Farm.

9. In terms of duration, the plant will be a long-term additional feature, but would eventually be removed as part of restoration, when the view will be broadly restored similar to existing on a permanent basis.

10. Overall this is considered to be a small degree of change to the baseline condition; change is discernible but underlying landscape character or view composition would be similar to baseline.

11. The magnitude of change predicted upon this viewpoint would be low and adverse.

12. The sensitivity of receptors at this viewpoint are considered to be high (recreational visitors in a largely rural context) and the overall effect would be no more than moderate.

13. The Hatfield Quarry conveyor is expected to be removed as part of the cessation of activity at the site in 2020, at which point there would be no cumulative effect of concurrent working with the proposed development. The short-term additional the visibility of the proposed development is therefore considered to be low and adverse and the overall effects would be no more than moderate; there are no significant cumulative effects at this location.

Viewpoint 2 - View south from public right of way as it joins the application site to the north

14. Viewpoint 2 is looking south along the public right of way as it joins the application site to the north. It is located at an elevation of 76m AOD and adjacent to the application site boundary.

15. It is located within "Area 31 De Havilland Plain" as described in The Welwyn Hatfield Landscape Character Assessment (*2005*) and designated Green Belt.

16. This viewpoint represents the recreational users of this route and visitors to Ellenbrook Fields in a broadly rural context.

17. The existing view as shown on Drawing HQ 8/6 has framed, narrow views between two mature hedgerows. The distant skyline is horizontal and vegetated.

18. The proposed plant site would be approximately 160km away from the viewpoint, with the mineral extraction area at 259m at its nearest point. However a soil storage and screening bund would be constructed as part of site establishment at 20m away and this would obscure much of the low-level aspects of the development. The right of way would be diverted to the west to follow along the toe of the bund through the break in vegetation.

19. In terms of size and scale of change:

- the plant site and stocking area would be screened by the perimeter bund which would be broad and would break the skyline / dominate the view. It would be grass seeded to ensure visual integration with the surroundings;
- there would be short-term visibility of the earthmoving plant and machinery carrying out the bund formation works;
- the proportion of the view occupied by the bund would relatively be large;
- advance planting of native tree and shrub species would be included around the northern site boundary and the toe of the bund as part of an ecological corridor, to soften views of the plant and bund;
- the existing intervening and framing trees are anticipated to continue to grow and mature over the subsequent period, resulting in likely increased level of screening; and
- the nature of the views of the proposed development would be transitory (passing visitors) and will be partial or glimpses only (being framed through the deciduous vegetation).

20. In terms of geographical extent:

- the application site is in the line of the main direction of travel for those heading southwards, albeit partially screened by intervening vegetation (for those heading north it would be positioned behind the direction of travel);
- the views to the south-west and its character would remain broadly unchanged (along the diverted route of the right of way); and
- the changes would be visible along c0.3km of this route.

21. In terms of duration, the bund will be a long-term additional feature, but would eventually be removed as part of restoration, when the view will be broadly restored similar to existing on a permanent basis.

22. Overall this is considered to be a small degree of change to the baseline condition; change is discernible but underlying landscape character or view composition would be similar to baseline.

23. The magnitude of change predicted upon this viewpoint would be low and adverse.

24. The sensitivity of receptors at this viewpoint are considered to be high (recreational visitors in a largely rural context) and the overall effect would be no more than moderate.

25. There is no simultaneous or sequential visibility of Hatfield Quarry at this location and therefore no cumulative effects are predicted.

Viewpoint 3 - View west from edge of Ellenbrook

26. Viewpoint 3 is looking west from the edge of Ellenbrook. It is located at an elevation of approximately 77m AOD at 0.5km north east of the application site boundary.

27. It is located within "Area 31 De Havilland Plain" as described in The Welwyn Hatfield Landscape Character Assessment (*2005*) and designated Green Belt.

28. This viewpoint represents the views of recreational visitors to the Ellenbrook Fields greenspace and local residents, in a broadly urban fringe context.

29. The existing view as shown on Drawing HQ 8/7 is broad over extensive level plain, which is a key characteristic of the area, although there is localised from scattered scrub and trees. The distant skyline is horizontal and vegetated, but with the edge of Ellenbrook visible.

30. The proposed plant site would be approximately 1.1km away from the viewpoint, with the mineral extraction area at 0.7km at its nearest point. However a soil storage and screening bund would be constructed as part of site establishment at 0.5km away and this would obscure much of the low-level aspects of the development, with the intervening vegetation screening the remainder, even in the winter when not in leaf.

31. In terms of size and scale of change:

- there may be short-term visibility of the earthmoving plant and machinery carrying out the bund formation works after which point it would be grass seeded to ensure visual integration with the surroundings;
- the proportion of the view occupied by the bund would negligible to low;
- advance planting of a new hedgerow would be included along the eastern site boundary and the toe of the bund, to soften views of the bund;
- the existing intervening and framing trees are anticipated to continue to grow and mature over the subsequent period, resulting in likely increased level of screening; and
- the nature of the views of the proposed development would be transitory (passing visitors) and more stationary (local residents) will be partial or glimpses only (being interrupted through the deciduous vegetation).

32. In terms of geographical extent:

- the application site is offset to the line of the main direction of travel for those heading along the path and also the main facades of the properties;
- the views and its character would remain broadly unchanged; and
- the very limited extent over which the changes would be visible.

33. In terms of duration, the bund will be a long-term additional feature, but would eventually be removed as part of restoration, when the view will be broadly restored similar to existing on a permanent basis.

34. Overall this is considered to be a very small degree of change to the baseline condition; change may be discernible but underlying landscape character or view composition would be very similar to baseline.

35. The magnitude of change predicted upon this viewpoint would be negligible to low and neutral.

36. The sensitivity of receptors at this viewpoint are considered to be high (recreational visitors in an urban fringe context and local residents) and the overall effect would be no more than slight/moderate.

37. There is no simultaneous or sequential visibility of Hatfield Quarry at this location and therefore no cumulative effects are predicted.

Viewpoint 4 - View from Hatfield Road at entrance to Popefield Farm

38. Viewpoint 4 is located on Hatfield Road at the entrance to Popefield Farm. It is located at an elevation of 75.7m AOD at 40m south of the application site boundary.

39. It is located on the edge of "Area 31 De Havilland Plain" as described in The Welwyn Hatfield Landscape Character Assessment (*2005*) and designated Green Belt.

40. This viewpoint represents the views of users of the local road network and local residents.

41. The existing view as shown on Drawing HQ 8/8 is a narrow, relatively busy road corridor, with footpath along one side, enclosed by mature trees and hedgerows. The farm itself is not visible at this location.

42. The proposed processing plant would be approximately 0.9km away from the viewpoint, with the mineral extraction area at approximately 100m at its nearest point. However a soil storage and screening bund would be constructed as part of site establishment at approximately 85m away and this would obscure much of the development, with the intervening vegetation screening the remainder, even in the winter when not in leaf. The proposed site access would be 240m west of this location, but any vegetation clearance for visibility splays is predicted to have a minimal effect on views. Traffic arriving at and leaving the proposed mineral development would be visible on Hatfield Road.

43. Indeed, there is no perceptible change to the composition of views or character predicted at this location.

44. The sensitivity of receptors at this viewpoint are considered to be low (road users) and high (local residents), but the overall effect would be none.

45. There is no simultaneous or sequential visibility of Hatfield Quarry at this location and therefore no cumulative effects are predicted.

Viewpoint 5 - View from Hatfield Road at junction with public right of way, near proposed site entrance

46. Viewpoint 5 is located on Hatfield Road at the junction with public right of way, near proposed site entrance. It is located at an elevation of 77m AOD at 19m south of the application site boundary.

47. It is located on the edge of "Area 31 De Havilland Plain" as described in The Welwyn Hatfield Landscape Character Assessment (*2005*) and designated Green Belt.

48. This viewpoint represents the views of users of the local road network and local residents, as well as users of the right of way and visitors to Ellenbrook Fields and/or parking at Notcutts Garden Centre.

49. The existing view as shown on Drawing HQ 8/9 is a narrow, relatively busy road corridor, with footpath along one side, enclosed by mature trees and hedgerows.

50. The plant site would be approximately 0.8km away from the viewpoint, with the mineral extraction area at 86m at its nearest point. However a soil storage and screening bund would be constructed as part of site establishment at 42m away and this would obscure much of the low-level aspects of the development, with the intervening vegetation screening the remainder, even in the winter when not in leaf.

51. The proposed site access however would be 120m east of this location and the vegetation clearance for visibility splays is predicted to be visible, as are the subsequent vehicle movements.

52. In terms of size and scale of change:

- there may be short-term visibility of the plant and machinery carrying out the access formation works after which point the verges and adjacent areas would be grass seeded and planted to ensure visual integration with the surroundings;
- the proportion of the view occupied by the access would negligible to low;
- the existing intervening and framing trees are anticipated to continue to grow and mature over the subsequent period, resulting in likely increased level of screening; and
- the nature of the views of the proposed development would be transitory (passing visitors) and more stationary (local residents) will be partial or glimpses only (being interrupted through the deciduous vegetation).

53. In terms of geographical extent:

- the application site is adjacent to the line of the main direction of travel;
- the views and its character would remain broadly unchanged; and
- the very limited extent over which the changes would be visible as road users move along the route.

54. In terms of duration, the new access and vehicle movements will be a long-term additional feature, but would eventually be removed as part of restoration, when the view will be broadly restored similar to existing on a permanent basis.

55. Overall this is considered to be a small degree of change to the baseline condition; change may be discernible but underlying landscape character or view composition would be similar to baseline.

56. The magnitude of change predicted upon this viewpoint would be to low and adverse.

57. The sensitivity of receptors at this viewpoint are considered to be low (road users) and high (recreational visitors in an urban fringe context and local residents) and the overall effect would be no more than moderate.

58. There is no simultaneous or sequential visibility of Hatfield Quarry at this location and therefore no cumulative effects are predicted.

Viewpoint 6 - View south from public right of way to the west edge of Ninefields Nursery

59. Viewpoint 6 is looking south from the public right of way to the western edge along Ninefields Nursery (separated by a tree belt) and at the eastern edge of Ellenbrook Fields. It is located at an elevation of 78m AOD on the western application site boundary.

60. It is located within "Area 31 De Havilland Plain" as described in The Welwyn Hatfield Landscape Character Assessment (*2005*) and designated Green Belt.

61. This viewpoint represents the recreational users of this route and part of Ellenbrook Fields in a broadly rural context.

62. The existing view as shown on Drawing HQ 8/10 has a broad, long distance view over extensive level plain, which is a key characteristic of the area. The distant skyline is horizontal and vegetated but with buildings visible on the skyline, including the university campus and Hatfield Business Park. There is localised enclosure to the rough grassland by linear hedgerows and trees.

63. The proposed plant site would be approximately 340m away from the viewpoint, with the mineral extraction area approximately 40m at its nearest point. The quarry access road would be approximately 30m away from this viewpoint. However the phased removal of the existing hedgerow would ensure that screening is retained for as long as possible and a soil storage and screening bund would be constructed

as part of site establishment approximately 20m away with an acoustic fence present on the top of the bund and this would obscure the majority of the development.

64. In terms of size and scale of change:

- the quarry access road and moving vehicles during operational hours would be relatively close to this viewpoint but largely hidden by the bund and fence;
- the erection of the processing plant would alter a small part of horizontal skyline and introduce a new industrial element. Intervening vegetation would mitigate the effects from this location;
- the lower parts of the plant site and stocking area would be screened by the perimeter bund (and acoustic fence). The bund would be grass seeded to further ensure visual integration with the surroundings;
- there would be short-term visibility of the earthmoving plant and machinery carrying out the bund formation works;
- temporary mineral stockpiles may be visible at certain times, as the heaps are surcharged on a campaign basis and then reduced in size as processed and sold from site;
- the proportion of the view occupied by the plant site and bund would relatively be small;
- advance planting of a section of hedgerow would be included on the western site boundary to soften views of the plant and bund/fence;
- the existing intervening and framing trees are anticipated to continue to grow and mature over the subsequent period, resulting in likely increased level of screening; and
- the nature of the views of the proposed development would be transitory (passing visitors) and will be partial or glimpses only (being framed through the deciduous vegetation).

65. In terms of geographical extent:

- the application site is alongside this route for over 0.5km, in either direction;
- the viewpoint is adjacent to the proposed development; and
- the extent over which the changes would be visible increases as the development reaches its later phases, whilst during the initial phases the main impact is the road corridor.

66. In terms of duration, the road will be a long-term additional feature, whilst the working in the later operational phases are more likely to be medium term, but all would eventually be removed as part of restoration, when the view will be broadly restored similar to existing on a permanent basis.

67. Overall this is considered to be a small degree of change to the baseline condition; change is discernible but underlying landscape character or view composition would be similar to baseline.

68. The magnitude of change predicted upon this viewpoint would be low and adverse.

69. The sensitivity of receptors at this viewpoint are considered to be high (recreational visitors in a largely rural context) and the overall effect would be moderate.

70. There is no simultaneous or sequential visibility of Hatfield Quarry at this location and therefore no cumulative effects are predicted.

Viewpoint 7 - View from residential properties, near to Oaklands Lane and public right of way

71. Viewpoint 7 is looking east from residential properties, near to Oaklands Lane and public right of way. It is located at an elevation of 77.5m AOD at 289m west of the application site boundary.

72. It is located on the edge of "Area 31 De Havilland Plain" as described in The Welwyn Hatfield Landscape Character Assessment (*2005*) and designated Green Belt.

73. This viewpoint represents local residents and users of the nearby public right of way.

74. The existing view as shown on Drawing HQ 8/11 is an enclosed housing development with mature trees and hedgerows and view out are very restricted. However, the orientation of Pasture View is northwards and views include the existing Cemex plant site, approximately 460m away, with views to the north east towards the proposed plant site also present. Properties to the east of pasture view and a small mews type development would have some windows facing eastwards towards the proposed mineral development.

75. The proposed plant site would be approximately 470m away from the viewpoint, with the mineral extraction area at 335m at its nearest point. Low levels development features would be screened by existing intervening vegetation and at a later stage by the woodland block planting. The proposed processing plant is likely to be the most visible element but at a distance of approximately 650m.

76. There would be a perceptible change to the composition of views at this location, as the processing plant would most likely be visible from some limited locations within the housing area.

77. The magnitude of change predicted upon this viewpoint would be low and adverse.

78. The sensitivity of receptors at this viewpoint are considered to be high (recreational visitors in an urban fringe context) and the overall effect would be moderate.

79. There would be some simultaneous visibility of the nearer Hatfield Quarry plant site on the northern edge of Pasture View, in conjunction with the proposed processing plant. However both plant site buildings would be screened to a large extent and therefore cumulative effects would be restricted.

Viewpoint 8 - View south from public right of way to the west, parallel to Oaklands Lane

80. Viewpoint 8 is looking south from the public right of way to the west of the application site, parallel to Oaklands Lane. It is located at an elevation of approximately 80m AOD at 289m from the western application site boundary.

81. It is located within "Area 31 De Havilland Plain" as described in The Welwyn Hatfield Landscape Character Assessment (*2005*) and designated Green Belt.

82. This viewpoint represents the recreational users of this route.

83. The existing view as shown on Drawing HQ 8/12 has a broad, long distance view over extensive level plain, which is a key characteristic of the area. The distant skyline is obscured by vegetated and adjacent housing developments. There is localised enclosure to the rough grassland by linear hedgerows and trees and the new housing on the edge of Smallford (off Oaklands Lane) is visible forming urban fringe. The security fence marking the edge of Hatfield Quarry plant site area is also visible to the north of the viewpoint.

84. The proposed plant site would be approximately 0.4km away from the viewpoint, but with the processing plant over 640m distant. The mineral extraction area would be at 439m at its nearest point. However a soil storage and screening bund would be constructed as part of site establishment at 324m away and this in conjunction with a new intervening woodland block would obscure much of any low-level aspects of the development visible.

85. In terms of size and scale of change:

- the quarry access road and moving vehicles during operational hours would be relatively close to this viewpoint;
- the erection of the processing plant would alter a small part of horizontal skyline and introduce a new industrial element.
- the lower parts of the plant site and stocking area would be screened by the perimeter bund which would be broad and relatively low and would not break the skyline. It would be grass seeded to further ensure visual integration with the surroundings;
- there would be short-term visibility of the earthmoving plant and machinery carrying out the bund formation works;
- temporary mineral stockpiles may be visible at certain times, as the heaps are surcharged on a campaign basis and then reduced in size as processed and sold from site;
- the proportion of the view occupied by the plant site and bund would relatively be small;
- advance planting of native tree and shrub species would be included around the north western site boundary and the toe of the bund, to soften views of the plant and bund;

- the existing intervening and framing trees are anticipated to continue to grow and mature over the subsequent period, resulting in likely increased level of screening; and
- the nature of the views of the proposed development would be transitory (passing visitors) and will be partial or glimpses only (being framed through the deciduous vegetation).

86. In terms of geographical extent:

- the application site is offset to the line of the main direction of travel for those heading along the path;
- the viewpoint is some distance away from the proposed development; and
- the extent over which the changes would be visible are limited due to the increase in intervening vegetation to the north.

87. In terms of duration, the plant and screening bunds will be a long-term additional feature, whilst the working in the later operational phases are more likely to be medium term, but all would eventually be removed as part of restoration, when the view will be broadly restored similar to existing on a permanent basis.

88. Overall this is considered to be a small degree of change to the baseline condition; change is discernible but underlying landscape character or view composition would be similar to baseline.

89. The magnitude of change predicted upon this viewpoint would be low and adverse.

90. The sensitivity of receptors at this viewpoint are considered to be high (recreational visitors in an urban fringe context) and the overall effect would be moderate.

91. There would be some simultaneous visibility of the much nearer Hatfield Quarry plant site, in conjunction with the proposed processing plant. However both plant site buildings would be screened to a large extent and therefore cumulative effects would be restricted.

HATFIELD AERODROME

Appendix 9/1: Dispersion Modelling Methodology
Prepared for: **Brett Aggregates Limits**

SLR Ref: 403.09885.00024
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Appendix 9/1 - Dispersion Modelling Methodology

Road Traffic Emissions

Traffic Inputs

The ADMS-Roads assessment incorporates numbers of road traffic vehicles, vehicle speeds on the local roads and the composition of the traffic fleet.

Traffic data are consistent with the analysis undertaken, and presented as part of Chapter 7: Transport within the Environmental Statement.

The quarry is expected to generate a maximum of 184 vehicles per operational day, of which 164 are HDVs. For the purposes of providing a conservative assessment, these values have been treated as AADT, whereas in reality anticipated AADT values are likely to be lower once annualised. Furthermore, the assessment has assumed that 100% of generated traffic volumes will occur in every direction on the neighbouring arterial network, where sensitive receptors exist – to ensure all worst-case impacts are assessed, considered unlikely. It could be argued that road traffic flows would be under the EPUK & IAQM screening criteria once distributed onto the local public road network once off-Site (i.e. adopting a 50/50 east/west bound split on the A1057 St Albans Road West).

Traffic speeds were modelled at the relevant speed limit for each road. However, where appropriate, the speeds have been reduced to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to be an issue, in accordance with LAQM.TG(16). Traffic speeds have been assumed to be consistent across all the modelled scenarios.

The Emissions Factors Toolkit (EFT) version 10.1 developed by Defra[1] has been used to determine vehicle emission factors for input into the ADMS-Roads dispersion model.

A summary of the traffic flows used in this assessment are provided in Table 9/1-1, whilst the modelled roads in relation to the Site are presented in Figure 9.1.

Table 9/1-1
Traffic Data Used Within the Assessment: Summary

Link	2019 BC		2023 DM		2023 DS		Speed (kph) (A)
	AADT	% HDV	AADT	% HDV	AADT	% HDV	
A1057: West of Ellenbrook Lane	13,718	6.3	14,062	6.3	14,246	7.4	64.4
A1057: East of Ellenbrook Lane	15,227	6.3	15,609	6.3	15,793	7.2	48.3/64.4
Comet Way	18,978	8.8	19,454	8.8	19,638	9.6	48.3/80.5
A1 (M)	61,105	6.8	62,638	6.8	62,822	7.1	112.7

(A) Speeds based upon National Speed Limits. Traffic speeds have been adjusted to take into account queues and congestion in accordance with LAQM.TG(16).

Meteorological Data

As input into the road traffic emissions modelling assessment, 2019 meteorological data recorded at Luton Airport, located approximately 15km to the north east of the Site has been used. Luton Airport represents the

[1] Defra, EFT v10.1. https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html.

closest representative meteorological station relative to the Site. A wind rose for the corresponding period is presented in Figure 9/1-1.

2019 represents the latest year of monitoring data available within the public domains suitable for model verification purposes. As stipulated in LAQM.TG(16), concurrent inputs (such as meteorological data, pollutant concentrations etc.) should be used for the purposes of model verification. Therefore, 2019 meteorological data was required as input for the road traffic dispersion modelling assessment.

LAQM.TG(16) recommends that meteorological data should have a percentage of usable hours greater than 85%. 2019 meteorological data from Luton Airport meteorological station includes 8,760 lines of usable hourly data for the year, i.e. 100% usable data. This is therefore suitable for the dispersion modelling exercise.

A roughness length z0 of 0.5m was used to represent the surface roughness of the principal study area. This value relates to 'parkland and open suburbia' and is reflective of the principal study area. Whereas a roughness length z0 of 0.2m was used to represent the surface roughness of the Luton Airport meteorological station. This value relates to 'agricultural areas (min)' and was considered representative given the airport setting.

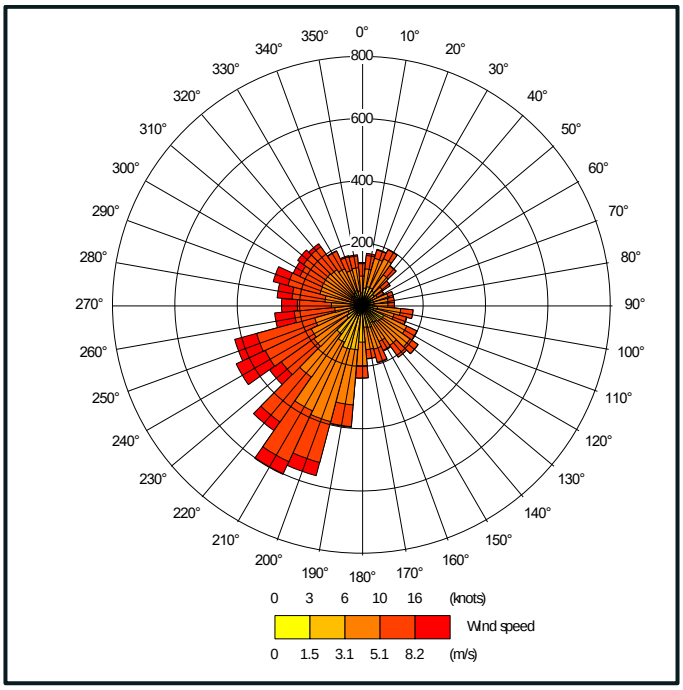


Figure 9/1-1
2019 Wind Rose for Luton Airport Meteorological Station

Model Verification

The ADMS-Roads dispersion model has been widely validated for this type of assessment and is specifically listed in the Defra's LAQM.TG(16) guidance as an accepted dispersion model.

Model validation undertaken by the software developer (CERC) will not have included validation in the vicinity of the Site. It is therefore necessary to perform a comparison of modelled results with local monitoring data at relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

Prior to undertaking model verification, model setup parameters and input data were reviewed to maximise the performance of the dispersion model in relation to the real-world conditions.

NO_x/NO_2 Verification Calculations

NO_x/NO_2 verification relates to the comparison and adjustment of modelled road-NO_x (as output from the ADMS-Roads dispersion model), relative to monitored road-NO_x.

For NO_x/NO_2 model verification, 2019 LAQM WHDC monitoring data has been used (Table 9/1-2). These relate to roadside monitoring locations within or adjacent to the principal study area. The latest LAQM monitoring published by SADC relates to 2018, and has not been considered further - as it does not align with the verification year (2019). It is noted that whilst WH13 is located within the modelled domain, it is an urban background site so cannot be used for verification purposes.

Table 9/1-2
Local Monitoring Data Available for NOx/NO_2 Model Verification

Site ID	X	Y	2019 Monitored NO_2 Concentration (µg/m³)	2019 Data Capture (%)
WH7	521575	208645	28.0	100.0
WH24	521164	207740	36.0	100.0

WH7 is located 44m from the nearest modelled road link (A41001 Comet Way) – therefore not considered a suitable monitoring location for the purposes of model verification of road traffic emissions. Furthermore, WH7 is located adjacent to a car park, whereby associated emission contributions have not been included within the ADMS-Roads model which could give rise to a localised monitored vs. modelled road NOx discrepancy which would otherwise be assumed to be constant across the modelled domain. For these reasons, WH7 was not considered an appropriate location for model verification purposes, was excluded from the verification process.

WH24 is the only appropriate roadside monitoring location situated within the modelled domain, given absence of 2019 data from SADC. Other roadside locations with supporting traffic datasets are located >1km from the extent of the modelled domain (WH14, WH12 and WH17), so have less relevance to the principal study area. Furthermore, as discussed above, the spatial extent of the dispersion model has been exaggerated through assuming 100% distribution with distance from the Site. WH24 also reported an annual mean NO_2 concentration of 36µg/m³, use of which will ensure all road modelled pollutant contributions are proportionately benchmarked to.

As such, taking the above points into consideration, along with the scale of trips generated, sensitivity of the area and conservatism of the model (e.g. assumed 2019 opening year), use of WH24 for verification purposes was considered sufficient in this context.

As NO_2 concentrations are solely reported using diffusion tubes, NO_x was back calculated using the latest version of Defra's NO_x to NO_2 Calculator (v8.1)[2]. The NO_x to NO_2 Calculator was also used to facilitate the conversion of modelled road-NO_x (as output from the ADMS-Roads dispersion model) into road-NO_2.

Verification was completed using the 2019 DEFRA background mapped concentrations (2018 base year) for the relevant 1km x 1km grid squares (i.e. those within which the model verification locations are located).

Comparison of the modelled vs. monitored road NO_x contribution at WH24 is provided in Table 9/1-3. An adjustment factor of 2.462 has been derived, based on a linear regression forced through zero, as shown in Figure 9/1-2. No further improvement to the ADMS-Roads dispersion model could be achieved.

Table 9/1-3
NO_x/NO_2 Model Verification (2.462)

Site ID	Monitored Total NO_2 (µg/m³)	Monitored Road NOx (µg/m³)	Modelled Road NOx (µg/m³)	Adjustment Factor
WH24	36.0	42.7	17.3	2.462

[2] Defra NO_x to NO_2 Calculator v8.1, available at https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc.

On this basis, the derived verification factor (2.462) was considered acceptable and was subsequently applied to all road-NO_x concentrations predicted (as output of the ADMS Roads dispersion model).

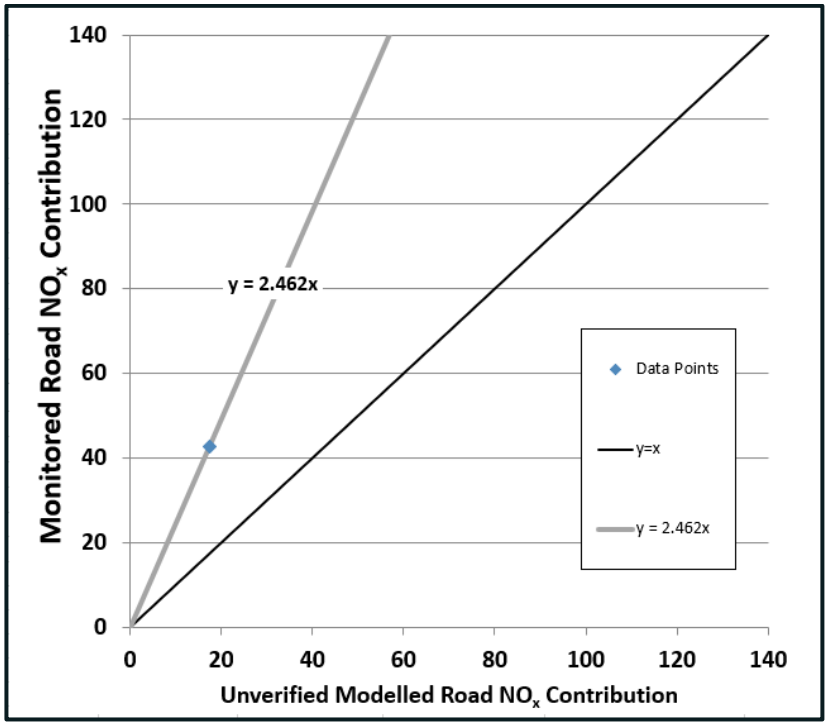


Figure 9/1-2
Comparison of Modelled vs. Monitored Road NO_x Contribution (2.462)

PM_{10}/$PM_{2.5}$ Verification Calculations

The adjustment factor of 2.462 was applied to road-PM_{10} and $PM_{2.5}$ concentrations (as output of the ADMS Roads dispersion model), following the recommendations of LAQM.TG(16) guidance, in the absence of local particulate monitoring.

Fugitive Dust Emissions

Source Term

In the absence of dust emissions factors for similar quarry operations in the UK, emission factors and associated compilation methodologies provided within the following guidance documents have been used:

- Australian Government Department of the Environment and Heritage National Pollutant Inventory (NPI) 'Emission Estimation Technique Manual for Mining'; and
- United States Environmental Protection Agency 'Air Pollutant 42' (US EPA AP-42);

These emission factors relate to arid regions of the USA and Australia where mining is prevalent. As such, application within the context of UK schemes is believed to be conservative, therefore likely to over-predict the potential impacts. This is further endorsed by the IAQM minerals guidance.

The modelling assessment quantified emissions from all operational processes, as well as control measures proposed to be implemented. These sources include:

- materials handling and drops (e.g. drops from conveyors, dump trucks onto stockpiles, loaders, plant etc.);
- excavation of material;

- vehicle entrainment of dust on internal unpaved roads;
- wind erosion on exposed areas and stock piles; and
- crushing, screening and conveyor transfers.

Details of these emission parameters are discussed below.

Consideration has been given to the phased extraction of material (and transportation) within the dispersion model for those phases located adjacent to sensitive receptor locations (Phase A, B, D, F, G) achieved via the source group function. Emissions from the remainder of the site have assumed to be constant throughout – as will remain unchanged. This is to ensure all worst case impacts (in terms of separation distance and orientation to nearby sensitive receptors) are understood and assessed. The maximum concentration/deposition rate recorded across all phases has been used to represent a worst-case assessment.

An indicative model layout is illustrated in Figure 9/1-5.

Emission Quantification

The extent of emissions considered has been informed by Chapter 11.19.1 Sand and Gravel Processing.

The emission factors are typically based on activity rate (i.e. output) and account for characteristics of mineral material and meteorological conditions to account for natural suppression, as well as site-based controls and associated reductions in emissions (Figure 9/1-3).

$$E = A\ x\ EF\ x\ (1 - ER/100)$$

Where:
E = Emission
A = Activity
EF = Emission factor
ER = Overall emission efficiency achieved through abatement or deterioration of device (%)

Figure 9/1-3
Emission Calculation

Material Handling and Drops

The following AP-42 equation (Chapter 13.2.4) has been used to estimate fugitive emissions arising from handling of aggregates throughout the site:

$$E = k(0.0016)\ \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Where:

E = particle size-specific emission factor (kg/t handled).

k = particle size multiplier (see Chapter 13.2.4).

U = mean wind speed (4.5m/s from 2015-2019 Luton Airport meteorological data).

M = material moisture content (7.9% based on Table 11.9-3 Chapter 11.9 – overburden)

Emissions arising from disturbances simulated by both batch and continuous drops were considered throughout the site, achieved via mapping of aggregate interactions. This comprised:

- as dug material from excavator into dump truck (for all phases considered);
- as dug material dropped onto stockpile from pit (from dump truck);

- as dug material fed into the hopper (controlled);
- continuous drops from conveyors at processing plant onto stockpiles (controlled - post washing);
- processed material from stockpiles transferred to larger stockpiles (controlled); and
- processed material from stockpiles to HGVs for export (controlled).

The dispersion modelling assessment assumed a 100% pass through of material (250,000tpa) for the above processes to be conservative.

All stockpiles will be watered during dry periods. Therefore, where indicated (controlled), a correction factor of 10% (90% control efficiency) was applied as per Chapter 13.2.4 to simulate suppression of dust. This has also been applied to drops from conveyors at the processing plant following washing.

Excavation

The following AP-42 equation (Chapter 11.9 Western Surface Coal Mining) has been used to estimate fugitive TSP emissions arising from extraction of aggregates:

$$TSP = \frac{2.6\ (s)^{1.2}}{(M)^{1.3}}$$

Where:

TSP = TSP emission rate (kg/hr).

s = material silt content (6.9% based on Table 11.9-3 Chapter 11.9 – overburden).

M = material moisture content (7.9% based on Table 11.9-3 Chapter 11.9 – overburden).

Emission estimates for PM_{10} and $PM_{2.5}$ were calculated using the corresponding scaling factors provided. Emissions were factored based upon operational hours/known throughput to derive a corresponding annual estimate. Emissions were limited to the extraction areas.

Internal Unpaved Roads

The following AP-42 equation (Chapter 13.2.2 Unpaved Roads) has been used to estimate fugitive emissions associated with vehicles traveling on unpaved surfaces (assumed at industrial sites):

$$E = k\left(\frac{s}{12}\right)^{a}\left(\frac{W}{3}\right)^{b}$$

Where:

E = particle size-specific emission factor (g/vehicle miles travelled).

k = particle size multiplier empirical constant (lb/vehicle mile travelled). A correction has been applied to derive metric equivalent units (see Chapter 13.2.2).

a and b = particle size empirical constants (see Table 13.2.2-1).

s = surface material silt content (%) (see Table 13.2.2-1):

4.8% (mean) for plant roads

8.3% (mean) for haul road to/from pit

W = mean vehicle weight (tons). Corrected to derive UK metric equivalent units

Unladen and laden trips considered.

Consideration was given to the following sources:

- HGV entering plant from access road (unladen);

- HGV leaving plant to access road (laden);
- Dump trucks travelling from pit to plant (laden); and
- Dump trucks travelling from plant to pit (unladen).

Annual average trips were calculated based upon a known (representative) payload of dump trucks and HGVs.

Unpaved internal haul roads will be watered via a bowser. AP-42 provides a bi-linear relationship for road-watering control efficiency to minimise dust generation. A small increase in the surface moisture content of the road (where the controlled moisture content is double that of the uncontrolled moisture content) results in a large increase in control efficiency, up to 75%; beyond this, control efficiency grows slowly with increased moisture content. For the purposes of the assessment, a control efficiency of 75% has been assumed. This is considered realistic given that on average natural suppression from precipitation occurs for 39.1% of the time, (see Chapter 9: Air Quality).

Furthermore, emission estimates relating to unpaved haul roads have been divided by a factor of four, in line with published research[3].

Wind Erosion from Exposed Areas

The following AP-42 equation (Chapter 11.9) has been used to estimate fugitive TSP emissions arising from wind erosion of exposed areas (seeded land, stripped overburden, graded overburden):

$$TSP = 0.85\ (\frac{tonne}{(hectare)(year)})$$

Where:

TSP = TSP emission rate (tonne/hectare/year).

Emission estimates for PM_{10} were assumed to be 50% of the corresponding TSP emission as per NPI guidance (section 1.1.17). Emission estimates for $PM_{2.5}$ were assumed to be 15% of the corresponding PM_{10} emission as per AP-42 guidance.

Each proposed phase was assumed to be fully exposed for the purposes of providing a conservative assessment.

Annual emission factors have been factored to account for periods where hourly winds are >5m/s (approximately 37.8% of the time) to reflect known wind velocity thresholds.

Bunding of material will be placed around the perimeter of the site acting as wind break. Therefore, a correction factor of 30% (70% control efficiency) was applied as per NPI to simulate reductions in wind velocities. This is believed to be conservative, as natural mitigation (via precipitation) accounts for 39.1% of the period, and exposed areas are likely to be suppressed to an extent through use of an on-site bowser.

Wind Erosion from Stockpiles

The following NPI equation (section 11.1.17) has been used to estimate fugitive TSP emissions arising from wind erosion of stockpiles :

$$TSP = 0.4\ (\frac{kg}{(hectare)(hour)})$$

Where:

TSP = TSP emission rate (kg/hectare/hour).

[3] Air Quality Modelling and Impacts on the Mining Industry: An Overview. Cliffs Natural Resources. 2011.

Emission estimates for PM_{10} were assumed to be 50% of the corresponding TSP emission as per NPI guidance (section 1.1.17). Emission estimates for $PM_{2.5}$ were assumed to be 15% of the corresponding PM_{10} emission as per AP-42 guidance.

Annual emissions were calculated through the aggregation of hours in a year where winds are >5m/s (approximately 37.8% of the time) to reflect known wind velocity thresholds.

All stockpiles will be watered during dry periods. In addition, bunding of material will be placed around the perimeter of the site acting as wind break. Therefore, a correction factor of 10% (90% control efficiency) was applied as per AP-42 Chapter 13.2.4 to simulate suppression of dust.

Crushing, Screening and Conveyor Transfers

Emission factors provided within US EPA AP-42 Chapter 11.19.2 have been utilised to account for emissions generated from crushing, screening and conveyor transfers.

From review of Chapter 3: Development Description, the following sources have been considered:

- 2 x conveyor transfer (uncontrolled);
- 1 x primary screen (controlled);
- 1 secondary screen (controlled);
- 1 x secondary crusher (controlled); and
- 2 x conveyor transfer (controlled).

Aggregate is passed through a washing facility before screening/crushing. Before this point emissions are assumed to be dry and uncontrolled.

Dispersion Model

Dispersion modelling of fugitive dust missions has been undertaken using the US American Meteorological Society and Environmental Protection Agency Regulatory Model (AERMOD v9) dispersion model. Details of AERMOD specific inputs are discussed below, in turn.

Emissions were represented via an array of volume, area and line sources.

Topography

Topography has been incorporated within the AERMOD dispersion model using 30m resolution Shuttle Radar Topography Mission (SRTM) terrain data files. Data was processed by the AERMAP function within AERMOD to calculate terrain heights (Figure 9/1-4). These ground level elevations were in addition applied to all receptors included within the AERMOD dispersion model, however, were entered manually for and sources.

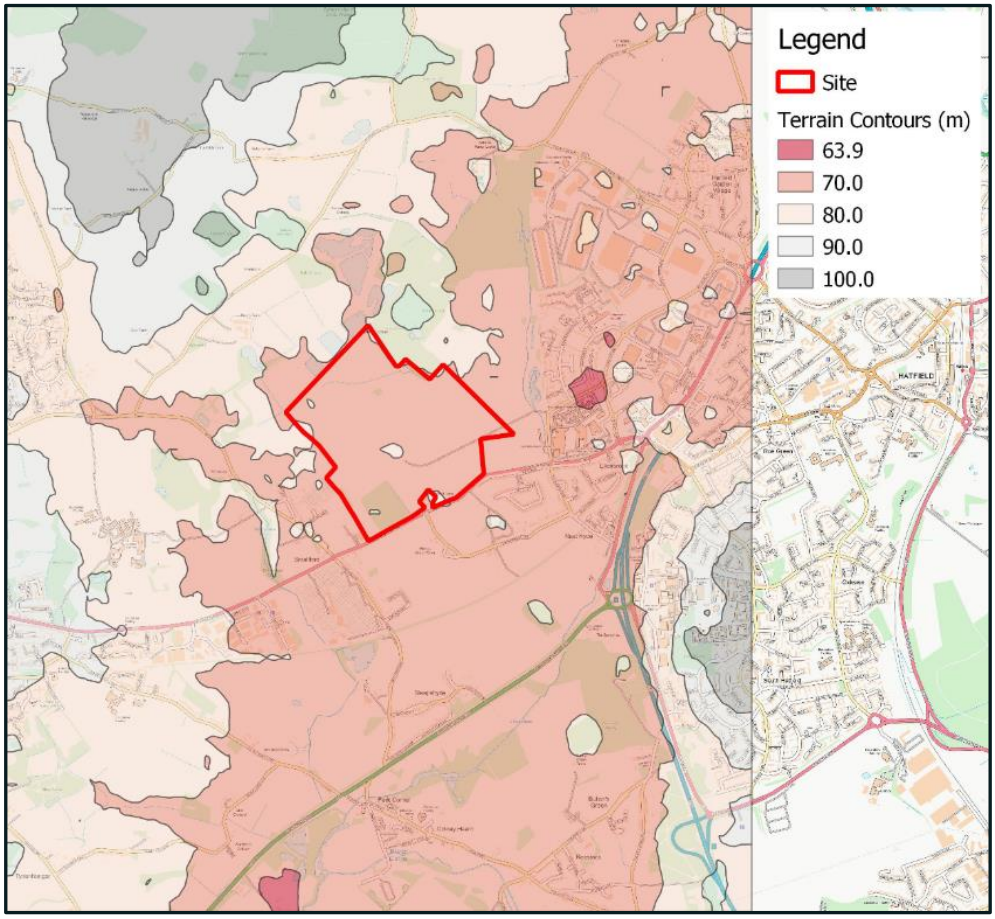


Figure 9/1-4
Terrain Contours Across Modelled Domain

Meteorological Data and Pre-processing

Five consecutive years of hourly-sequential meteorological data recorded at Luton Airport was utilised within the AERMOD assessment (2015 to 2019 inclusive), whereby the maximum concentration (across all phases considered) has been used to account for conservatism and inter-year variability.

A wind rose for the corresponding period is presented in Chapter 9: Air Quality.

The European Commission CORINE (Co-Ordinated Information on the Environment) 100m spatial resolution land cover dataset was used with AERSURFACE to determine the surface roughness, albedo and bowen ratio of the modelled domain, as per AERMOD guidance[4] (Table 9/1-4).

Characteristics were applied to individual degree sectors to reflect variation in the surrounding topography where relevant, following a review of satellite imagery.

Table 9/1-4
Applied Meteorological Surface Characteristics: AERMOD

Sector (Degrees)	Albedo [A]	Bowen Ration [B]	Surface Roughness (m) [B]
0 – 60	0.17	0.63	0.373
60 – 90			0.408

[4] EPA, AERMOD Implementation Workgroup, AERMOD Implementation Guide (August 2019)

Sector (Degrees)	Albedo [A]	Bowen Ration [B]	Surface Roughness (m) [B]
90 - 230			0.613
230 - 360			0.189

[A] Reflective of the 10km x 10km grid square centred on the site
[B] Reflective of the 1km x 1km grid square centred on the site

Variable Emissions

Operational led processes (i.e. material handling, excavation, vehicle entrainment, crushing etc.) have all been represented in the dispersion model to emit during the proposed operational hours (see Chapter 3: Development Description). Emissions have been normalised based upon these operational hours, as input into AERMOD.

Emissions generated as a function of wind speed (wind erosion), have only been considered within AERMOD for hourly periods where wind speed >5m/s – in-line with IAQM and US EPA AP-42 guidance.

Deposition Modelling

Particle deposition is determined mainly by the particle size (aerodynamic) and density, with the terminal velocity of a particle determining how far and soon it will deposit. AERMOD incorporates two methods for modelling deposition of particles:

- Method 1 is used when a significant fraction (> 10%) of the total particulate mass has a diameter greater than 10 microns and the particle size distribution is reasonably well known; and
- Method 2 is used when the particle size distribution is not well known and when a small fraction (less than 10% of the mass) consists of particles with a diameter of 10 microns or larger.

For this assessment, the approach adopted by the US-EPA[5] to validate their modelling protocol for coal mines has been used. In the approach adopted by the US-EPA the composite distribution from four tests on haul roads was used to characterise all emissions from road and area sources because '*a) haul roads account for more than half of all emissions and b) various categories of fugitive dust sources have been shown to exhibit similar particle size profiles, as indicated by emissions factor data presented in AP-42 Section 11.2'*.

The particle deposition parameters using the approach outlined in Method 1 are presented in Table 9/1-5.

Table 9/1-5
Particle Deposition Parameters

Aerodynamic Diameter (µm)	Mass Fraction (%)	Particle Density (g/cm^3)
32	39	1
25	20	1
20	12	1
15	8	1
10	7	1
5	5	1
2.5	5	1
1	4	1

[5] US-EPA Modelling Fugitive Dust Impacts from Surface Coal Mining Operations – Phase II Model Evaluation Protocol (1994).

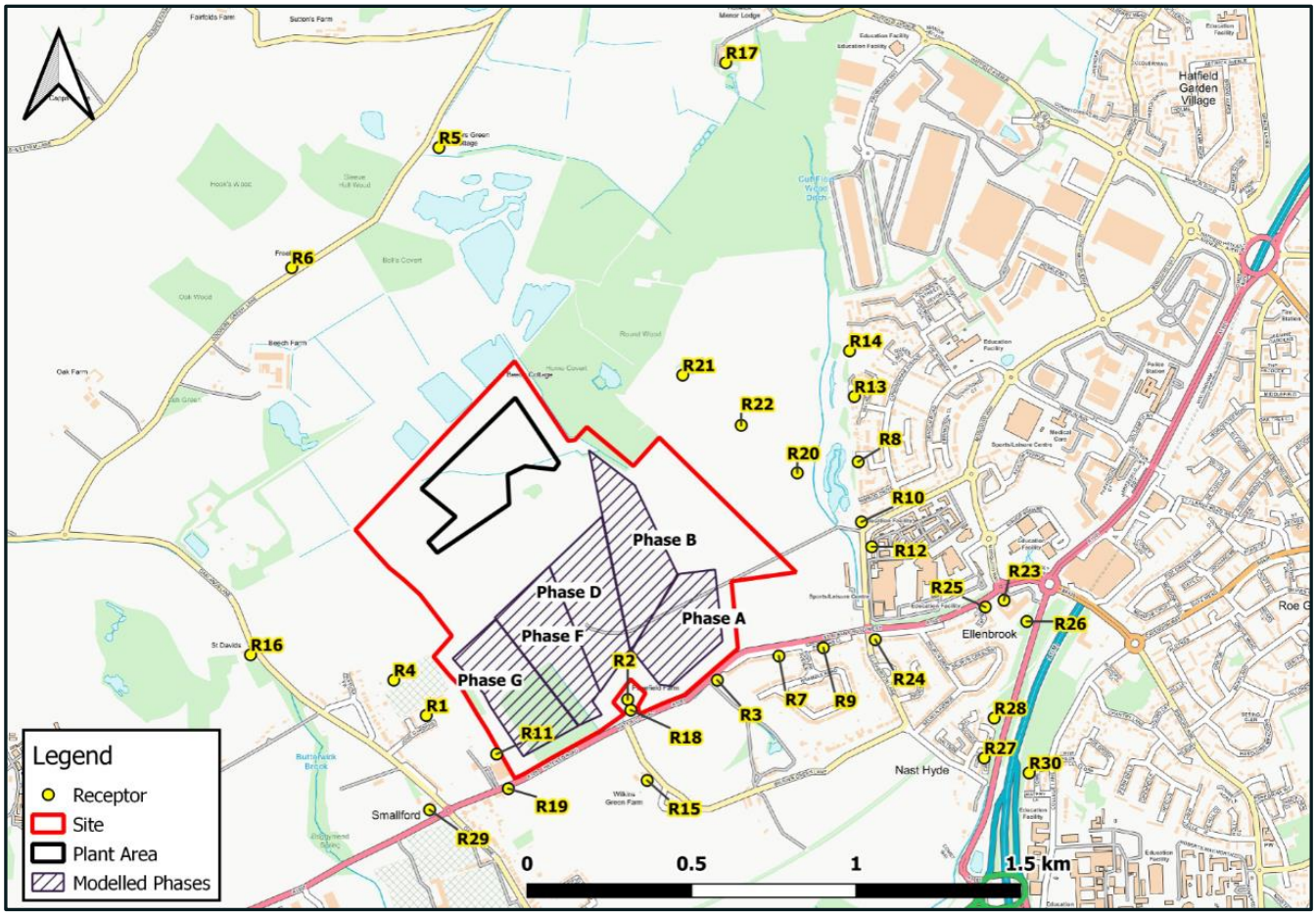


Figure 9/1-5
Indicative Fugitive Dust Model Configuration

Human Receptors

Human receptors considered in the assessment are detailed in Table 9/1-6, whilst their locations are illustrated in Figure 9.1.

Receptors R20, R21 and R22 represent residential receptors associated with an outline planning application for a large-scale mixed use development (Hatfield Business Park)[6] currently under consideration for completeness.

Both sets of receptors have been modelled in each dispersion model for completeness.

Table 9/1-6
Modelled Human Receptor Locations

Receptor	Type	X	Y	Height (m)
R1	Residential	519464	207952	1.5
R2	Residential	520076	208001	1.5
R3	Residential	520349	208059	1.5
R4	Residential	519365	208059	1.5

[6] Welwyn Hatfield Borough Council: Planning Application: 6/2018/2768/OUTLINE.

Receptor	Type	X	Y	Height (m)
R5	Residential	519502	209677	1.5
R6	Residential	519055	209312	1.5
R7	Residential	520536	208132	1.5
R8	Residential	520777	208723	1.5
R9	Residential	520671	208157	1.5
R10	Residential	520787	208540	1.5
R11	Garden Centre	519678	207834	1.5
R12	Residential	520818	208464	1.5
R13	Residential	520765	208921	1.5
R14	Residential	520751	209060	1.5
R15	Residential	520135	207754	1.5
R16	Residential	518929	208136	1.5
R17	Residential	520374	209935	1.5
R18	Residential	520086	207968	1.5
R19	Residential	519713	207729	1.5
R20	Future Residential	520592	208689	1.5
R21	Future Residential	520243	208986	1.5
R22	Future Residential	520421	208834	1.5
R23	Residential	521220	208302	1.5
R24	Residential	520829	208182	1.5
R25	Residential	521163	208281	1.5
R26	Residential	521290	208237	1.5
R27	Residential	521160	207822	1.5
R28	Residential	521190	207944	1.5
R29	Residential	519474	207665	1.5
R30	Residential	521297	207777	1.5

Background Ambient Concentrations

For the assessment of ambient pollutant concentrations at sensitive human receptor locations, consideration has been given to inclusion of appropriate background datasets.

As detailed in Chapter 9: Air Quality, an urban background NO_2 site (WH13) is located 0.2km from the site, however a 2019 concentration was not reported to align with the verification study. Furthermore, upon closer inspection this monitoring location is situated roadside of Poplars Close and approximately 15m from a modelled link (A1057 St Albans Road W). No other background NO_2 monitoring is undertaken within 3km of the site. Furthermore, no background particulate monitoring is undertaken within or adjacent to the modelled domain.

In the absence of locally representative background monitoring sites, annual mean background concentrations used for the purposes of the assessment have been obtained from the Defra supplied background maps (2018 reference year), based on the 1km grid squares which cover the modelled area. Further detail on these datasets can be found in Chapter 9: Air Quality.

To avoid double counting of potential source contributions already contained within the ADMS-Roads dispersion model, 'Motorway in' and 'Primary Road in' were removed from each grid square. As the relationship between NO_2 and NO_x is not linear, the NO_2 Adjustment for NO_x Sector Removal Tool[7] has been used – in accordance with LAQM.TG(16).

Modelled Outputs

Ambient Concentrations

The background pollutant values discussed above have been used in conjunction with the concentrations predicted by the ADMS-Roads model (and AERMOD where relevant) to calculate predicted total annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ for each respective scenario. The road traffic modelled contribution has been subject to adjustment (2.462), as discussed above.

It is acknowledged that a recent planning application[8] for an extension of a sand and gravel quarry at Hatfield Quarry off Oaklands Lane, Hertfordshire (Land Adjoining Coopers Green Lane) located 2km north east of the site has been submitted. Maximum modelled PM_{10} (1.26µg/m^3) and $PM_{2.5}$ (0.89µg/m^3) concentrations reported within the accompanying health impact assessment[9] for all phases and receptors considered were added to the future year modelled concentrations (2023 DM and 2023 DS). This ensures the assessment and resultant modelled concentrations considers potential future localised sources of PM concentrations in line with IAQM guidance in the event that consent is granted for both sites. This approach is believed to be conservative on reflection, given that the development does not represent a committed development and as assumes the maximum calculated concentration from all receptors considered is constant across the modelled area (not accounting for dispersion and dilution with distance).

For the prediction of annual mean NO_2 concentrations for all modelled scenarios at receptor locations, the adjusted road NO_x contributions have been converted to total NO_2 following the methodology in LAQM.TG(16) using the latest version of Defra's NO_x to NO_2 conversion tool (v8.1). The modelled NO_2 road contribution was then added to the appropriate NO_2 background concentration value to obtain an overall total annual mean NO_2 concentration.

For the prediction of short-term NO_2 impacts, LAQM.TG(16) advises that it is valid to assume that exceedences of the 1-hour mean AQAL for NO_2 are unlikely to occur where the annual mean NO_2 concentration is <60µg/m^3. This approach has thus been adopted for the purposes of this assessment, at relevant receptor locations with an applicable exposure period.

Cumulative Assessment – PM_{10}/$PM_{2.5}$

For the assessment of PM_{10} and $PM_{2.5}$, modelled outputs from each process (i.e. road traffic and fugitive dust releases) have been combined at each receptor to provide a cumulative assessment. Due consideration has been given to the assessment of the PM_{10} short term (24-hour) AQAL.

Given the known limitations in modelled short term objectives for road traffic, preference was to adopt the LAQM.TG(16) prescribed empirical relationship between the annual mean and the number of exceedences of the 24-hour mean AQAL for PM_{10}. This is as follows:

$$\text{No. 24-hour mean exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$$

This relationship has thus been adopted to determine whether exceedences of the short-term PM_{10} AQAL are likely in this assessment.

---

[7] Defra NO_2 Adjustment for NO_x Sector Removal Tool (v8.0).

[8] Hertfordshire County Council, Planning Application PL\0963\18.

[9] Land adjoining Coopers Green Lane Extension to Hatfield Quarry, off Oaklands Lane, Hertfordshire Health Impact Assessment. CEMEX UK Operations Ltd and Gascoyne Cecil Estates. September 2018.

Deposition Modelling

The maximum monthly modelled deposition rate as output from AERMOD has been divided by 30 to derive a corresponding m^2/day value for comparison with the applied standards.

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Appendix 9/2: Dispersion Modelling Results
Prepared for: **Brett Aggregates Limits**

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Appendix 9/2 - Dispersion Modelling Results

Ambient Concentrations

NO_2 Modelling Results

Exhaustive annual mean NO_2 modelled concentrations at all human receptor locations are presented in Table 9/2-1.

Table 9/2-1
Predicted Annual Mean NO_2 Concentrations

Receptor	Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)			% Change of AQAL	% of 2023 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2023 DM	2023 DS			
R1	13.9	13.9	13.9	<0.1	34.8	Negligible
R2	15.2	15.3	15.3	0.1	38.3	Negligible
R3	18.0	18.1	18.3	0.4	45.8	Negligible
R4	13.2	13.2	13.2	<0.1	33.0	Negligible
R5	11.6	11.6	11.6	<0.1	29.0	Negligible
R6	11.6	11.6	11.6	<0.1	29.0	Negligible
R7	16.0	16.1	16.2	0.2	40.5	Negligible
R8	13.9	13.9	14.0	<0.1	35.0	Negligible
R9	16.2	16.3	16.3	0.2	40.8	Negligible
R10	14.2	14.2	14.2	<0.1	35.5	Negligible
R11	14.8	14.8	14.9	0.1	37.3	Negligible
R12	14.4	14.5	14.5	<0.1	36.3	Negligible
R13	13.7	13.8	13.8	<0.1	34.5	Negligible
R14	13.0	13.0	13.0	<0.1	32.5	Negligible
R15	13.9	13.9	14.0	<0.1	35.0	Negligible
R16	13.7	13.7	13.7	<0.1	34.3	Negligible
R17	12.7	12.7	12.7	<0.1	31.8	Negligible
R18	16.6	16.7	16.8	0.2	42.0	Negligible
R19	19.8	19.9	20.1	0.5	50.3	Negligible
R20	13.8	13.9	13.9	<0.1	34.8	Negligible
R21	13.5	13.6	13.6	<0.1	34.0	Negligible
R22	13.7	13.7	13.7	<0.1	34.3	Negligible
R23	22.2	22.3	22.5	0.4	56.3	Negligible
R24	16.4	16.5	16.6	0.2	41.5	Negligible
R25	22.6	22.7	22.9	0.4	57.3	Negligible
R26	24.4	24.6	24.8	0.3	62.0	Negligible
R27	23.3	23.5	23.6	0.2	59.0	Negligible

Receptor	Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)			% Change of AQAL	% of 2023 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2023 DM	2023 DS			
R28	23.4	23.6	23.7	0.2	59.3	Negligible
R29	17.0	17.1	17.2	0.3	43.0	Negligible
R30	29.3	29.7	29.8	0.2	74.5	Negligible

PM_{10} Modelling Results

Exhaustive annual mean PM_{10} modelled concentrations at all human receptor locations are presented in Table 9/2-2. Modelled concentrations comprise both fugitive and road traffic emission sources.

Table 9/2-2
Predicted Annual Mean PM_{10} Concentrations

Receptor	Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)			% Change of AQAL	% of 2023 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2023 DM [A]	2023 DS [A]			
R1	15.5	16.8	16.8	0.2	42.0	Negligible
R2	15.8	17.1	17.4	0.9	43.5	Negligible
R3	16.4	17.7	18.1	0.9	45.3	Negligible
R4	15.8	17.1	17.2	0.2	43.0	Negligible
R5	15.0	16.2	16.2	<0.1	40.5	Negligible
R6	15.0	16.2	16.2	<0.1	40.5	Negligible
R7	16.0	17.3	17.5	0.5	43.8	Negligible
R8	15.5	16.8	16.8	0.2	42.0	Negligible
R9	16.0	17.3	17.4	0.3	43.5	Negligible
R10	15.6	16.8	16.9	0.2	42.3	Negligible
R11	15.7	17.0	17.2	0.6	43.0	Negligible
R12	15.6	16.9	17.0	0.2	42.5	Negligible
R13	15.5	16.7	16.8	0.2	42.0	Negligible
R14	14.9	16.2	16.3	0.2	40.8	Negligible
R15	16.2	17.5	17.5	0.2	43.8	Negligible
R16	15.4	16.6	16.7	<0.1	41.8	Negligible
R17	14.9	16.1	16.2	<0.1	40.5	Negligible
R18	16.8	18.1	18.4	0.7	46.0	Negligible
R19	16.9	18.2	18.3	0.5	45.8	Negligible
R20	15.5	16.7	16.9	0.3	42.3	Negligible
R21	15.4	16.7	16.8	0.4	42.0	Negligible
R22	15.5	16.7	16.9	0.4	42.3	Negligible
R23	18.2	19.5	19.6	0.2	49.0	Negligible
R24	16.0	17.3	17.4	0.2	43.5	Negligible

Receptor	Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)			% Change of AQAL	% of 2023 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2023 DM [A]	2023 DS [A]			
R25	18.4	19.7	19.8	0.2	49.5	Negligible
R26	18.8	20.1	20.2	0.2	50.5	Negligible
R27	18.7	20.0	20.0	0.1	50.0	Negligible
R28	18.7	20.0	20.1	0.2	50.3	Negligible
R29	16.2	17.5	17.6	0.2	44.0	Negligible
R30	19.6	21.0	21.0	0.1	52.5	Negligible

[A] Includes an annual mean PM_{10} concentration of $1.26\mu g/m^3$ – the maximum modelled PM_{10} contribution associated with the extension of a sand and gravel quarry at Hatfield Quarry off Oaklands Lane, Hertfordshire (Land Adjoining Coopers Green Lane)[1]

$PM_{2.5}$ Modelling Results

Exhaustive annual mean $PM_{2.5}$ modelled concentrations at all human receptor locations are presented in Table 9/2-3. Modelled concentrations comprise both fugitive and road traffic emission sources.

Table 9/2-3
Predicted Annual Mean $PM_{2.5}$ Concentrations

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$)			% Change of AQAL	% of 2023 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2023 DM [A]	2023 DS [A]			
R1	10.4	11.3	11.3	<0.1	45.2	Negligible
R2	10.3	11.2	11.3	0.3	45.2	Negligible
R3	10.7	11.6	11.7	0.4	46.8	Negligible
R4	10.0	10.9	10.9	<0.1	43.6	Negligible
R5	9.7	10.6	10.6	<0.1	42.4	Negligible
R6	9.7	10.6	10.6	<0.1	42.4	Negligible
R7	10.4	11.3	11.4	0.2	45.6	Negligible
R8	10.2	11.1	11.1	<0.1	44.4	Negligible
R9	10.5	11.4	11.4	0.1	45.6	Negligible
R10	10.2	11.1	11.1	<0.1	44.4	Negligible
R11	10.5	11.4	11.4	0.2	45.6	Negligible
R12	10.2	11.1	11.1	<0.1	44.4	Negligible
R13	10.1	11.0	11.0	<0.1	44.0	Negligible
R14	9.8	10.7	10.7	<0.1	42.8	Negligible
R15	10.3	11.2	11.3	<0.1	45.2	Negligible
R16	10.0	10.9	10.9	<0.1	43.6	Negligible

[1] Hertfordshire County Council, Planning Application PL\0963\18.

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$)			% Change of AQAL	% of 2023 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2023 DM [A]	2023 DS [A]			
R17	9.8	10.7	10.7	<0.1	42.8	Negligible
R18	10.7	11.6	11.7	0.3	46.8	Negligible
R19	11.2	12.1	12.1	0.2	48.4	Negligible
R20	10.2	11.0	11.1	<0.1	44.4	Negligible
R21	10.1	11.0	11.0	0.1	44.0	Negligible
R22	10.1	11.0	11.1	0.1	44.4	Negligible
R23	11.8	12.7	12.8	0.1	51.2	Negligible
R24	10.5	11.4	11.4	0.1	45.6	Negligible
R25	11.9	12.8	12.9	0.1	51.6	Negligible
R26	12.2	13.1	13.1	0.1	52.4	Negligible
R27	12.0	12.9	13.0	<0.1	52.0	Negligible
R28	12.0	13.0	13.0	<0.1	52.0	Negligible
R29	10.8	11.7	11.7	0.1	46.8	Negligible
R30	12.6	13.5	13.5	<0.1	54.0	Negligible

[A] Includes an annual mean $PM_{2.5}$ concentration of $0.89\mu g/m^3$ – the maximum modelled $PM_{2.5}$ contribution associated with the extension of a sand and gravel quarry at Hatfield Quarry off Oaklands Lane, Hertfordshire (Land Adjoining Coopers Green Lane)[1]

Dust Deposition

Human Receptors – Dust Disamenity

Exhaustive dust deposition rates modelled at all human receptor locations are presented in Table 9/2-4.

Table 9/2-4
Maximum Predicted Dust Deposition Rates at Human Receptors

Receptor	Maximum Deposition Rate ($mg/m^2/day$)	% of Applied Threshold ($200mg/m^2/day$)
R1	2.4	1.2
R2	6.5	3.3
R3	7.5	3.7
R4	1.8	0.9
R5	0.6	0.3
R6	0.7	0.3
R7	3.6	1.8
R8	1.1	0.6
R9	1.9	1.0
R10	1.4	0.7
R11	5.6	2.8

Receptor	Maximum Deposition Rate (mg/m^2/day)	% of Applied Threshold (200mg/m^2/day)
R12	1.4	0.7
R13	1.0	0.5
R14	1.0	0.5
R15	2.1	1.0
R16	0.7	0.3
R17	0.7	0.4
R18	5.7	2.9
R19	3.3	1.6
R20	1.8	0.9
R21	3.5	1.8
R22	2.2	1.1
R23	0.6	0.3
R24	1.1	0.6
R25	0.6	0.3
R26	0.5	0.3
R27	0.6	0.3
R28	0.6	0.3
R29	1.5	0.8
R30	0.5	0.2

Respirable Crystalline Silica

For the purposes of facilitating a conservative assessment in relation to respirable crystalline silica (RCS), it has been assumed that 100% of PM_{10} emissions are silica.

There is no statutory limit value for ambient exposure to RCS in the UK, however following a review of US literature, 3µg/m^3 is typically adopted as an annual mean limit. As such, this threshold has been adopted for the assessment of annual mean RCS exposure.

Table 9/2-5
Maximum Predicted RCS Concentrations at Human Receptors

Receptor	Maximum Predicted Annual Mean RCS Concentration (µg/m^3)	% of AQAL
R1	0.1	3.1
R2	0.3	11.0
R3	0.3	11.1
R4	0.1	2.4
R5	<0.1	0.8
R6	<0.1	0.8
R7	0.2	6.3
R8	0.1	2.4
R9	0.1	3.8

Receptor	Maximum Predicted Annual Mean RCS Concentration (µg/m³)	% of AQAL
R10	0.1	3.1
R11	0.2	8.0
R12	0.1	3.1
R13	0.1	2.2
R14	0.1	2.0
R15	0.1	3.1
R16	<0.1	0.8
R17	<0.1	0.8
R18	0.3	8.9
R19	0.1	4.4
R20	0.1	3.7
R21	0.2	5.1
R22	0.1	4.7
R23	<0.1	1.2
R24	0.1	2.4
R25	<0.1	1.3
R26	<0.1	1.0
R27	<0.1	1.0
R28	<0.1	1.0
R29	0.1	2.1
R30	<0.1	0.8

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HATFIELD AERODROME, HERTFORDSHIRE

Environmental Statement - Appendix 11/1

Biodiversity Net Gain Report

Prepared for: **Brett Aggregates Ltd**

SLR Ref: 403.009885.00024
Version No: V1
September 2021

BASIS OF REPORT

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1.0 INTRODUCTION

1.1 Background

Brett Aggregates Ltd are proposing to undertake a phased extraction of some eight million tonnes of sand and gravel, with on-site processing, and for progressive restoration using imported inert fill on the remaining undeveloped areas of a former airfield at Hatfield Aerodrome site, AL4 0HN (central Ordnance National Grid Reference: TL199083).

An Ecological Impact Assessment[1] (EcIA) was completed by SLR Consulting (SLR) in 2016, as part of a planning approval submission, in order to describe the predicted ecological effects and their likely significance. Planning consent was refused in January 2021. The applicant (Brett Aggregates Ltd) has prepared an amended scheme, which includes the removal of a concrete batching plant, and a new planning submission is being sought.

SLR Consulting Ltd (SLR) was commissioned by Brett Aggregates Ltd in March 2021 to undertake a quantitative assessment of the potential biodiversity impact of the proposed development plans and complete an update of the previous EcIA report. The results of the Biodiversity Net Gain assessment are contained within this report.

1.2 Consultation

Scoping Opinion provided by Hertfordshire County Council in July 2021 has confirmed that they wish the revised scheme to:

- *"minimise the impacts on and provide net gains for biodiversity;*
- *contribute to the establishment of coherent ecological networks resilient to current and future pressures;*
- *support the maintenance and enhancement of green infrastructure and landscape across local authority boundaries;*
- *identify and pursue opportunities for securing measurable net gains for biodiversity, and*
- *deliver measurable biodiversity and ecological improvements in line with DEFRA Biodiversity Metric 2.0."*

1.3 Scope of Works

The objectives of the Biodiversity Net Gain assessment were to:

- Input all relevant habitat and landscaping information into a Biodiversity Net Gain calculator and provide detailed notes on the information input into the calculator; and
- Provide a quantitative assessment of biodiversity losses and/or gains as a result of the proposed development.

[1] SLR Consulting (2016). Hatfield Quarry, Hertfordshire – Chapter 11 of Environmental Statement.

2.0 Methodology

2.1 Method of Assessment

In undertaking this Biodiversity Net Gain (BNG) SLR have used the guidance and Biodiversity Metric 3.0 calculator tool and condition assessment guidance provided by The Department for Environment, Food and Rural Affairs and Natural England[2]. This calculator has been approved for BNG studies by central government to quantify the impacts of development on biodiversity and is expected to be the metric used for mandatory net gain, which is a feature of the Environment Bill, which is currently making its passage through Parliament. As a result, use of the Biodiversity Metric 3.0 was considered most likely to give a robust and defensible result.

In order to complete the Biodiversity Net Gain assessment, the areas of all existing habitats were measured (in hectares, or in metres for linear features (i.e. hedgerows)) and input in the Biodiversity Metric 3.0 calculator. These values were calculated from the UK Habitat Classification (UKHab)[3] baseline (Appendix 01) produced during a habitat surveys of the site in 2021. The predicted future biodiversity value of the site was calculated from areas highlighted for habitat creation and restoration, as provided in the proposed final restoration, as described in Chapter 3 of the ES and illustrated on Drawing HQ3/11.

2.2 Limitations

Metric 3.0 is only recently released, bugs within the calculator may not yet be identified.

The baseline condition assessment for all habitat types has been estimated using the author's experience and with reference to Metric 3.0 Technical Guidance and in consultation with field ecologists that conducted habitat survey. Field surveys to assess habitat condition were undertaken prior to the release of the Metric 3.0 Detailed Condition Assessment Guidance Sheets.

The restoration scheme was designed in advance of the publication of UKHab and therefore some interpretation of proposed habitat types has been necessary to fit the proposed habitats into UKHab classification and therefore Metric 3.0. Professional judgement has been used to estimate condition of created and enhanced habitats, although a precautionary approach has been taken.

2.3 Project Phasing and Time to Target Condition

This initial assessment has been based upon a simplified development programme, with all development/habitat losses occurring in Year 1 and restoration of each phase occurring in a simplified timetable, as set out below. This approach significantly underestimates the contribution to biodiversity of the undeveloped phases of the site and is a fundamental flaw in Metric 3.0. It is assumed for the purposes of this exercise that the project would commence in Year 1 2022.

For the purposes of the assessment, it is proposed that all habitat enhancement is commenced in Year 1, with the implementation of a detailed management plan. However, it may take a few years for habitats to reach target condition, in which case it is recommended that an updated metric is completed to review progress against the predictions made in this pre-planning assessment.

[2] The Biodiversity Metric 3.0 - JP039 (naturalengland.org.uk)
[3] www.ukhab.org

Table 1 – Quarry Development and GCN Mitigation Phasing Programme

Year/Drawings Reference	Quarry Development Phase	Habitat Impacts	Habitat Restoration
Year 1 D1 – Baseline	Conclude planning consent and Section 106. Discharge pre-commencement conditions.	N/A	
Year 1 D2 – Site Establishment PCC-C7	Pre-commencement works, including earthworks for establishment phase, plant site and recharge lagoons. Earthworks continue and establish plant site, road etc. Commence mineral extraction.	Losses of habitats within plant site. Initial habitat creation of grassland on screening bunds and other perimeter planting. Earthworks impact on c.30ha of habitat.	Enhancements to 6ha of retained GCN receptor/refuge site. Creation of 7 new ponds Enhancement to broadleaved woodland, scrub and grassland with 2 existing ponds
Year 2 D3 – Phase A PCC-C8	Mineral extraction continues from recharge lagoons. Vegetation clearance from Quarry Phase A and soil storage areas		Perimeter soil bunds, which account for approximately 4ha of new grassy habitat, will become available to GCN
Year 4	Mineral extraction from Quarry Phase A		The mineral recharge lagoon which accounts for approximately 2.32ha of habitat will be accessible to GCN and become established as habitat.
Year 5	Mineral extraction from Quarry Phase A. Commence earthworks to strip soils from within Quarry Phase B.	Vegetation lost from Phase B. Earthworks impact on c.7ha of habitat.	
Year 8	Mineral extraction from Phase C	Earthworks impact on c 7 ha of habitat.	Restoration of Phase A, 7 ha of habitat is created and will be handed back to Ellenbrook Trust on completion to be managed in accordance with agreed

Year/Drawings Reference	Quarry Development Phase	Habitat Impacts	Habitat Restoration
			Management Plan. Area includes 0.642ha of woodland (WP3) and scattered scrub with c. 3ha of grassland habitat.
Year 11	Mineral extraction from Quarry Phase D.	Earthworks impact on c.7ha of habitat in Phase D.	Restoration of Phase B, c.7 ha of habitat is created and will be handed back to Ellenbrook Trust on completion to be managed in accordance with agreed Management Plan
Year 14	Mineral extraction from Quarry Phase E.	Earthworks impact on c.7ha of habitat in Phase E.	Restoration of Phase C, c.7 ha of habitat is created and will be handed back to Ellenbrook Trust on completion to be managed in accordance with agreed Management Plan
Year 19	Mineral extraction from Quarry Phase F.	Earthworks impact on c.7ha of habitat in Phase F.	Restoration of Phase D, c.7 ha of habitat is created and will be handed back to Ellenbrook Trust on completion to be managed in accordance with agreed Management Plan
Year 22	Mineral extraction from Quarry Phase G.	Earthworks impact on c.7ha of habitat in Phase G.	Restoration of Phase E, c.7 ha of habitat is created and will be handed back to Ellenbrook Trust on completion to be managed in accordance

Year/Drawings Reference	Quarry Development Phase	Habitat Impacts	Habitat Restoration
			with agreed Management Plan
Year 25	Site continues to operate, progressively being restored.		Restoration of Phase F and G and plant site, remaining habitat is created and will be handed back to Ellenbrook Trust on completion to be managed in accordance with agreed Management Plan
Year 26	Restored site is handed back to Ellenbrook Trust for long-term management as a country park		

2.4 Hertfordshire Local Nature Strategy

The site is situated within the Hornbeams and Heaths (part of NCA 111 – North Thames Basin) Character Area of Hertfordshire. Habitats of local importance within the Character Area are:

- ancient woodlands, wood-pasture, parkland (of both mediaeval and contemporary origins), commons and also recent plantations;
- acidic soils ranging from drier sands and gravels to clays, managed as unenclosed pastures and commons, providing a stronghold for acid grassland and heathland;
- more neutral pastures are fragmented and also of conservation significance; and
- chalk river habitats and winterbournes.

2.5 Summary of Site Restoration Strategy

The site will be restored to a range of different habitats, consistent with the local landscape character and their likely future biodiversity value and in consideration of the feasibility of creation and ongoing management. The proposed habitat creation / enhancement measures recommended in each of the different major habitat types is summarised below:

- **Retained Recharge Lagoon Area**: The recharge lagoon constructed during the site set up phase will be retained throughout the operation and thereafter as a permanent waterbody. On completion of operations, the lagoon will be partially backfilled to the top of the interburden layer, using site derived and imported material, to provide drainage and flood storage capacity in the catchment. Ecological enhancements will be made to the lagoon and additional ponds to provide shallow margins, large draw-down zones and incorporate wetland scrapes. Marginal vegetation/reedbeds will be incorporated in a planting design to aim for a biodiverse assemblage. Species-rich neutral and calcareous grassland will

be created adjacent to the lagoons and ponds, with advance hedgerow and tree planting to provide structural and habitat diversity.

- **Neutral and Acid Grassland with Ponds and Ditches:** The site will be dominated with grassland habitats that are interspersed with ponds and ditches. Marginal vegetation will surround ponded areas, acting as transitional habitat between the aquatic and terrestrial habitat. The land will drain from west to east into the lagoons.
- **Wet Grassland Habitats**: A complex of ridge and furrows will form continuous mechanism for water to drain from the grassland area between the xxx river and the centre of site. This is expected to maintain a wet grassland without extensive year-round waterlogging.
- **Proposed Hedgerow Planting:** Two connecting hedgerows will be created in the north east of the site. These will be mixed in species composition to provide a diverse habitat.
- **Peripheral Woodland, Mixed Scrub and Hedge Creation**: Broadleaved and mixed woodland blocks and linear features will be created through a planting scheme. A habitat grading from trees to scrub, and then scrub to grassland will be created within block areas.
- **Existing Trees and Scrub Along Site Periphery:** Lines of trees, scattered trees and hedgerow will be retained, where possible, along the southern and part of the western site boundary.

3.0 Results

The completed version of the Biodiversity Metric 3.0 MS Excel calculator is provided alongside this Biodiversity Net Gain report. The MS Excel calculator contains all figures used in the calculations and also contains detailed 'assessor comments' to help link the figures provided to the existing and proposed habitat plans of the site.

3.1 Headline Summary Calculations

The Biodiversity Net Gain assessment considers the value of the existing area habitats present at the site to be 572 units. The calculator assesses the value of the proposed area habitats post-development to be 567 units. **This equates to a LOSS of c.5 habitat units, equivalent to <1% decrease in habitat units as a result of the proposed development.**

The Biodiversity Net Gain assessment considers the value of the existing hedgerow habitat present at the site to be 10 units. The calculator assesses the value of the proposed hedgerow habitats post-development to be 17 units. **This equates to a GAIN of c7 hedgerow units, equivalent to 64% increase in hedgerows units as a result of the proposed development.**

3.2 Discussion of Results

According to Metric 3.0, the current landscape design creates insufficient scrub habitats for the area of this habitat type that would be lost to the development. Approximately 10ha of scrub habitats would be lost and the current restoration scheme creates only 3.67ha. Creation of a further 6 ha of scrub within the overall design would ensure that trading rules ("Same broad habitat or a higher distinctiveness habitat required") can be met. It should be noted that the restoration scheme provides a considerable area of scattered scrub within grassland habitats, e.g. within the restored quarry Phase A. Due to limitations of the calculator, this area is classified as other neutral grassland, with no capacity to include reference or recognise benefit from the scattered scrub proposed in this area. It should also be noted that there is a 64% increase in hedgerow habitat within the site upon restoration. Whilst these new hedgerow units cannot be traded with scrub habitat, they do perform similar ecological functions.

According to Metric 3.0, the current landscape design creates insufficient woodland habitat units for the area of this habitat type that would be lost to the development. There would be a total gain in area of woodland of 0.4ha in total, but the biodiversity unit losses are significantly higher (loss of 31 units), because the calculator assumes that all woodland losses would occur in Year 1 of development. In actual fact, woodland losses would occur progressively through the phasing of the quarry, whilst woodland planting would be focussed primarily in the earlier years of development. Woodland creation is heavily penalised due to the time-to-target condition multipliers within Metric 3.0.

4.0 Summary and Conclusions

SLR has undertaken a Biodiversity Net Gain assessment for the proposed Hatfield Quarry development using the Biodiversity Metric 3.0 calculator. The method and its limitations are presented in this report.

The calculation shows that there would be a **<1% loss in Habitat Units and a 64% gain in Hedgerow Units.**

Due to limitations within the calculator in relation to phased quarry development, it is considered that a more refined tool would demonstrate that the proposed development is capable of delivering biodiversity gains to the site. However, the current tool predicts a net loss of biodiversity, as measured by Metric 3.0.

Recommendations to improve the scores returned by Metric 3.0, e.g. through the creation of additional scrub habitat, may lead to enhanced scores in the metric.

It is also recommended that and updated assessment is undertaken at the end of the establishment phase of quarry development. At this point in time, habitat enhancement should have been commenced and a good proportion of the habitat creation will have been started. An interim BNG assessment will allow the operator and the local planning authority to review progress against the benchmarks set in this report.

APPENDIX 01

Plan of Existing Habitats

519500 520000 520500

209000 208500 208000

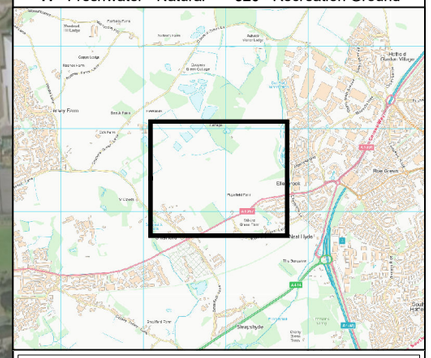
N

LEGEND

- Site Boundary
- r1 - Eutrophic Standing Waters
- g1a6 - Other lowland dry acid grassland
- g3c - Other Neutral Grassland
- g4 - Modified Grassland
- h2a - Hedgerow (Priority Habitat)
- h3a - Blackthorn Scrub
- h3d - Bramble Scrub
- h3h - Mixed Scrub
- r1 - Standing Open Water and Canals
- u1b - Developed Land, Sealed Surface
- u1b5 - Buildings
- w1f7 - Other Lowland Mixed Deciduous Woodland
- w1g6 - Line of Trees

Secondary Habitats

10 - Scattered Scrub
11 - Scattered Trees
14 - Scattered Rushes
16 - Tall Herb
17 - Ruderal/Ephemeral
36 - Plantation
37 - Semi-Natural Woodland
38 - Secondary Woodland
41 - Freshwater - Natural
58 - Grazed
73 - Bare Ground
80 - Unmanaged
94 - Green Lane
99 - Nature Reserve
162 - Temporary Water Bodies
191 - Ditch
520 - Recreation Ground



0 100 200 300 400

Metres

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HATFIELD AERODROME

ECOLOGY REPORT

UK HABITAT SURVEY RESULTS

1

Scale 1:5,000 @ A3

Date MAY 2021

09885.00024.0002.0 UK Habitat Survey

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Aerial Imagery: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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APPENDIX 02

Proposed Restoration Phasing and Final Restoration

PLANT SITE AND STOCKING AREA TO BE RESTORED TO ACID GRASSLAND MOSAIC USING RESIDUAL MINERAL LEFT OVER AT END OF SITE CLEARANCE, WITH RIDGE AND FURROW, MICRO-TOPOGRAPHICAL VARIATION AND MANAGED AS TRANQUIL AREA FOR NATURE CONSERVATION.

TWO EXISTING GREAT CRESTED NEWT PONDS ON MARGIN OF SITE RETAINED

SEMI-NATURAL SPECIES RICH GRASSLAND TO INCLUDE RIDGE AND FURROW, MICROTOPOGRAPHICAL AND SUBSTRATE VARIATION TO MAXIMISE OVERALL POTENTIAL HABITAT VALUE AND INTEREST

FRESHWATER AND SILT LAGOONS RETAINED AS PERMANENT WATERBODIES AS PART OF RESTORATION

THE TWO RECHARGE LAGOONS TO BE RETAINED AS PERMANENT WATERBODIES, BUT PARTIALLY BACKFILLED TO TOP OF INTERBURDEN USING SITE DERIVED AND IMPORTED MATERIAL

PILLBOX RETAINED

OVERFLOW/OUTFALL FROM RESTORED WATERBODY AS DITCH/PIPE AT 75.5m AOD TO DRAIN TO DIVERTED NAST CULVERT

INVERT OF EXISTING NAST CULVERT ALONG THE SIDE OF THE ROAD AT 71.78m AOD.

SW7A & SW7B
(71.788) (71.896)

PARTS OF PERIMETER SOIL BUND TO BE RETAINED AS A LOW BERM AROUND THE SITE FOR RECREATIONAL ACCESS AND VIEWS

NEW CAR PARK FOR RECREATIONAL USE

ACCESS ROAD RETAINED

N

LEGEND

- SITE BOUNDARY
- PROPOSED CONTOURS (2m INTERVALS)
- PROPOSED NAST DIVERSION (PERFORATED PIPE)
- PROPOSED NAST DIVERSION (SOLID PIPE)
- GAS PIPELINE ROUTE TAKEN FROM NATIONAL GRID DRAWING EA_TE_Z6_2S_16351
- PUBLIC RIGHT OF WAY
- BRIDLEWAY TO BE DEDICATED
- PERMISSIVE RIGHT OF WAY
- MINERAL EXTRACTION AREA
- NAST CULVERT AND SURFACE WATER MONITORING POINT
- RETAINED BOREHOLES
- RETAINED ACCESS ROAD
- POTENTIAL INDICATIVE LOCATION OF BACK DRAIN
- PROPOSED OPEN DITCH/SWALE
- ADVANCE HEDGEROW AND TREE PLANTING
- EXISTING TREES AND SHRUBS
- PROPOSED HEDGROW
- PROPOSED SCRUB
- PROPOSED MARGINAL VEGETATION/REEDBED
- WATER BODY / PONDS
- UNIMPROVED NEUTRAL-ACIDIC GRASSLAND
- CALCAREOUS GRASSLAND
- PROPOSED RIDGE AND FURROW

0 80m 200
Metres 1:2500

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HATFIELD AERODROME

PLANNING APPLICATION

RESTORATION PLAN

HQ 3/15

Scale	Date
1:2,500 @ A1	AUGUST 2021

210615_01009.00190.29.HQ_3.15_RESTORATION_PLAN_REV1_EW.dwg

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T: +44 (0)203 805 6418

MAIDSTONE
T: +44 (0)1622 609242

MANCHESTER (Denton)
T: +44 (0)161 549 8410

MANCHESTER (Media City)
T: +44 (0)161 872 7564

NEWCASTLE UPON TYNE
T: +44 (0)191 261 1966

NOTTINGHAM
T: +44 (0)115 964 7280

SHEFFIELD
T: +44 (0)114 245 5153

SHREWSBURY
T: +44 (0)1743 23 9250

STIRLING
T: +44 (0)1786 239900

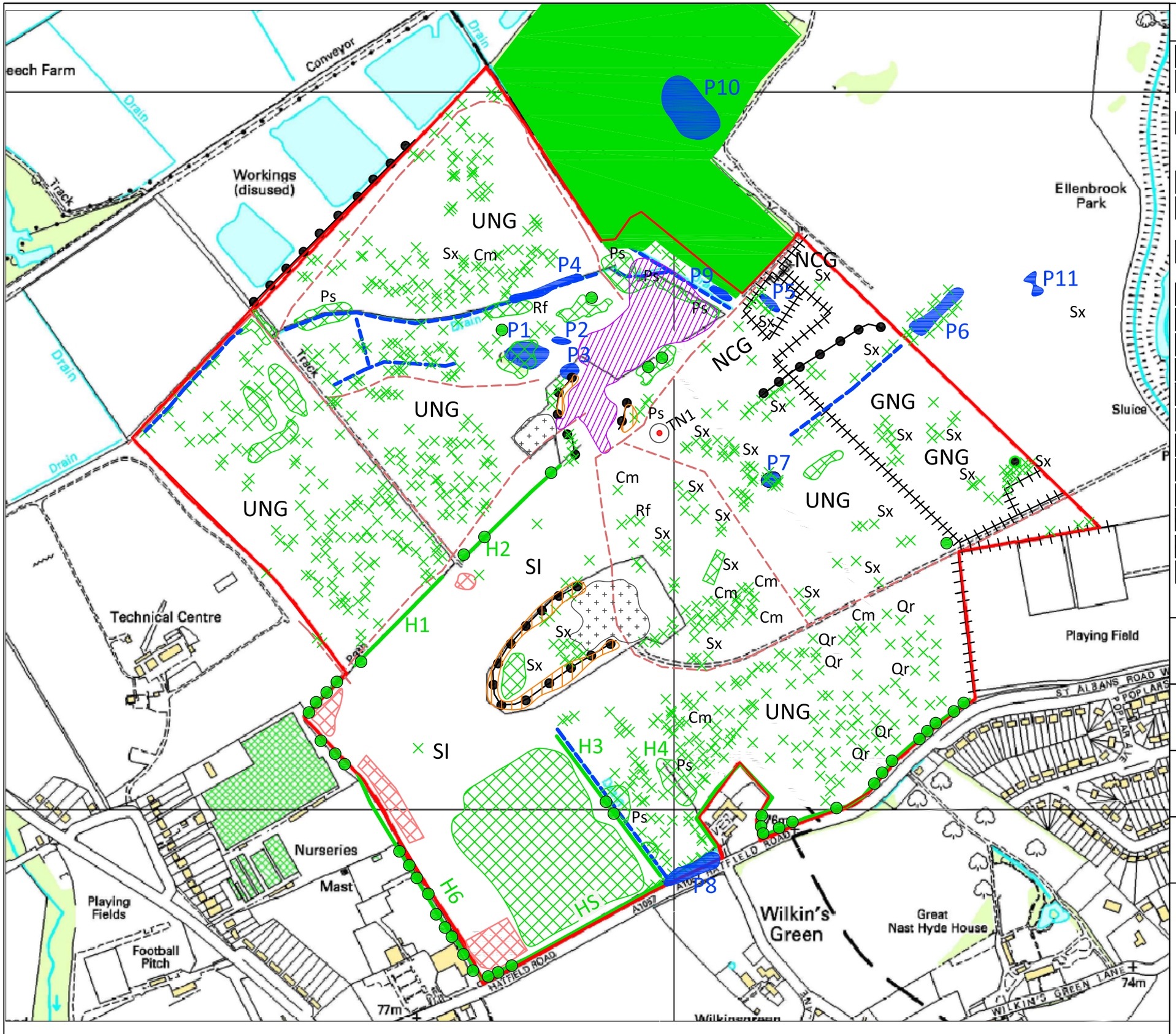
WORCESTER
T: +44 (0)1905 751310
1310

Ireland

DUBLIN
T: + 353 (0)1 296 4667

France

GRENOBLE
T: +33 (0)6 23 37 14 14



Key

- Application site
- UNG Unmanaged neutral grassland
- SI Species-poor Semi-improved mown grassland
- GNG Grazed neutral grassland
- NCG Neutral/calcareous grassland
- Neutral to acidic grassland
- Disturbed/bare ground
- Dense scrub
- Scattered scrub
- Broad-leaved woodland
- Tall ruderal
- Waterbodies (with reference)
- Landscape planting
- Hedgerow (with reference)
- Fence
- Bund
- Footpath/track
- Seasonally wet ditch
- Mature tree
- Structure
- Target note
- Qr *Q. robur*
- Sx *Salix sp.*
- Cm *C. monogyna*
- Ps *P. spinosa*
- Rf *R. fruticosus*

DO NOT SCALE

Title
Habitat Map

Project	Client
Hatfield Aerodrome	Brett

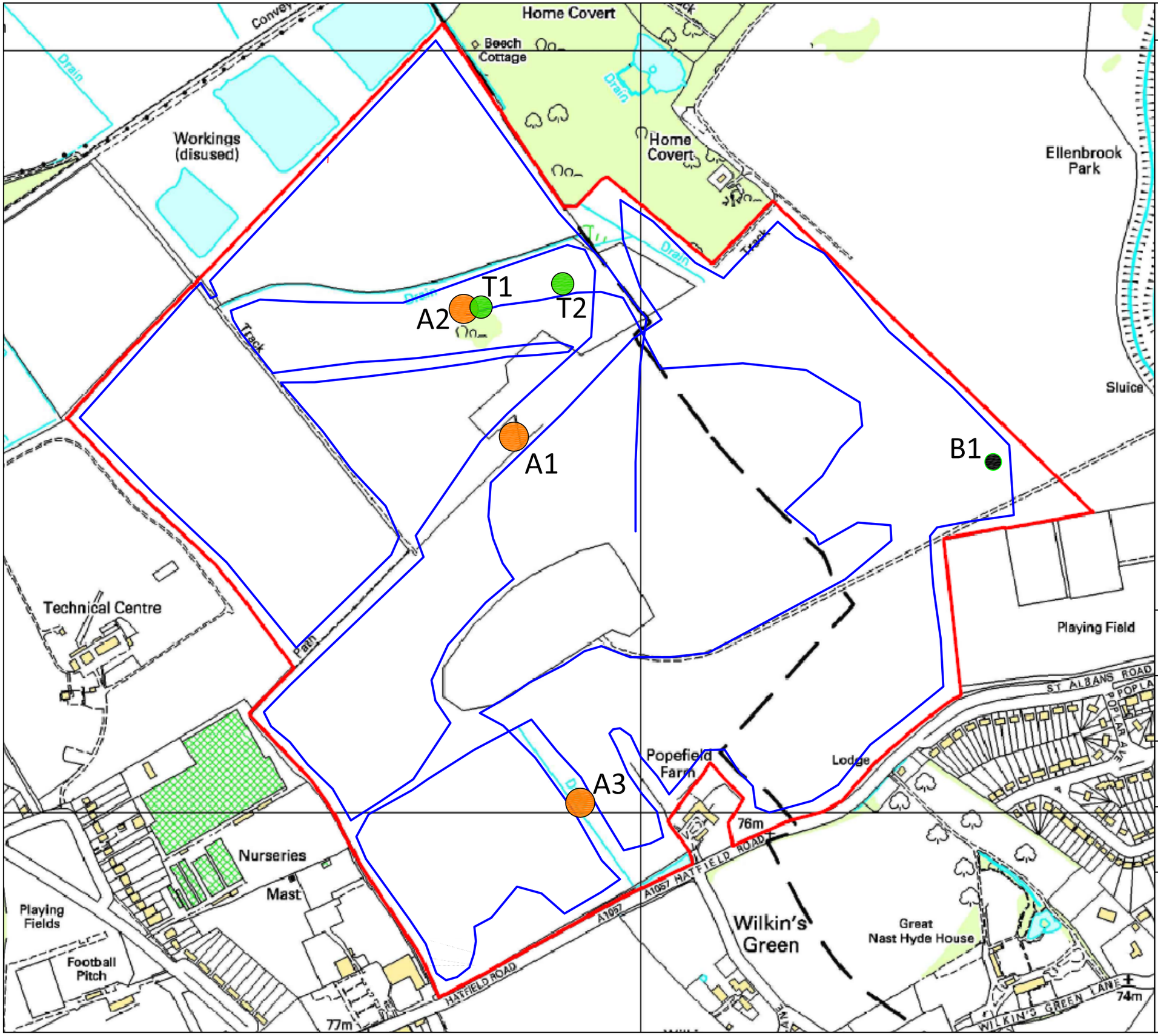
Drawing No.	Revision	Project No.
Figure 1	A	E1823

Drawn	Checked	Date
BC		January 2016

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Key

- Application site
- Surveyor transect route (approximate)
- Automated detector location (with reference)
- Tree location (with reference)
- Structure location (with reference)

DO NOT SCALE

Title

Bat survey plan

Project	Client
Hatfield Aerodrome	Brett

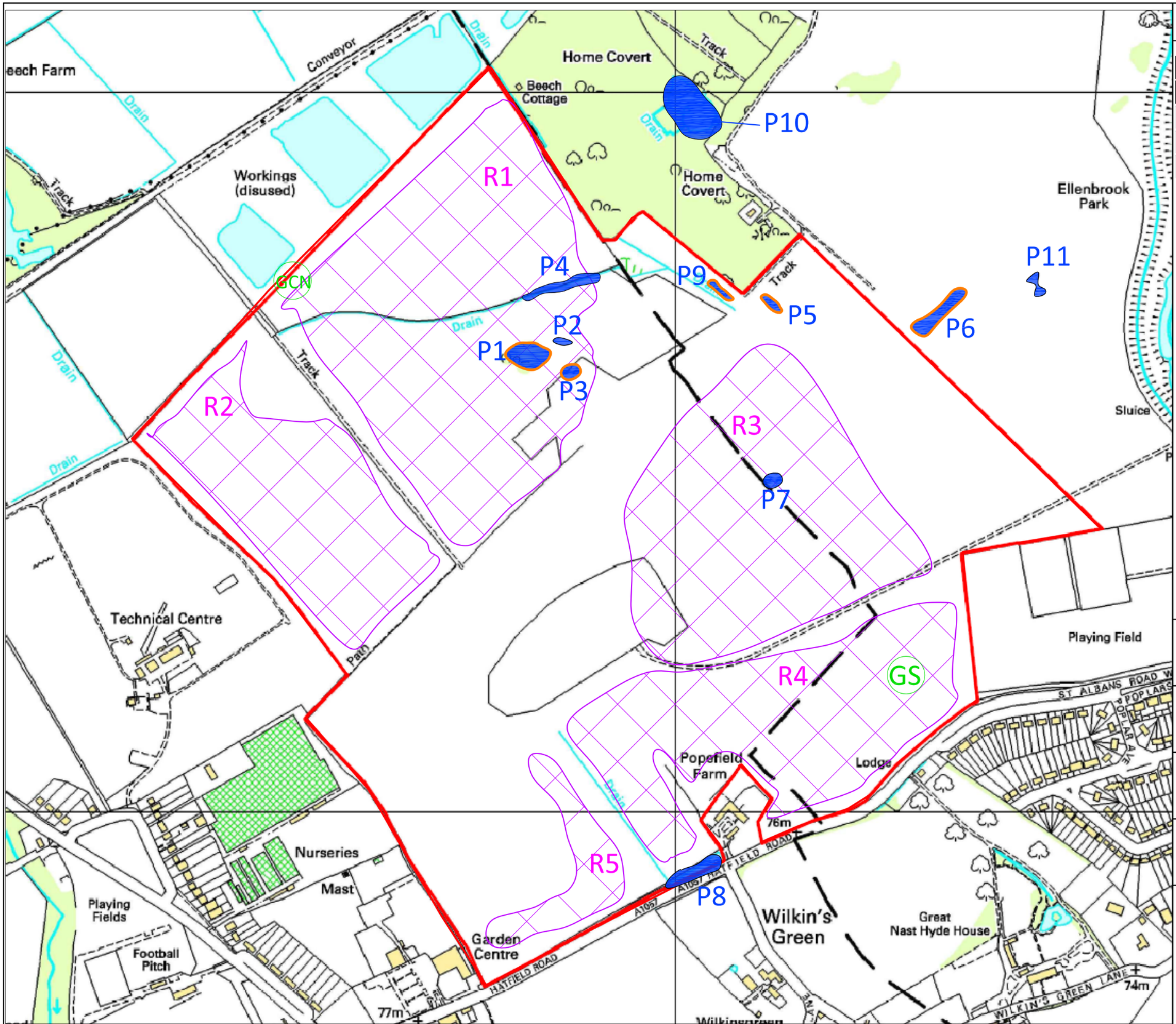
Drawing No.	Revision	Project No.
Figure 2	A	E1823

Drawn	Checked	Date
BC		January 2016

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Key

- Application site
- Waterbody with reference
- Waterbody with great crested newt present
- Reptile survey areas (with reference)
- GS — Grass snake sighting
- GCN — Great crested newt recorded during reptile survey

DO NOT SCALE

Title

Great crested newt and reptile survey plan

Project	Client
Hatfield Aerodrome	Brett

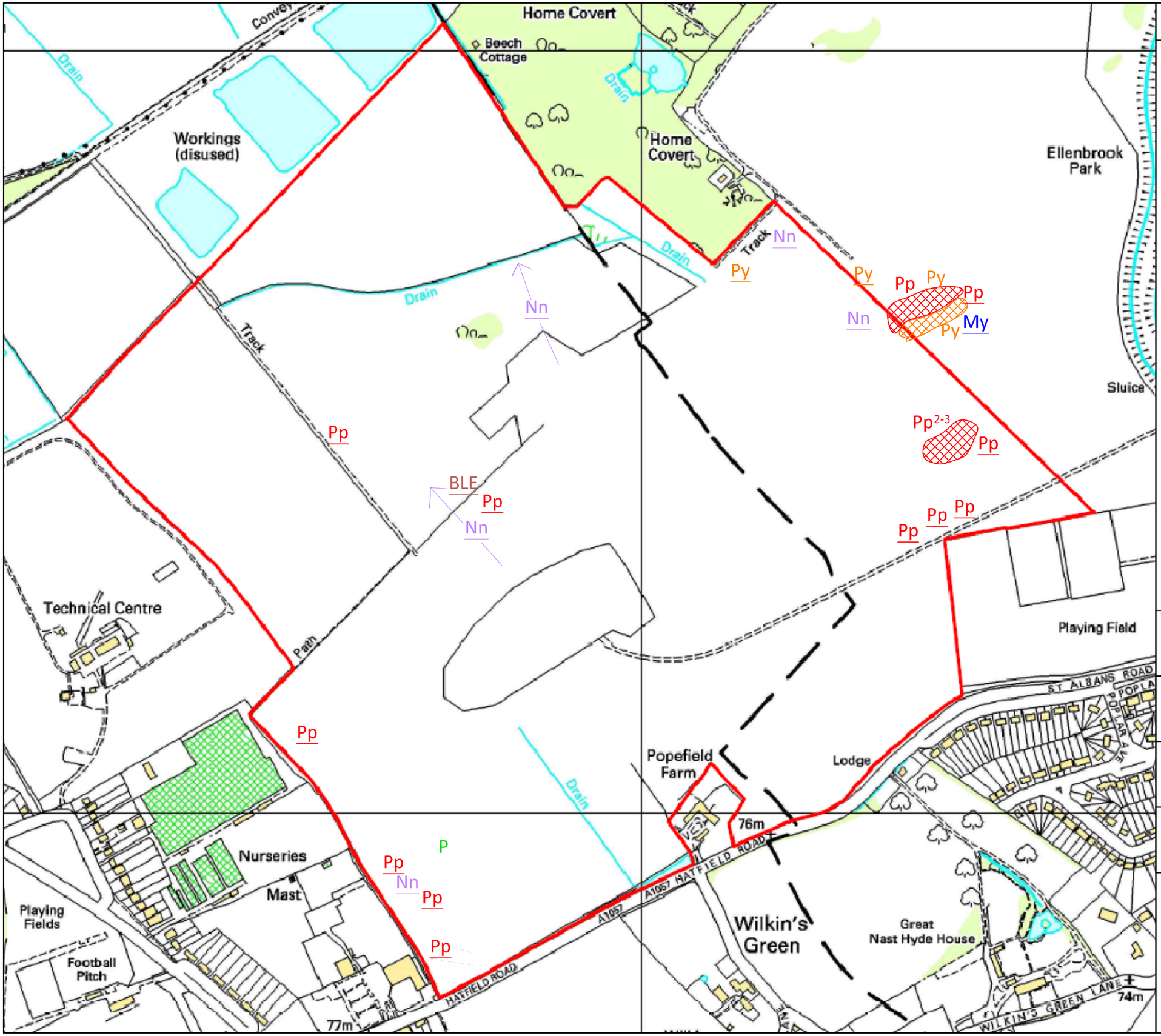
Drawing No.	Revision	Project No.
Figure 3	A	E1823

Drawn	Checked	Date
BC		January 2016

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Key

- Application site
- Pp Common pipistrelle
- Py Soprano pipistrelle
- Ps Pipistrelle (common/soprano)
- P Pipistrelle (Nathusius'/ common)
- My *Myotis* bat
- Nn Noctule bat
- BLE Brown long-eared bat
- Pp Bat pass
- Pp Commuting
- (Pp) Social call
- Flying area (not foraging)
- Foraging
- Pp^2 Number of bats

DO NOT SCALE

Title

Bat transect: Evening of 23/06/2015

Project	Client
Hatfield Aerodrome	Brett

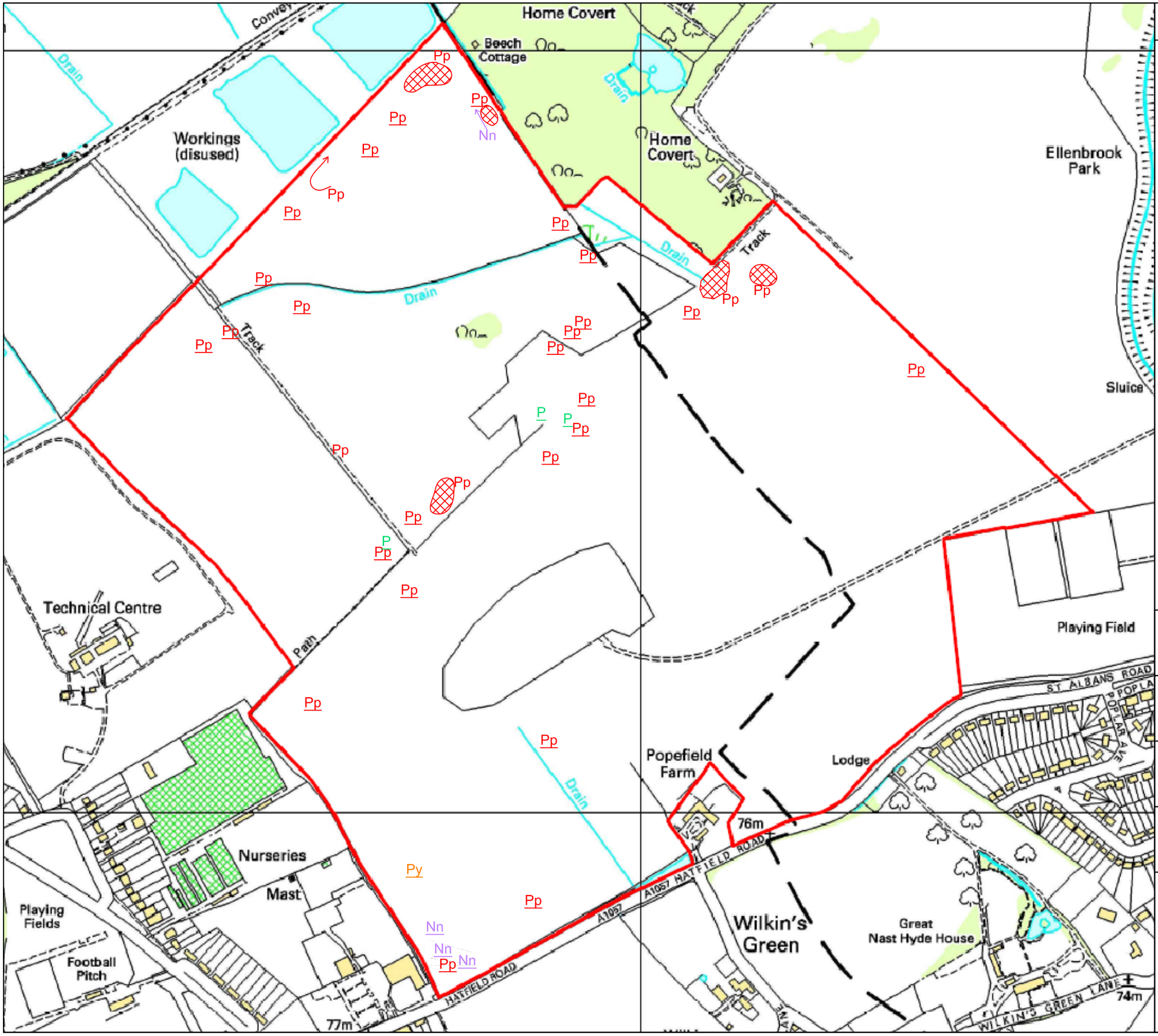
Drawing No.	Revision	Project No.
Figure 4	A	E1823

Drawn	Checked	Date
FM	BC	January 2016

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Key

- Application site
- Nn Noctule
- Pp Common pipistrelle
- P Pipistrelle species (Nathusius'/ common)
- Py Soprano pipistrelle
- Pp Bat pass
- Pp Commuting
- (Pp) Social call
- Flying area (not foraging)
- Foraging
- Pp^2 Number of bats

DO NOT SCALE

Title

Bat transect: Evening of 29/07/2015

Project	Client
Hatfield Aerodrome	Brett

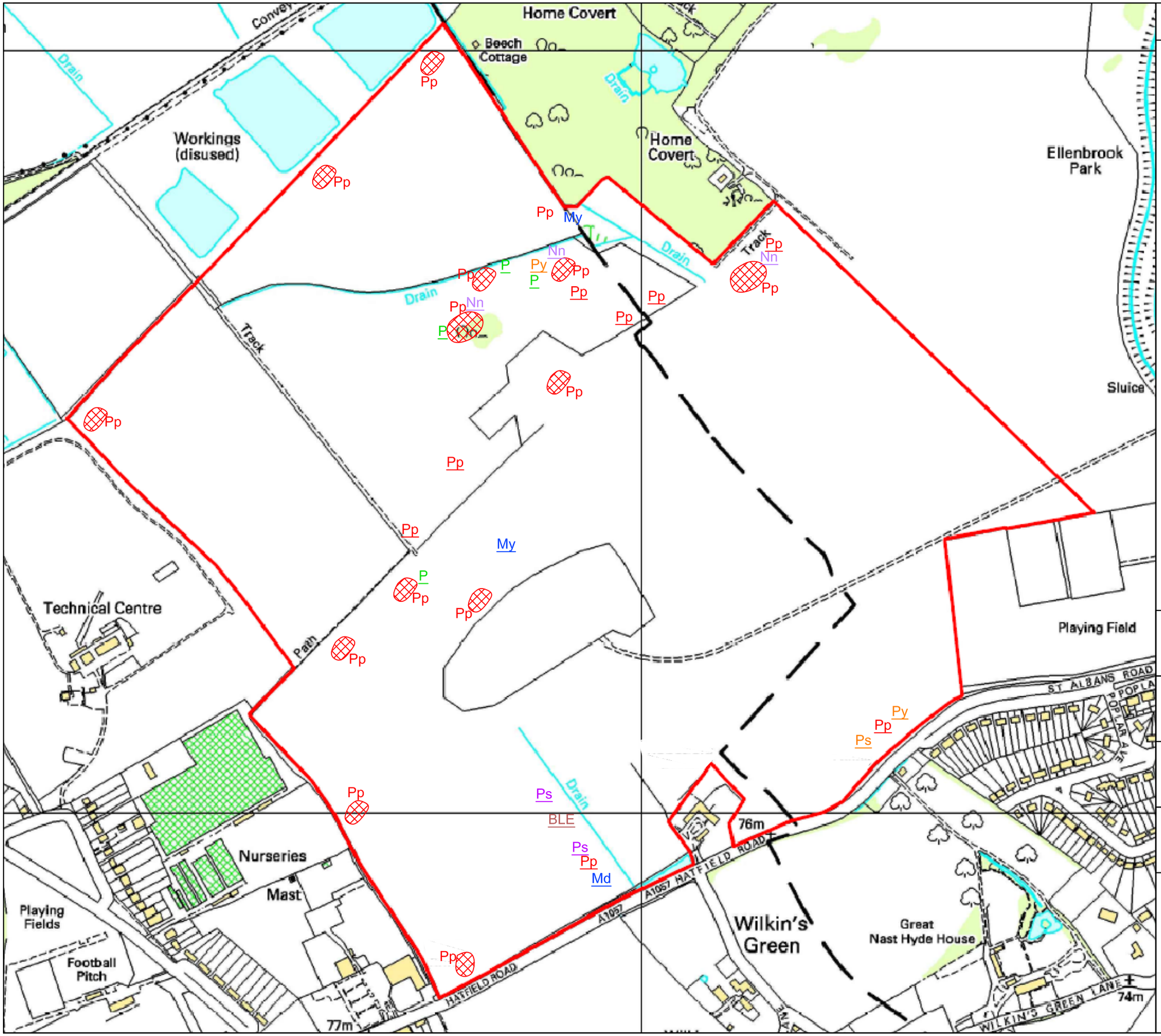
Drawing No.	Revision	Project No.
Figure 5	A	E1823

Drawn	Checked	Date
FM	BC	November 2015

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Key

- Application site
- Pp — Common pipistrelle
- P — Pipistrelle species (Nathusius'/ common)
- Ps — Pipistrelle species (common/soprano)
- Py — Soprano pipistrelle
- Nn — Noctule
- My — Myotis species
- Md — Daubenton's bat
- BLE — Brown long-eared bat
- Pp — Bat pass
- Pp — Commuting
- (Pp) — Social call
- Flying area (not foraging)
- Foraging
- Pp^2 — Number of bats

DO NOT SCALE

Title

Bat transect: Evening of 07/09/2015

Project	Client
Hatfield Aerodrome	Brett

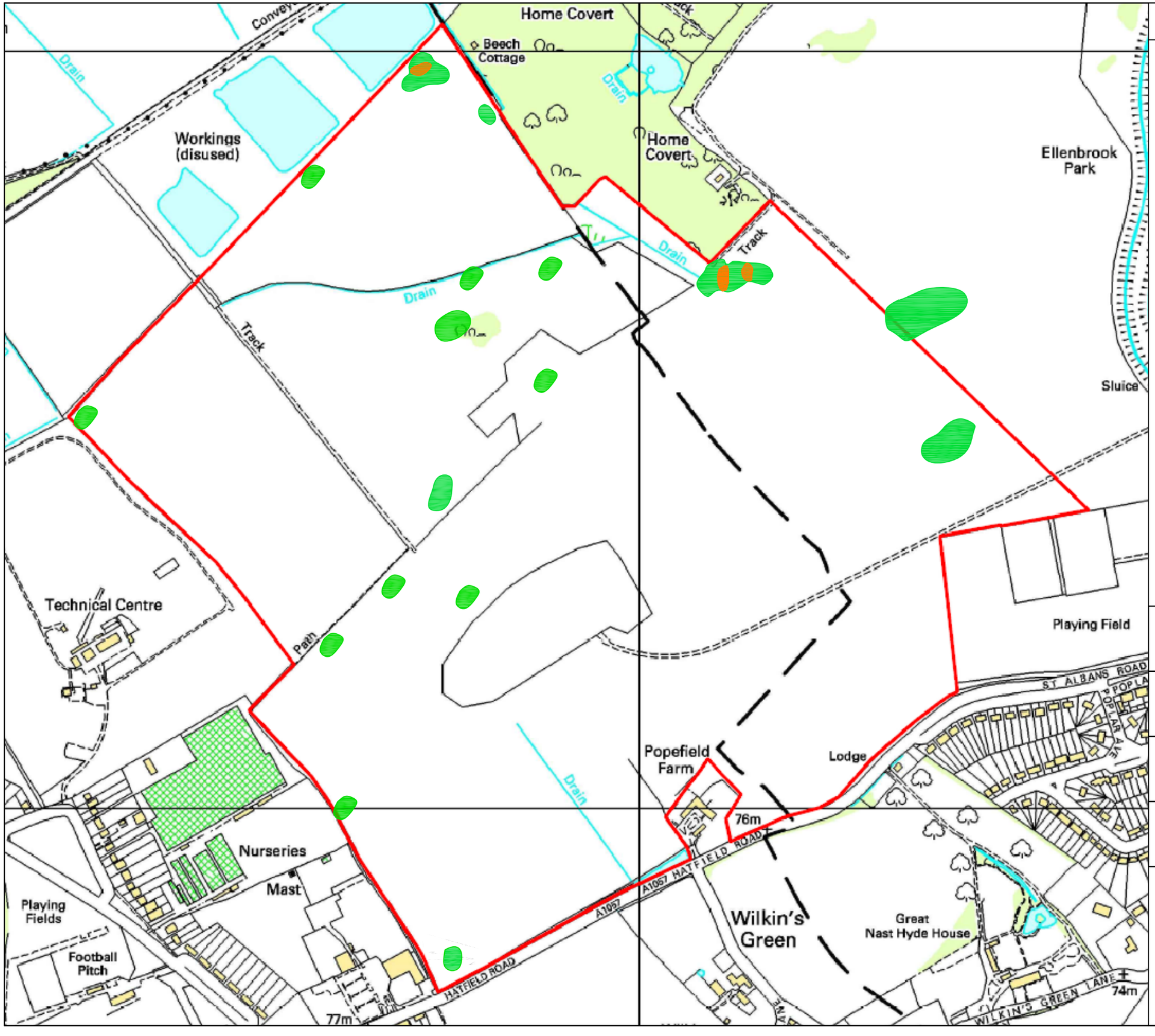
Drawing No.	Revision	Project No.
Figure 6	A	E1823

Drawn	Checked	Date
FM	BC	January 2016

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Key

- Application site
- Bat foraging recorded over two surveys
- Bat foraging recorded over one survey

DO NOT SCALE

Title

Bat activity summary

Project	Client
Hatfield Aerodrome	Brett

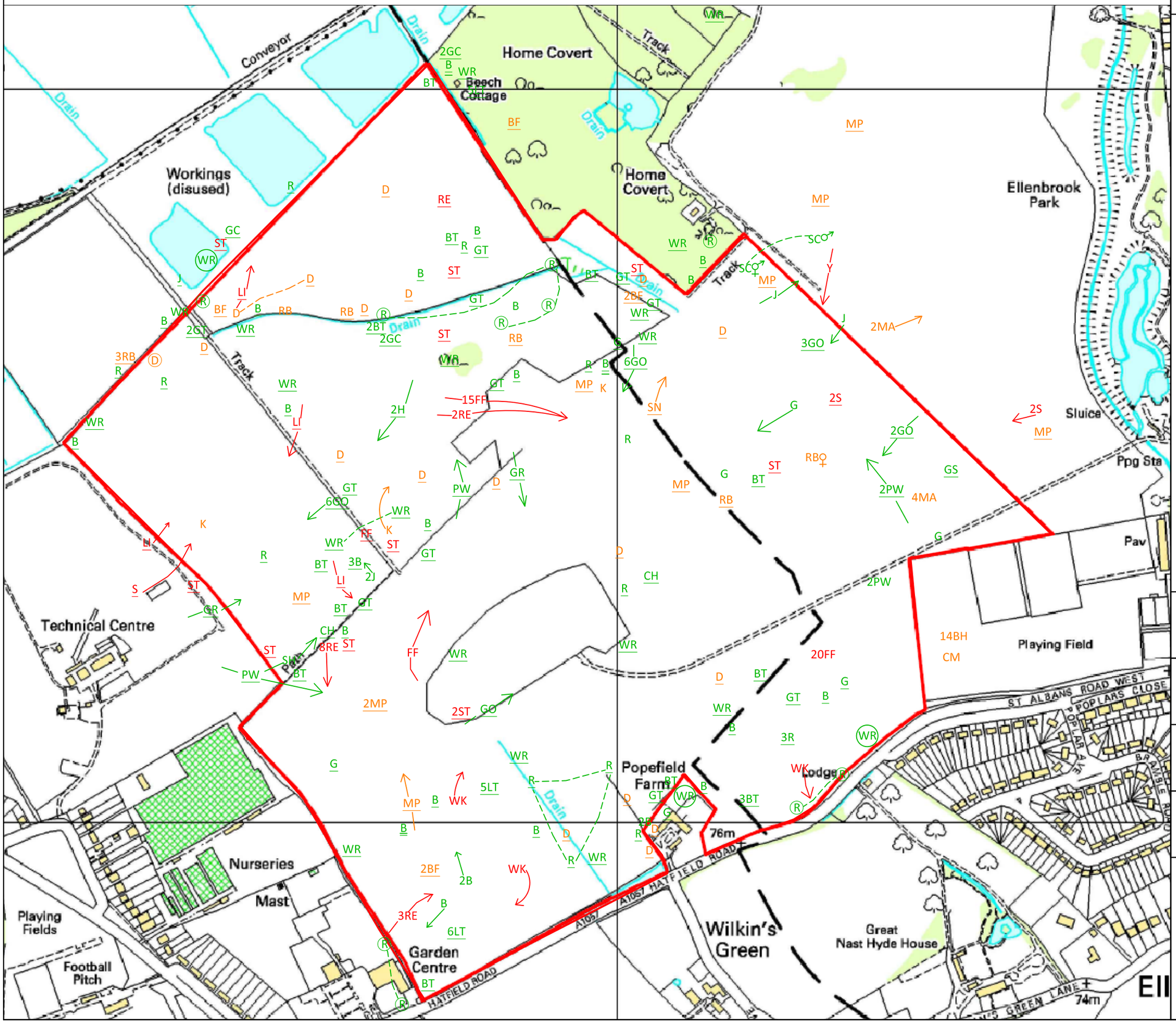
Drawing No.	Revision	Project No.
Figure 7	A	E1823

Drawn	Checked	Date
BC	DW	January 2016

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Key

	Application site	GC	Goldcrest
FF	Fieldfare	GO	Goldfinch
LI	Linnet	GS	Great Spotted Woodpecker
RE	Redwing	GT	Great Tit
S	Skylark	G	G. Woodpecker
ST	Song Thrush	GR	Greenfinch
WK	Woodcock	H	Grey Heron
Y	Yellowhammer	J	Jay
BH	Black-headed Gull	LT	Long-tailed Tit
BF	Bullfinch	PW	Pied Wagtail
CM	Common Gull	R	Robin
D	Dunnock	SH	Sparrowhawk
K	Kestrel	SC	Stonechat
MA	Mallard	WR	Wren
MP	Meadow Pipit		
RB	Reed Bunting		Symbols
SN	Snipe	♂	Male
B	Blackbird	♂♀	Pair
BT	Blue Tit	Ⓑ	Singing individual
CH	Chaffinch	B	Calling individual
		B→	Bird in flight
			Denotes different birds

DO NOT SCALE

Title
Wintering Bird Survey 28/11/2014

Project
Hatfield Aerodrome

Client
Brett

Drawing No.
Figure 8

Revision
A

Project No.
E1823

Drawn
FM

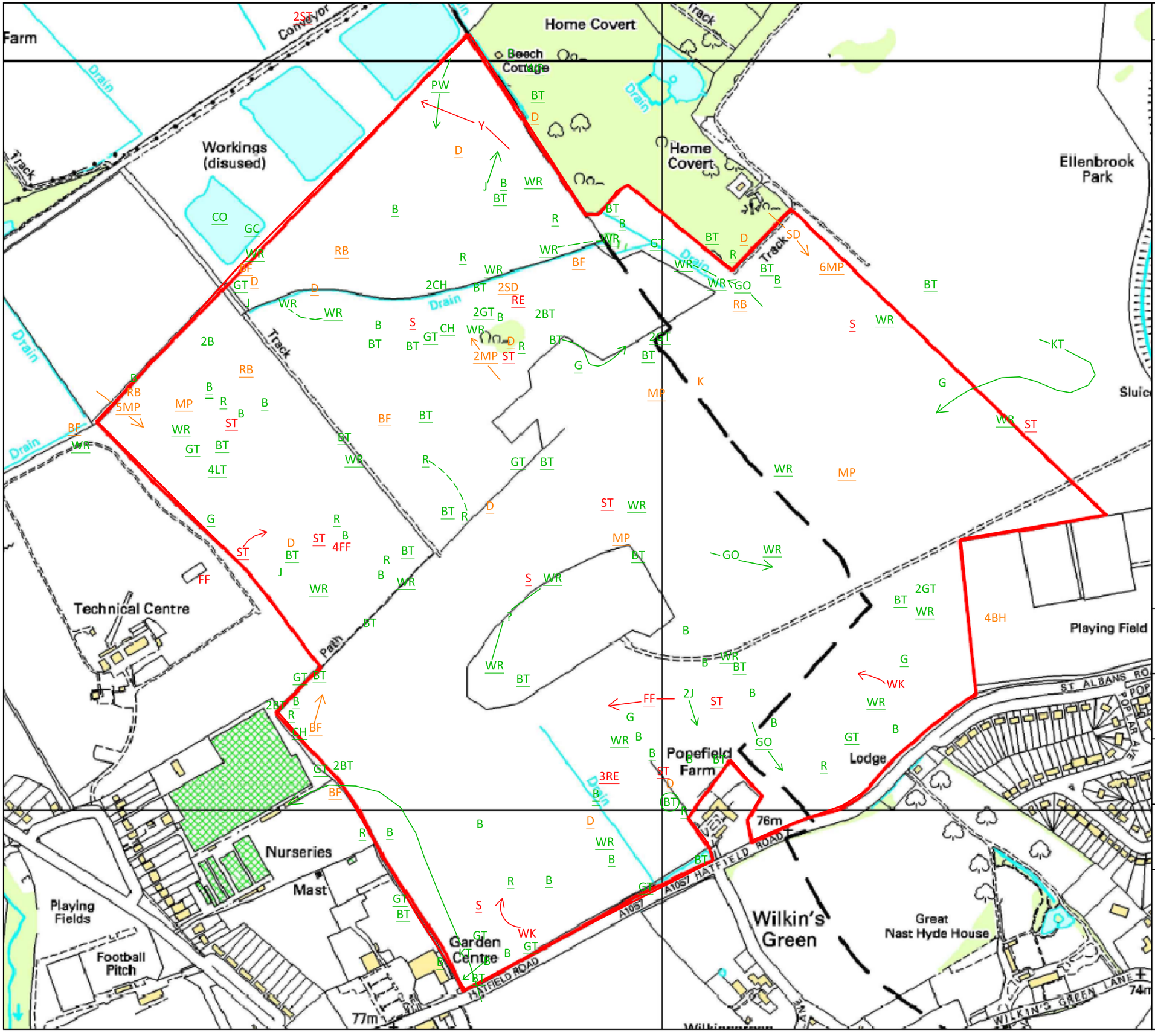
Checked
BC

Date
January 2016

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Key

Application site	
FF	Fieldfare
RE	Redwing
S	Skylark
ST	Song Thrush
WK	Woodcock
Y	Yellowhammer
BH	Black-headed Gull
BF	Bullfinch
D	Dunnock
K	Kestrel
MP	Meadow Pipit
RB	Reed Bunting
SD	Stock Dove
B	Blackbird
BT	Blue Tit
CH	Chaffinch
CO	Coot
GC	Goldcrest
GO	Goldfinch
GT	Great Tit
G	Green Woodpecker
J	Jay
LT	Long-tailed Tit
PW	Pied Wagtail
KT	Red Kite
R	Robin
WR	Wren

Symbols

- Pair
- (B) Singing individual
- B Calling individual
- B→ Bird in flight
- ----- Denotes different birds
- ? Possibly same bird

DO NOT SCALE

Title

Wintering Bird Survey 15/12/2014

Project	Client
Hatfield Aerodrome	Brett

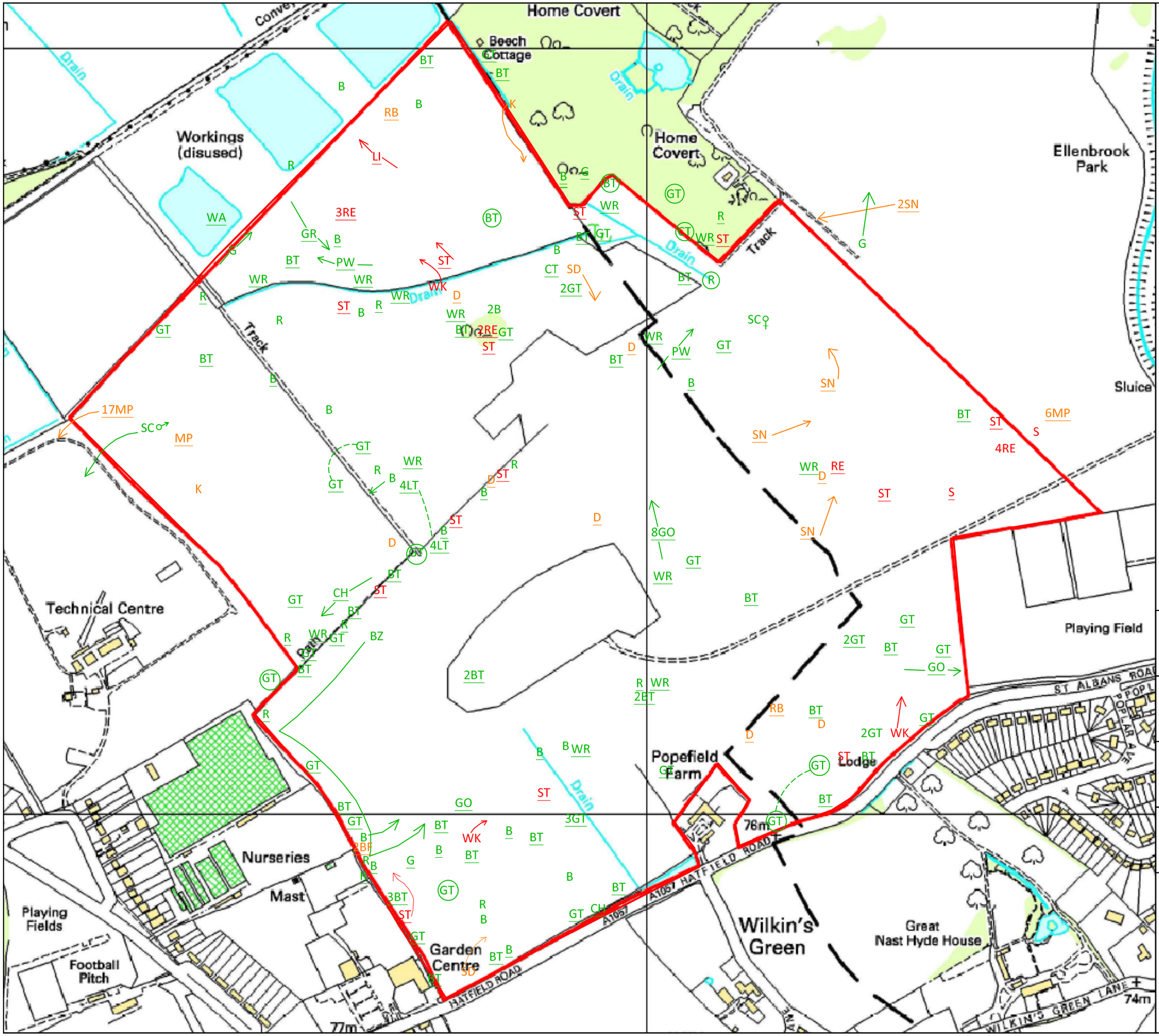
Drawing No.	Revision	Project No.
Figure 9	A	E1823

Drawn	Checked	Date
FM	BC	January 2016

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Key

	Application site	GT	Great Tit
FF	Fieldfare	G	Green Woodpecker
LI	Linnet	GR	Greenfinch
RE	Redwing	LT	Long-tailed Tit
S	Skylark	PW	Pied Wagtail
ST	Song Thrush	R	Robin
WK	Woodcock	SC	Stonechat
BF	Bullfinch	WA	Water rail
D	Dunnock	WR	Wren
K	Kestrel		
MP	Meadow Pipit		
RB	Reed Bunting		
SN	Snipe		
SD	Stock Dove		
B	Blackbird		
BT	Blue Tit		
BZ	Buzzard		
CH	Chaffinch		
CT	Coal Tit		
GO	Goldfinch		

Symbols

- Male
- Female
- Singing individual
- Calling individual
- Bird in flight
- Alarm call
- Denotes different birds

DO NOT SCALE

Title

Wintering Bird Survey 20/01/2015

Project	Client
Hatfield Aerodrome	Brett

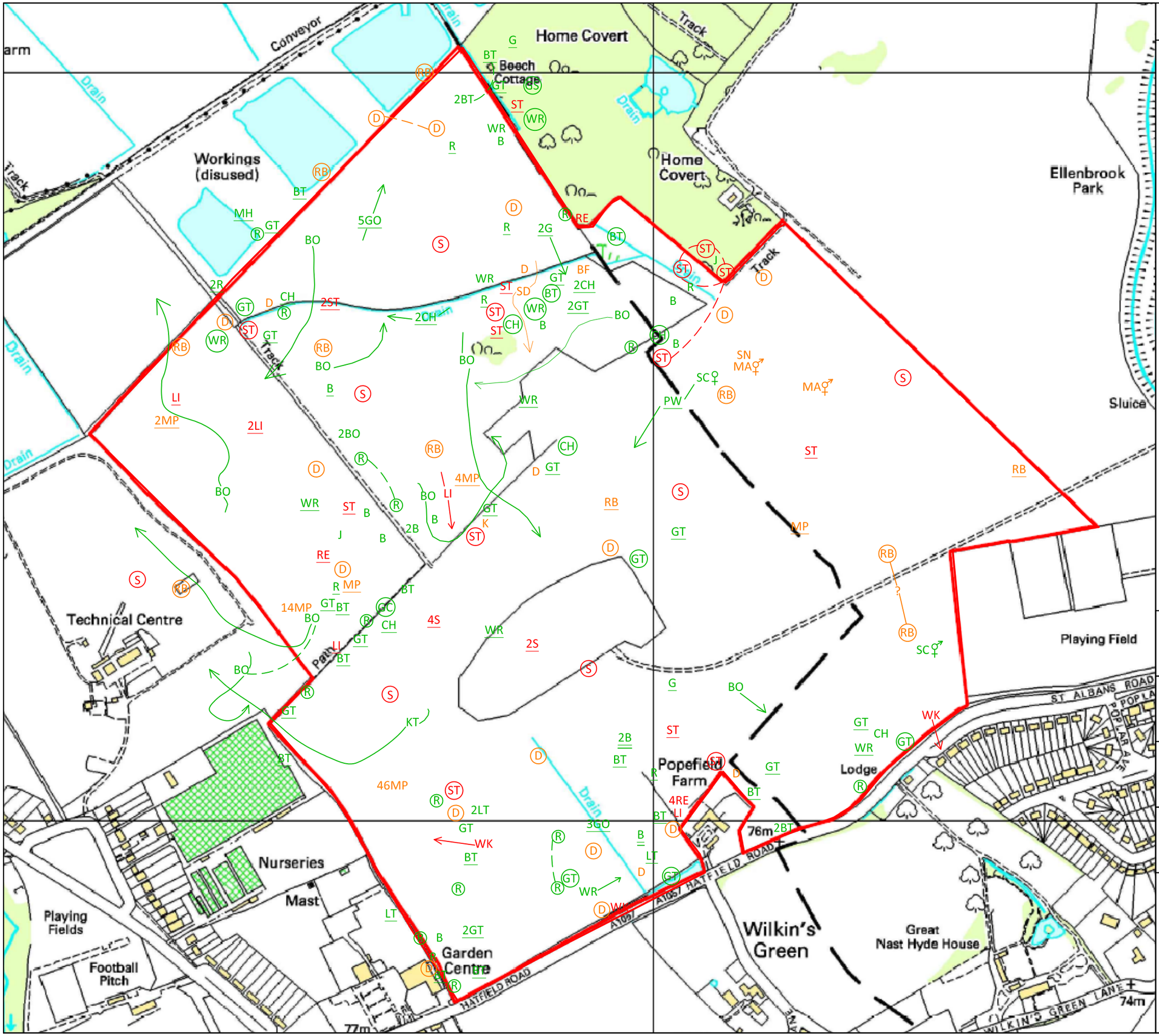
Drawing No.	Revision	Project No.
Figure 10	A	E1823

Drawn	Checked	Date
FM	BC	January 2016

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Key

	Application site	GS	G. S. Woodpecker
LI	Linnet	GT	Great Tit
RE	Redwing	G	Green Woodpecker
S	Skylark	J	Jay
ST	Song Thrush	LT	Long-tailed Tit
WK	Woodcock	MH	Moorhen
BF	Bullfinch	PW	Pied Wagtail
D	Dunnock	KT	Red Kite
K	Kestrel	RL	Red-legged Partridge
MA	Mallard	R	Robin
MP	Meadow Pipit	SC	Stonechat
RB	Reed Bunting	WR	Wren
SN	Snipe		
SD	Stock Dove		Symbols
BO	Barn Owl	♀	Female
B	Blackbird	♂♀	Pair
BT	Blue Tit	Ⓑ	Singing individual
CH	Chaffinch	B	Calling individual
GC	Goldcrest	B→	Bird in flight
GO	Goldfinch	B	Alarm call
		-?-	Possibly same bird
		-----	Denotes different birds

DO NOT SCALE

Title

Wintering Bird Survey 25/02/2015

Project	Client
Hatfield Aerodrome	Brett

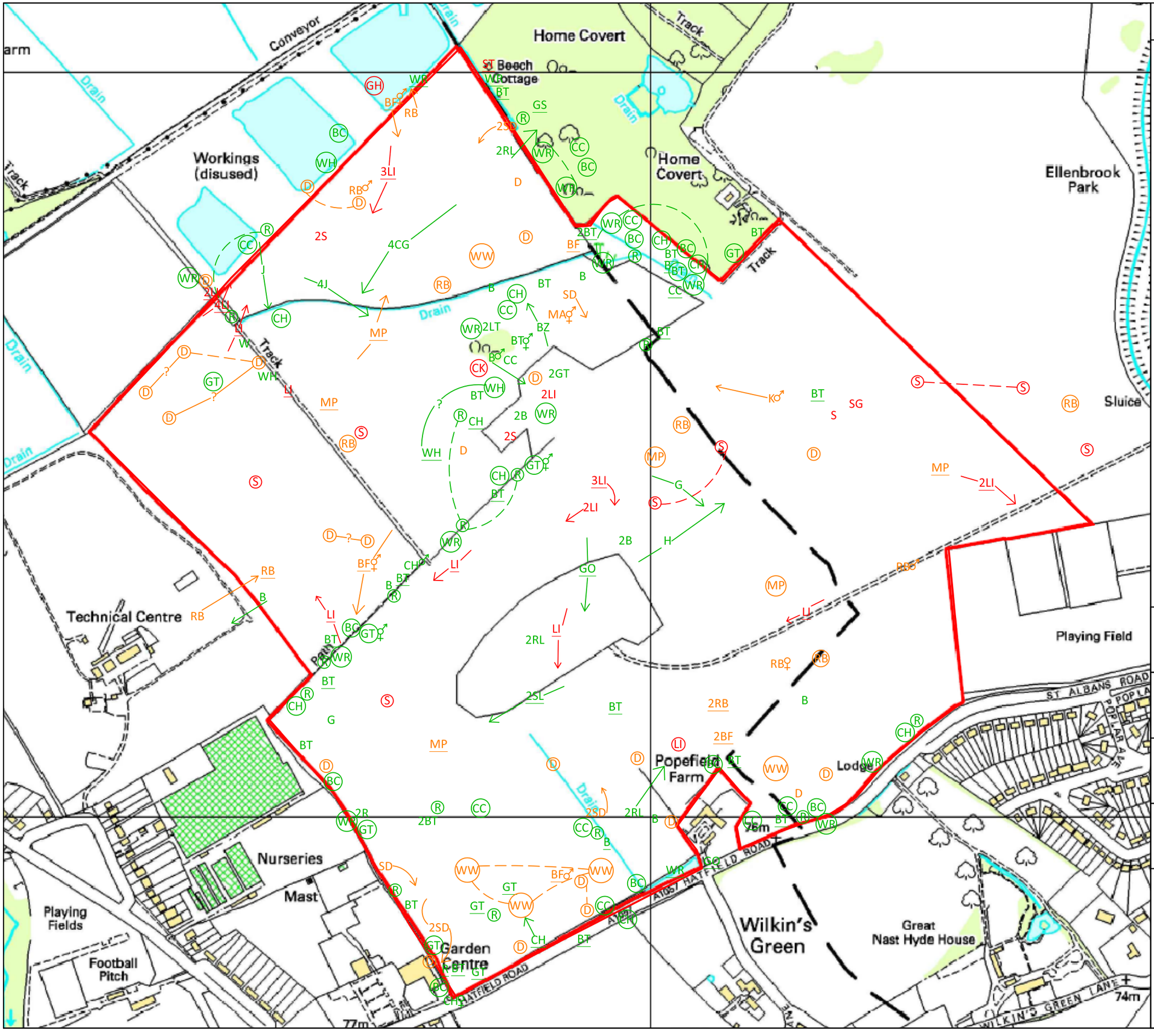
Drawing No.	Revision	Project No.
Figure 11	A	E1823

Drawn	Checked	Date
FM	BC	January 2016

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Key

- Application site
- CK Cuckoo
- GH Grasshop. Warbler
- LI Linnet
- S Skylark
- SG Starling
- BF Bullfinch
- D Dunnock
- K Kestrel
- MA Mallard
- MP Meadow Pipit
- RB Reed Bunting
- SD Stock Dove
- WW Willow warbler
- B Blackbird
- BT Blue Tit
- BZ Buzzard
- CH Chaffinch
- CC Chiffchaff
- G Green Woodpecker
- GC Goldcrest
- GO Goldfinch
- GT Great Tit
- H Grey Heron
- J Jay
- LT Long-tailed Tit
- RL Red-leg. Partridge
- R Robin
- SL Swallow
- W Wheatear
- WH Whitethroat
- WR Wren

Symbols

- ♂ Male
- ♀ Female
- ♂♀ Pair
- (B) Singing individual
- B̲ Calling individual
- B→ Bird in flight
- –?– Possibly same bird
- ----- Denotes different birds

DO NOT SCALE

Title

Breeding bird survey 15/04/2015

Project	Client
Hatfield Aerodrome	Brett

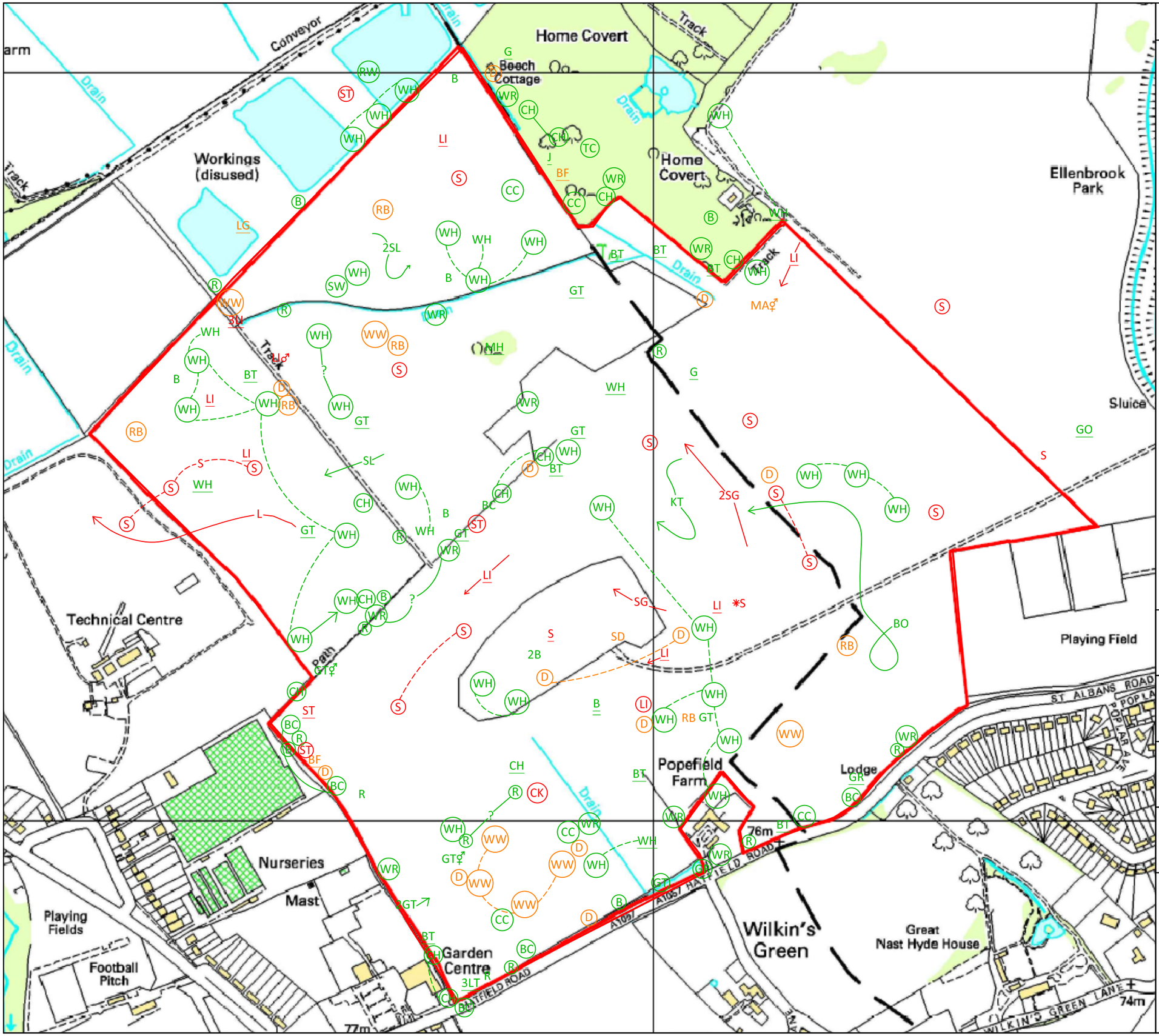
Drawing No.	Revision	Project No.
Figure 12	A	E1823

Drawn	Checked	Date
FM	BC	January 2016

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Key

	Application site	GR	Greenfinch
CK	Cuckoo	J	Jay
L	Lapwing	JD	Jackdaw
LI	Linnet	KT	Red Kite
S	Skylark	LT	Long-tailed Tit
ST	Song thrush	MH	Moorhen
SG	Starling	R	Robin
BF	Bullfinch	RW	Reed warbler
D	Dunnock	SW	Sedge warbler
MA	Mallard	SL	Swallow
RB	Reed Bunting	TC	Treecreeper
RW	Little grebe	WH	Whitethroat
SD	Stock Dove	WR	Wren
WW	Willow warbler		
BO	Barn Owl		
B	Blackbird		
BC	Blackcap		
BT	Blue Tit		
CH	Chaffinch		
CC	Chiffchaff		
GO	Goldfinch		
GT	Great Tit		
G	Green Woodpecker		

Symbols

- ♂ Male
- ♀ Pair
- (B) Singing individual
- B Calling individual
- B→ Bird in flight
- ? Possibly same bird
- ✳ Nest
- ----- Different birds

Title

Breeding bird survey 21/05/2015

DO NOT SCALE

Project	Client
Hatfield Aerodrome	Brett

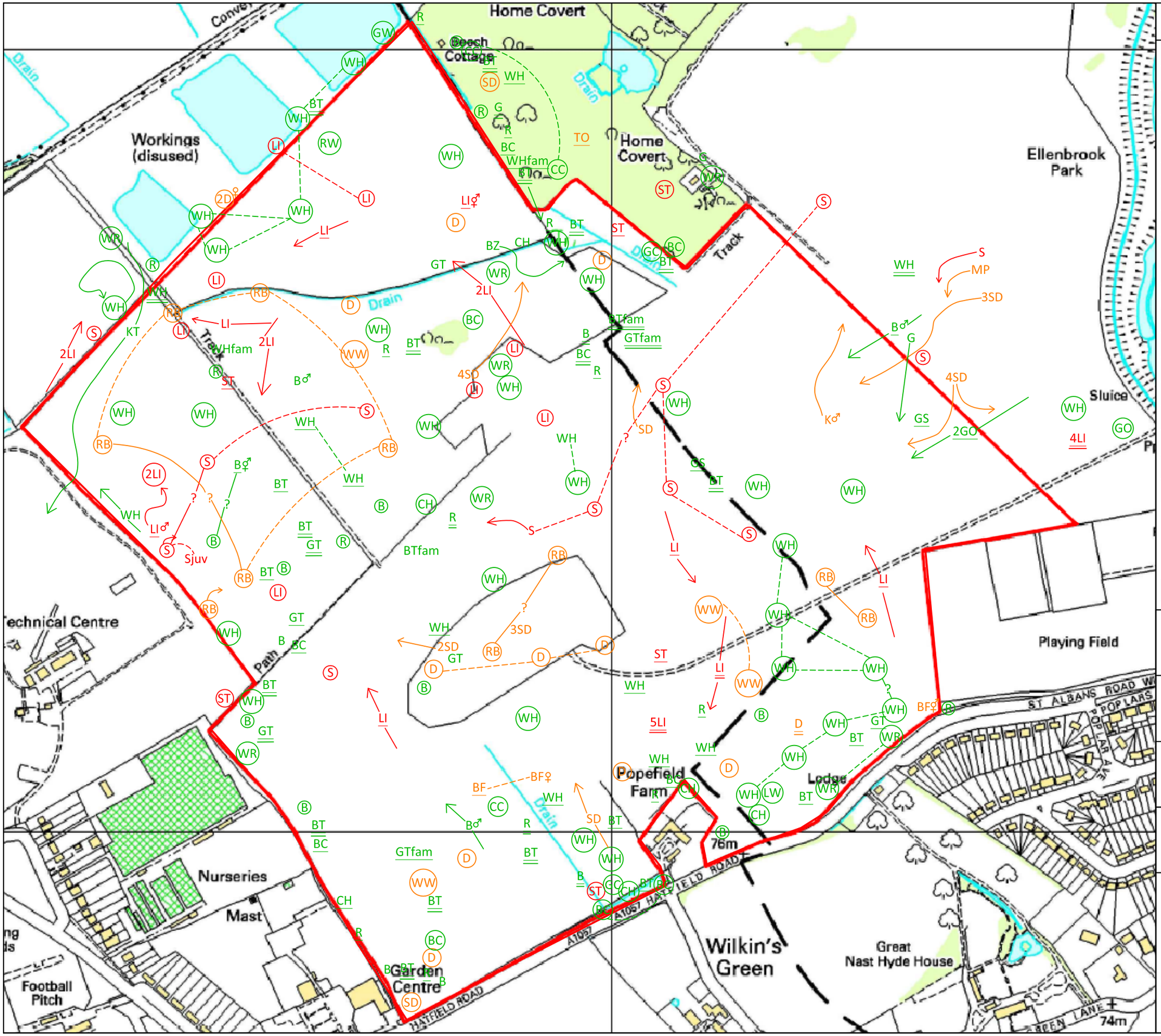
Drawing No.	Revision	Project No.
Figure 13	A	E1823

Drawn	Checked	Date
FM	BC	January 2016

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Key

Application site	
LI	Linnet
S	Skylark
ST	Song thrush
BF	Bullfinch
D	Dunnock
K	Kestrel
MP	Meadow pipit
RB	Reed Bunting
SD	Stock Dove
TO	Tawny owl
WW	Willow warbler
B	Blackbird
BC	Blackcap
BT	Blue Tit
CH	Chaffinch
CC	Chiffchaff
GW	Garden warbler
GC	Goldcrest
GO	Goldfinch
GS	Great spotted woodpecker
GT	Great Tit
G	Green Woodpecker
KT	Red Kite
LW	Lesser whitethroat
RW	Reed warbler
R	Robin
WH	Whitethroat
WR	Wren

Symbols

juv	Juvenile
fam	Family
♀	Female
♂	Male
♂♀	Pair
(B)	Singing individual
B	Calling individual
B	Calling individual
B→	Bird in flight
?–	Possibly same bird
-----	Different birds

DO NOT SCALE

Title
Breeding bird survey 24/06/2015

Project
Hatfield Aerodrome

Client
Brett

Drawing No.
Figure 14

Revision
A

Project No.
E1823

Drawn
FM

Checked
BC

Date
January 2016

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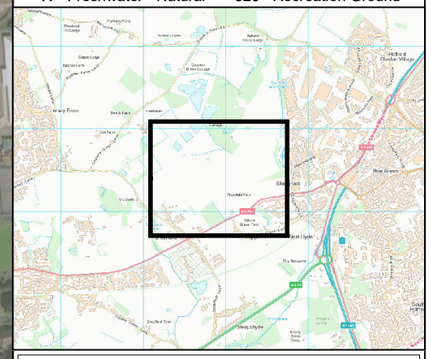
N

LEGEND

- Site Boundary
- r1 - Eutrophic Standing Waters
- g1a6 - Other lowland dry acid grassland
- g3c - Other Neutral Grassland
- g4 - Modified Grassland
- h2a - Hedgerow (Priority Habitat)
- h3a - Blackthorn Scrub
- h3d - Bramble Scrub
- h3h - Mixed Scrub
- r1 - Standing Open Water and Canals
- u1b - Developed Land, Sealed Surface
- u1b5 - Buildings
- w1f7 - Other Lowland Mixed Deciduous Woodland
- w1g6 - Line of Trees

Secondary Habitats

10 - Scattered Scrub
11 - Scattered Trees
14 - Scattered Rushes
16 - Tall Herb
17 - Ruderal/Ephemeral
36 - Plantation
37 - Semi-Natural Woodland
38 - Secondary Woodland
41 - Freshwater - Natural
58 - Grazed
73 - Bare Ground
80 - Unmanaged
94 - Green Lane
99 - Nature Reserve
162 - Temporary Water Bodies
191 - Ditch
520 - Recreation Ground



0 100 200 300 400

Metres

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HATFIELD AERODROME

ECOLOGY REPORT

UK HABITAT SURVEY RESULTS

1

Scale 1:5,000 @ A3

Date MAY 2021

09885.00024.0002.0 UK Habitat Survey

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N

10 (0.76)
4 (0.66)
9
5 (0.6)
6 (0.62)
11 (0.54)
2
1 (0.59)
3 (0.37)
7 (0.52)
8 (0.76)

0 100 200 300 400
Metres

LEGEND

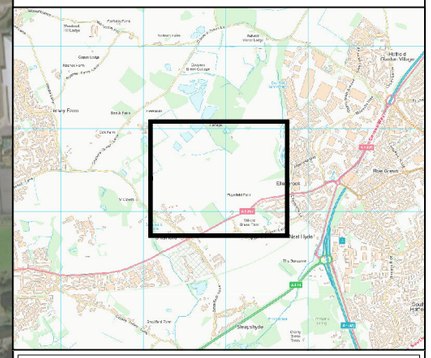
- Site Boundary
- Dry Pond
- Pond Not Surveyed 2017 (No Access)

Surveyed Pond (HSI Score)

- < 0.5: Poor
- 0.5 - 0.59: Below Average
- 0.6 - 0.69: Average
- 0.7 - 0.79: Good

Incidental Record

- Owl Box
- Owl box with Barn Owl Pellets
- Badger Dung Pit
- Schwegler 2F Bat Box
- Fenced Off Area for Japanese Knotweed Control



4/5 LOCHSIDE VIEW
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HATFIELD AERODROME

ECOLOGY REPORT

GCN HABITAT SUITABILITY & INCIDENTAL RECORDS

1

Scale	Date
1:5,000 @ A3	MAY 2021

09885.00024.0003.0 GCN Habitat Suitability and Incidental Records

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APPENDIX 11/5

HATFIELD AERODROME - CONFIDENTIAL ANNEXE - BADGER

Badger Survey Methodology

2014/15

1. Badger field signs searched for include prints, push-throughs, snagged hair, latrines, foraging evidence, paths and active or disused setts. Setts, if noted, were assessed for activity and classified according to standard criteria[1]. Incidental observations of badgers, where made, were recorded during the bat and bird surveys undertaken during 2014 and 2015.

2020/21

2. Incidental observations of badger setts and signs of their activity (e.g., dung pits) were searched for during the wintering bird surveys of 2020/21 and the habitat survey of 2021. Results are detailed within this Confidential Appendix that will be provided to the client with a confidential map (Appendix 11/5 - Drawing 1). These will not be made available in the public domain.

Baseline

Desk Study Results

3. An ecological assessment was produced for previous site owners in 2008[2] . Reference was made to signs of badger, but no setts, were found.

4. Based on recommendations for further survey work set out in the above study, and to inform proposals to open up the remainder of the airfield for public recreation, further targeted surveys were commissioned and carried out during 2010[3] . These included detailed surveys for badgers and identified the presence of badger setts.

5. The 2015 desk study identified 27 badger records for the search area. The closest badger record was approximately 0.9km to the west, with this record pertaining to a sett recorded in 2011.

6. The 2008 Cresswell Associates ecological report identified badger pathways and a latrine along the southern boundary of the site and an inactive outlier sett in Home Covert. The 2010 Cresswell Associates ecological summary report identified the presence of an active main sett near the centre of the site.

7. The 2021 desk study identified 42 badger records for the search area. The closest badger record was not readily determined as many grid references lacked accuracy. The most recent record was from 2020.

---

[1] Harris, Cresswell & Jefferies (1989) Surveying Badgers. The Mammal Society

[2] Cresswell Associates/Hyder Consulting (2008) Ecological Appraisal of Hatfield Green. Report No. WX82186/C1186/V1 Produced for Goodman UK Ltd.

[3] Cresswell Associates/Hyder Consulting (2010) Hatfield Green Summary of Ecological Surveys. Briefing document Produced for Goodman UK Ltd

Badger Survey Results

Field Survey

2015

1. Mapped badger activity is provided in this separate confidential appendix. In summary, a 20-entrance hole, main badger sett was observed near the centre of the site (the same sett identified by Cresswell Associates in 2010). Other than occasional foraging signs, and two outlying latrines, no other signs of activity were found on the site.

2021

2. In 2021, during the habitat survey conducted by SLR, one candidate main badger sett was identified with numerous mammal holes of an appropriate size, with open and clear entrances but without any confirmatory positive evidence of current badger use. One potential annexe/subsidiary sett was recorded to the west. Badger prints were found in this area. 22 mammal holes were checked. One entrance hole located was of a characteristic shape and size for badger (entrance and tunnel) but had partially collapsed, all the remaining holes were attributed to rabbit. All identified setts are shown on Appendix 11/5 - Drawing 1.

3. A detailed badger survey has not been conducted in 2021 and numerous mammal holes present within the site may also be used by badger, in particular at the location on the bund in the centre of the site either now or in the future. A single dung pit was also recorded in 2021, indicating recent use of the site by this species. The location of the setts identified are at either end of a hedgerow, with the dung pit recorded between them. This evidence is suggestive, but not conclusive, that the two setts are used by the same clan of badgers.

Evaluation

4. The application site is considered to be an important feature for the local population of badgers, largely due to the legal protections offered to this species and its setts.

Potential effects

5. Identification of potential effects and their zone of influence has included review of the development description and working scheme (ES Chapter 3), landscape (ES Chapter 8), and noise and vibration (ES Chapter 10).

6. Taking the above into account, the project is considered to have the potential to give rise to a range of potentially significant direct and indirect effects relevant to badger, including *inter alia*:

7. Implementation Phase - *direct effects*

- Direct mortality of badger; and
- Loss of an established, candidate main badger sett and a potential annexe/subsidiary sett.

8. Implementation Phase - *indirect effects*

- Displacement and/or disturbance of badger using application site, due to loss of commuting/sheltering/foraging habitats and/or operational activities.

9. Completed Scheme - *indirect effects*

- Likely changes in use of the site by badgers already associated with the site (offering commuting, shelter and foraging opportunities).

Assessment of effects in the absence of mitigation

10. Table 11-A5-1 sets out the likely significant effects on badger identified prior to the application of any additional mitigation measures for both the implementation phase of the project and the post-completion phase. It thus takes into account the avoidance, mitigation and compensation measures taken as part of the design process, as previously set out in this chapter.

Table 11/A5-1
Predicted Effects on Key Receptors in the Absence of Additional Avoidance or Mitigation

Receptor	Value							Potential Effects	Magnitude	Significance	Additional Avoidance or Mitigation Measures Proposed?
	I	N	R	C	B/D	P	ZoI				
Home Covert and Round Wood Local Wildlife Site (LWS)							*	1) Loss of candidate main sett and high proportion of associated foraging area. 2) Direct mortality of badger with increase in road/site vehicle traffic and plant/machinery/operations on site.	1) Major at the geographical level specified (immediate zone of influence) although likely to be no more than minor at Parish or above levels. 2) Major at the geographical level specified (immediate zone of influence) although likely to be no more than minor at Parish or above levels.	1) Potential for significant negative effects up to parish level in the absence of mitigation. Impacts would have legal implications and therefore further consideration of avoidance and mitigation is required. 2) Potential for significant negative effects up to parish level in the absence of mitigation. Impacts would have legal implications and therefore further consideration of avoidance and mitigation is required.	1) Yes. An artificial sett would be constructed, and badgers encouraged to use it a minimum of six months prior to the closure/destruction of the existing sett under licence. Loss of foraging area adjudged not to require mitigation because progressive restoration will ensure continued availability of sufficient resource. 2) Precautionary working methods to avoid accidental death and entrapment will be clearly outlined in a Construction Environmental Management Plan (CEMP) and strictly adhered to on site.

Further Avoidance, Mitigation, Compensation and Enhancement for Badger

11. The main badger sett and potential annexe/subsidiary sett present on the site will not be affected until the mid to late part of the phased working sequence. The substantial lead-in time before this sett needs to be excluded/destroyed under licence will therefore be used to construct an artificial sett at an appropriate location near to the site boundary. Construction of this structure and commencement of the process of encouraging badgers to begin using it (i.e., in order that they are habituated to it well in advance of staged closure of the existing setts) will be required a minimum six months in advance of licenced exclusion/destruction of the identified and any additional sett(s) on site or considered within a zone of influence (i.e., disturbance/damage to underground sett structure).

12. A badger survey will be required in advance of the licence application to provide an updated assessment of badger activity on site. This will inform the detail of a badger mitigation strategy. This approach will be secured pursuant to a condition attached to the planning permission.

13. In addition to the above, prior to the commencement of stripping on each working phase, a repeat badger survey of that area will be carried out. If any additional setts are found to have become established, appropriate mitigation measures up to and including exclusion of animals from any sett that happens to be active at that time will be taken under the terms of the relevant licences.

14. Full detail of the methodology for the above will be prescribed fully within a Species Protection Plan in advance of replacement sett creation, sett closure/destruction and site clearance/construction works proceeding on site.

Residual Effects

15. The residual effects anticipated to arise as an overall consequence of the project (i.e., taking into account both the design mitigation set out above, and the further avoidance, mitigation and compensation measures) are summarised for badger in Table 11/A5/2 below.

Table 11/A5/2
Residential Effects

Receptor	Residual Effect
Badger	The significant lead-in time available to secure adequate mitigation for sett loss and the effect of phased working and progressive restoration of the site in terms of maintenance of foraging area reduce the scope and magnitude of potential impacts, with residual effects adjudged to be well below Parish-level significance even in the worst case.

Conclusions

16. The project will give rise to minor temporary negative effects on badgers during various stages of the working sequence. Badger are not predicted to be subject to negative effects of high magnitude (e.g., significant in terms of wider local populations), subject to mitigation measures which, in respect of badgers, are required under statute in any event.

17. There is no impediment to mitigation proposals being delivered that are in accordance with standard best practice, and in that context, there is no cause to believe that the requisite licenses will not be forthcoming in due course. There is also a high certainty that all temporary negative effects on badger related to habitat loss will be at least fully compensated in the long-term through the restoration scheme.

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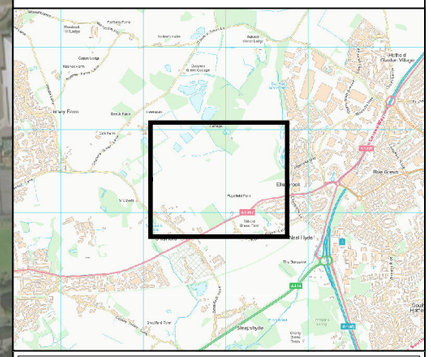
N

LEGEND

Site Boundary

Candidate Main Badger Sett

Potential Annexe / Subsidiary Baget Sett



0 100 200 300 400

Metres

4/5 LOCHSIDE VIEW
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HATFIELD AERODROME

ECOLOGY REPORT

CONFIDENTIAL

BADGER MAP

1

Scale 1:5,000 @ A3

Date MAY 2021

09885.00024.0004.0 CONFIDENTIAL Badger Map

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N

B. - Blackbird
BF - Bullfinch
BH - Black-headed Gull
BT - Blue Tit
C. - Carrion Crow
CD - Collared Dove
CH - Chaffinch
D. - Dunnock
FF - Fieldfare
G. - Green Woodpecker
GO - Goldfinch
GT - Great Tit
HH - Hen Harrier
KT - Red Kite
LB - Lesser Black-backed Gull
MG - Magpie
MP - Meadow Pipit
R. - Robin
RE - Redwing
RL - Red-legged Partridge
SC - Stonechat
SG - Starling
SN - Snipe
ST - Song Thrush
ST - Song Thrush
WP - Woodpigeon
WR - Wren

0 100 200 300 400
Metres

LEGEND

Site Boundary

Bird Registration

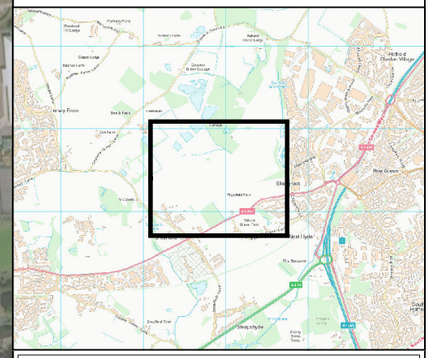
Singing

Calling

Alarm Call

Flyover directional flight line

Red Conservation Concern
Amber Conservation Concern
No Conservation Concern



4/5 LOCHSIDE VIEW
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HATFIELD AERODROME

ECOLOGY REPORT

WINTERING BIRD SURVEY RESULTS

Visit 1 - 15/01/2021

Scale 1:5,000 @ A3

Date MAY 2021

09885.00024.0001.0 Wintering Bird Survey

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LEGEND

Site Boundary

Bird Registration

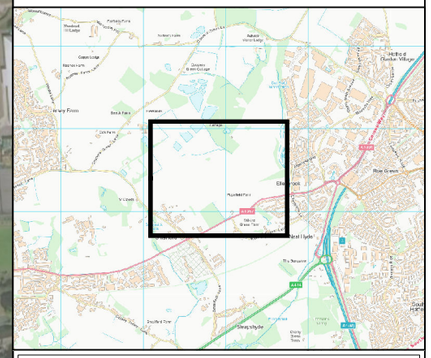
Singing

Calling

Alarm Call

Flyover directional flight line

Red Conservation Concern
Amber Conservation Concern
No Conservation Concern



B. - Blackbird	KT - Red Kite
BF - Bullfinch	LB - Lesser Black-backed Gull
BH - Black-headed Gull	MG - Magpie
BT - Blue Tit	MP - Meadow Pipit
BZ - Buzzard	PW - Pied/White Wagtail
C. - Carrion Crow	R. - Robin
CH - Chaffinch	RE - Redwing
D. - Dunnock	SC - Stonechat
FF - Fieldfare	SD - Stock Dove
G. - Green Woodpecker	ST - Song Thrush
GO - Goldfinch	WP - Woodpigeon
GT - Great Tit	WR - Wren

0 100 200 300 400

Metres

09885.00024.0001.0 Wintering Bird Survey

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HATFIELD AERODROME

ECOLOGY REPORT

WINTERING BIRD SURVEY RESULTS

Visit 2 - 09/02/2021

Scale 1:5,000 @ A3

Date MAY 2021

519500 520000 520500

209000 208500 208000

N

LEGEND

Site Boundary

Bird Registration

Singing

Calling

Alarm Call

mat Carrying Nest Material

food Carrying Food

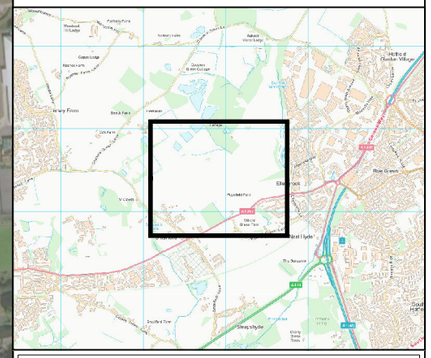
Simultaneous registration (different birds)

Flyover directional flight line

Owl Box

Old Owl Pellet

Red Conservation Concern
Amber Conservation Concern
No Conservation Concern



B. - Blackbird	KT - Red Kite
BF - Bullfinch	LI - Linnet
BH - Black-headed Gull	LT - Long-tailed Tit
BT - Blue Tit	MG - Magpie
BZ - Buzzard	MP - Meadow Pipit
C. - Carrion Crow	PH - Pheasant
CD - Collared Dove	R. - Robin
CH - Chaffinch	RE - Redwing
D. - Dunnock	RI - Ring-necked Parakeet
G. - Green Woodpecker	S. - Skylark
GL - Grey Wagtail	SC - Stonechat
GO - Goldfinch	SD - Stock Dove
GT - Great Tit	ST - Song Thrush
J. - Jay	WP - Woodpigeon
JD - Jackdaw	WR - Wren

0 100 200 300 400

Metres

4/5 LOCHSIDE VIEW
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HATFIELD AERODROME

ECOLOGY REPORT

WINTERING BIRD SURVEY RESULTS

Visit 3 - 09/03/2021

Scale 1:5,000 @ A3

Date MAY 2021

09885.00024.0001.0 Wintering Bird Survey

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Hertfordshire Ecological Network Mapping

Introduction

A project was carried out in 2011-2013 producing a new Hertfordshire habitat inventory with latest available data and then using these data to generate potential habitat network maps. Potential habitat network maps identify how our habitats are spatially related to each other and where the highest priorities are for expanding them and linking them together. This strategic approach ensures that efforts can be targeted to where they are of most potential benefit. It also ensures that the right combination of habitats are created in the right places, reflecting the historical context and physical factors and minimising unintended consequences of locking out the potential to restore functioning networks of one habitat for the sake of another.

The Hertfordshire Ecological Network mapping project was managed by a steering group that included representatives of the County Council and DEFRA bodies and the guidance document (below) has been approved by the Hertfordshire Local Nature Partnership Planning Task Group that includes representatives from Herts Ecology, the County Council, District Councils and landowners.

For more detail on the project, please visit https://bit.ly/2tR5jYw

How to interpret the maps

The guidance below is based on an advisory document, produced by the Hertfordshire Local Nature Partnership Planning Task Group, which is available here: https://bit.ly/2MNDhUu

The guidance below is based around identifying appropriate actions and principles to apply to the different areas on the map. For any development proposal the first stage is to identify how the different features within the dataset are distributed across the proposed development area. This will involve viewing the map component of the dataset and interrogating the associated data table for each of the map features within and around the proposed site. For ease of use, the map component of the dataset is colour-coded by the overarching categories in the first column of the data table.

Green areas on the map (values of 1 in the first column of the data table)

- These patches contain habitats listed within S41 of the NERC Act and should be avoided by development and protected by the development management system.
- Adjacent or surrounding development should provide for the enhancement of these habitats through ongoing positive conservation management. The data table identifies the habitat type that must be maintained.
- Development causing significant harm to these patches should normally be refused. Where there is unavoidable harm in the context of overriding public interest, the mitigation hierarchy should be applied. Depending on the circumstances, all other areas on the map could potentially be candidate areas for applying appropriate compensation measures. The same actions described for restoring and creating habitats to enhance ecological networks equally apply to compensation measures. NB a simple 1:1 ratio of compensation for habitat area damaged is unlikely to be enough due to the poor success rate and risks involved in creating new habitats to the same standard as those lost. In reality the ratio is likely to be much higher, in some cases up to a 1:10 ratio of harm to compensation area. Other habitat types are considered irreplaceable (eg. ancient woodland) and can never be adequately compensated if lost.

Purple areas on the map (values of 2 in the first column of the data table)

- These patches contain habitats not currently qualifying under S41 of the NERC Act but with high potential to do so. Whilst not receiving the same level of statutory and policy-based protection as the green areas, they should nonetheless be avoided by development and protected by the development management system where reasonable to do so. This is because they are important components of ecological networks and it is much quicker, less risky and more cost-effective to restore these habitats than to create new ones elsewhere.
- Enhancements to the ecological network can be carried out through restoring these habitat patches to the most appropriate S41 NERC Act habitat type. This would be provided through a combination of one-off capital works and ongoing positive conservation management. The data table specifies the target habitat type most appropriate to restore these patches to.

Orange/yellow/cream areas on the map (values of 3a, 3b and 3c in the first column of the data table)

- These patches contain no mapped existing habitats of any significance. Therefore, in the context of the ecological networks dataset, these areas are suitable for appropriate development.

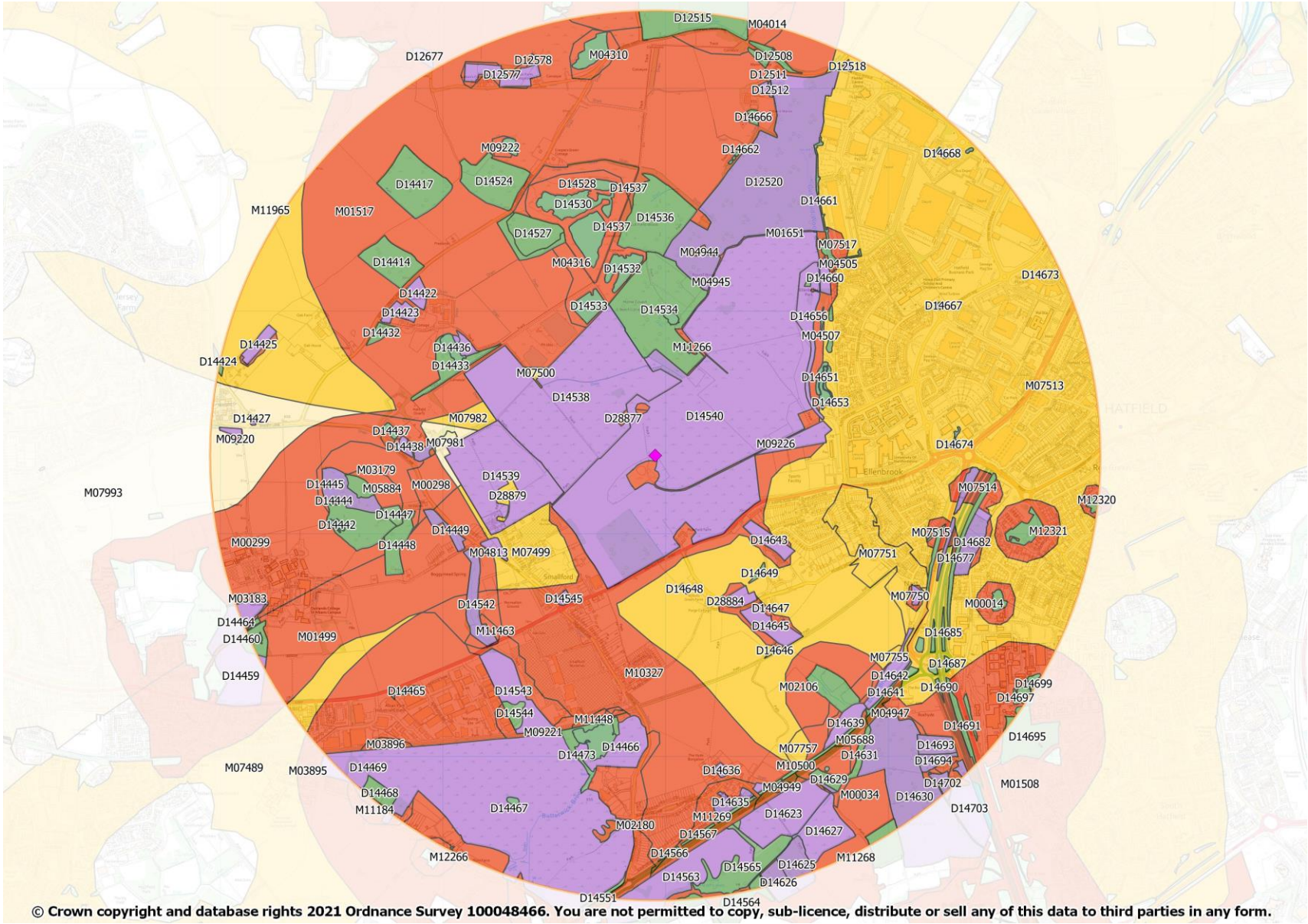
- These areas also form the potential for new habitat corridors to be created to improve ecological network integrity. The dataset identifies the relative priorities for habitat creation to form corridors and other links (eg. habitat 'stepping stones') between existing habitat patches. Orange areas are predicted to be of higher priority than yellow, which are predicted to be of higher priority than cream (values of 3a > 3b > 3c respectively in the first column of the data table). These relative priorities should be taken into account in the design of masterplans, by focusing habitat corridors primarily on the orange areas and then yellow and then cream, as appropriate. Development proposals containing large areas of orange on the map will need to plan the most sensitively and produce the greatest enhancements to the ecological network. The dataset simply predicts relative priority for habitat creation, not necessarily realistic sizes of such projects. Whilst it will normally be unlikely that whole areas coloured in orange on the map would be allocated for creating habitat, it is expected that where orange areas on the map exist, development should aim to provide ecologically functioning corridors from one end of their land to the other.

- There are no hard and fast rules for determining the scale of habitat corridors because it depends on the context and also the scale of development (with larger developments able to contribute the most). However, corridors should be of a scale to allow them to properly function ecologically. For example, a simple Green Infrastructure corridor consisting of a footpath with only a small verge of habitat is unlikely to function ecologically. As a general principle, the wider, larger and more continuous the corridor, the more it will contribute to the integrity of the ecological network.

- Opportunities for habitat creation projects to comprehensively link up existing habitats within and around the development envelope should be designed into the masterplan. This should be done at the earliest possible stage in the process, normally at the same time as other infrastructure, in order to ensure that contributions are both meaningful and cost-effective. If habitat corridors are designed into the masterplan as an afterthought, good opportunities will be missed and habitat creation projects are likely to be less appropriate and less cost-effective. Worst case scenario would be total and permanent severance of a network. It is highly recommended that expert ecological advice is sought in the earliest stages in the design of a masterplan.

- The dataset identifies the most appropriate predicted habitat types to focus on in any given area on the map. Habitat recommendations are found in the Target habitat type column of the table. Where more than one habitat type is recommended, it may be appropriate to focus on just one of

them or to try and combine all habitat recommendations into the habitat corridor being created. It is strongly recommended that expert ecological advice is sought in cases where more than one habitat type is recommended or where a soil test contra-indicates the recommended habitat type.



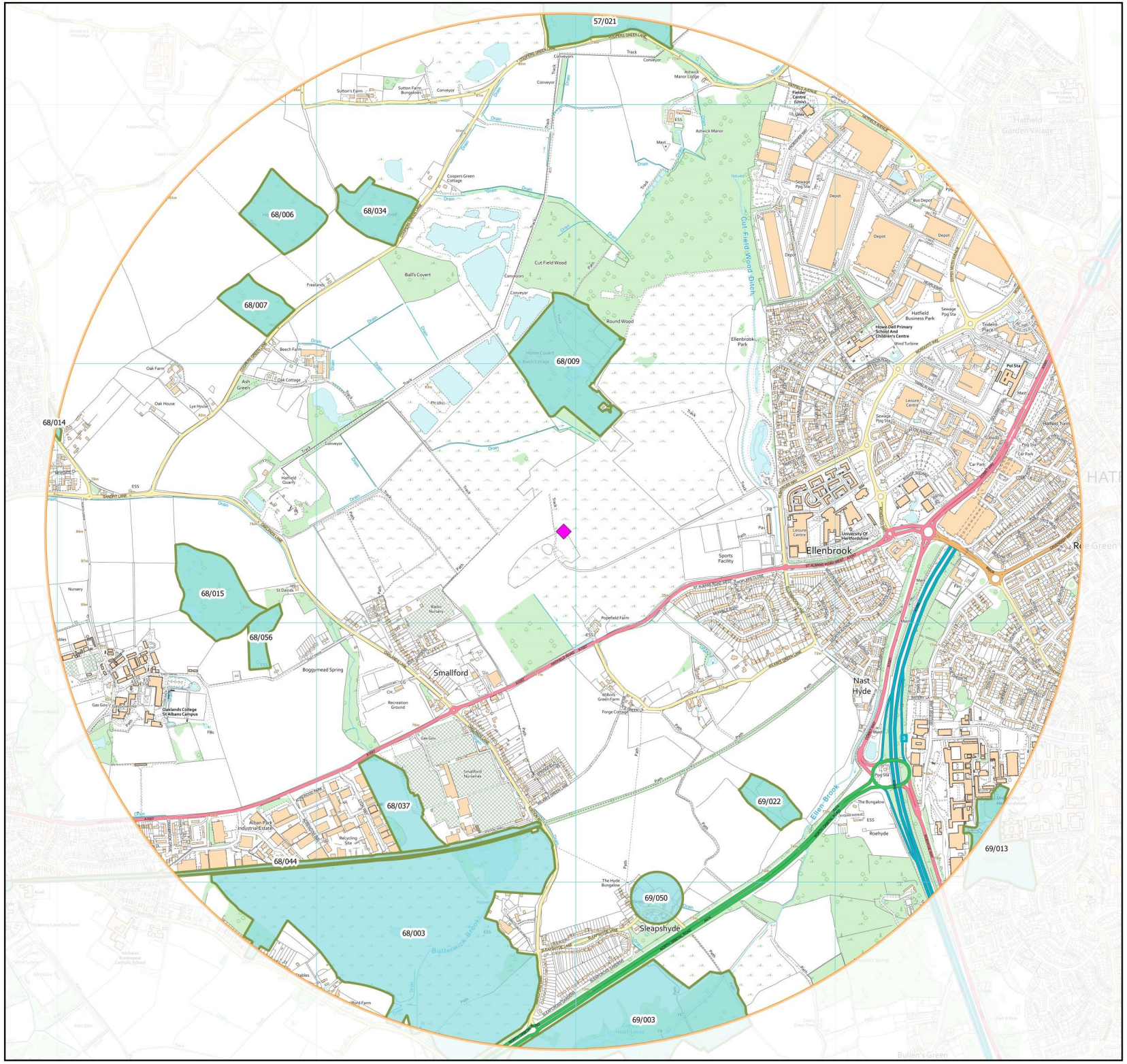
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HERC
Herts Environmental Records Centre

Map 1

05/05/2021

Local Sites Map 1



Search Information

- Search point
- Search area

Local Sites

- Local Wildlife Sites

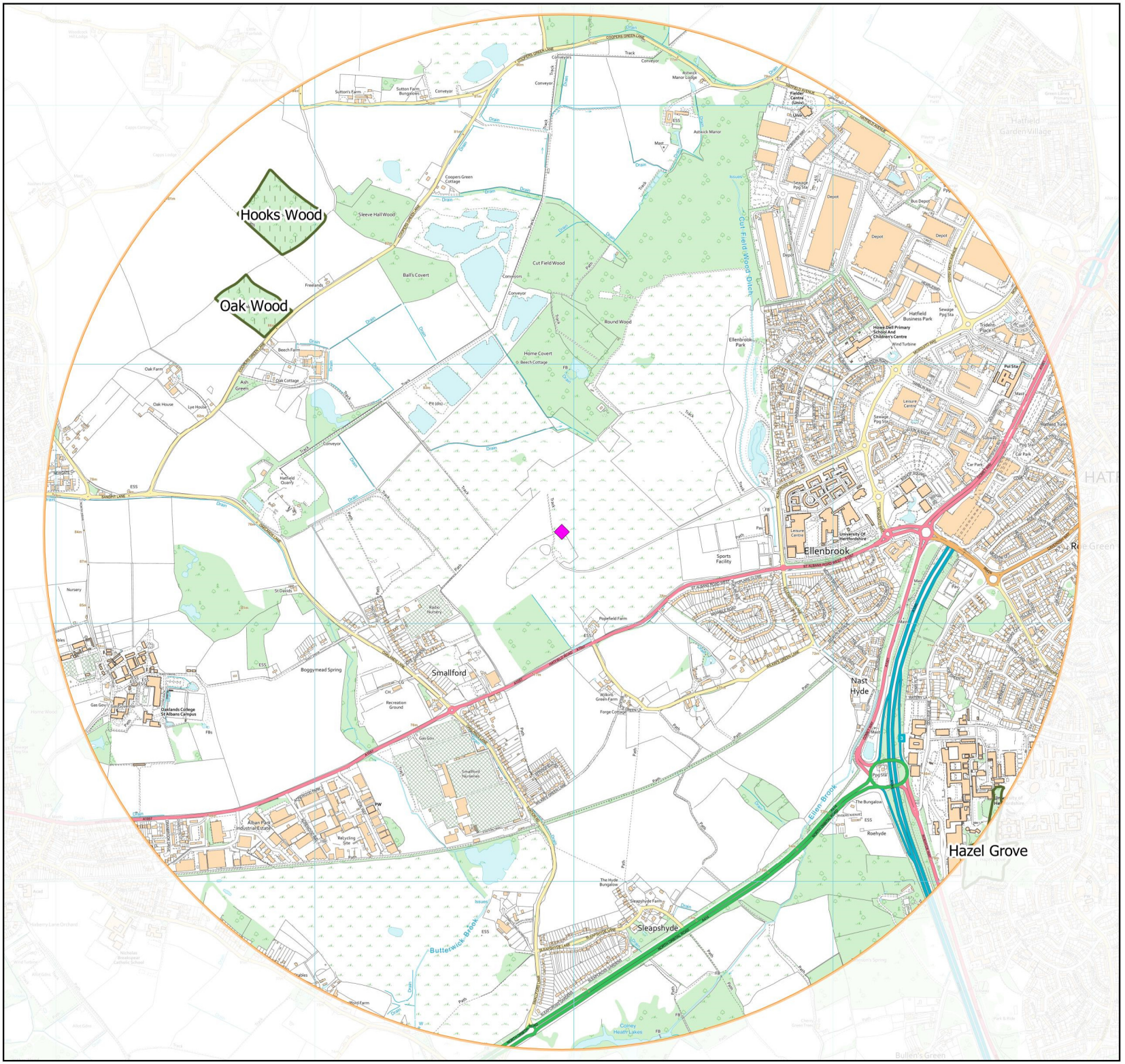
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HERC
Herts Environmental Records Centre

05/05/2021

National Sites Map 1



Search Information

- Search point
- Search area

National Sites

- Ancient Woodland Inventory

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HERC
Herts Environmental Records Centre

05/05/2021

Data Search Results 05/05/2021 HERC Ref: 202105_002

RAMSAR

Ramsar sites are designated under the Convention on Wetlands of International Importance especially as Waterfowl Habitat. Wetlands are designated, protected and promoted in order to stem the progressive encroachment on and loss of wetlands, which are broadly defined to include marsh, fen, peatland and water.

Special Areas of Conservation (SAC)

Special Areas of Conservation are sites designated by Member States under the EC Habitats Directive. The aim is to establish a European network of important high quality conservation sites that will make a significant contribution to conserving habitats and species considered to be most in need of conservation at a European level.

Special Protection Areas (SPA)

Special Protection Areas are designated under the EC Birds Directive, to conserve the habitat of certain rare or vulnerable birds and regularly occurring migratory birds. Any significant pollution or disturbance to or deterioration of these sites has to be avoided.

National Nature Reserves (NNR)

National Nature Reserves are statutory reserves established for the nation under the Wildlife and Countryside Act, 1981. NNRs may be owned by relevant national body (e.g. Natural England in England) or established by agreement; a few are owned and managed by non-statutory bodies. NNRs cover a selection of the most important sites for nature conservation in the UK.

Sites of Special Scientific Interest (SSSI)

Sites of Special Scientific Interest are areas notified under the Wildlife and Countryside Act, 1981, as being of 'special interest for nature conservation'. They represent the finest sites for wildlife and natural features in Great Britain supporting many characteristic, rare and endangered species, habitats and natural features. Notification as a SSSI is primarily a legal mechanism organised by Natural England and selected according to specific criteria. The *Guidelines for the Selection of Biological SSSIs*, published in 1989 by the Joint Nature Conservancy Council, set down the selection criteria for both biological and geological SSSIs.

Local Nature Reserves (LNR)

Land owned, leased or managed by Local Authorities and designated under the National Parks and Access to the Countryside Act. A site of some nature conservation value managed for educational objectives - no need for SSSI status. Some reserves are managed by a non-statutory body. Local authorities have the power to pass bylaws controlling (e.g.) access, special protection measures.

Statutory Sites

Site Name	Status	Grid Reference	Area (ha)	Distance (m)
None				

Ancient woodland

Ancient Woodland is land that has had a continuous woodland cover since at least 1600 AD and has only been cleared for underwood or timber production. It can be placed in two categories:

Ancient Semi-natural Woodland (ASNW) – woodland that retains a native tree and shrub cover that has not been planted, although it may have been managed by coppicing or felling and allowed to regenerate naturally. This covers all stands of ancient woodland which do not obviously originate from planting.

Ancient replanted Woodland (AWS - ancient woodland site or PAWS - plantation on ancient woodland site) – woodland where the original tree cover has been felled and replaced by planting, often with conifers and usually this century.

Ancient Woodland Inventory Sites

Site Name (where known)	Grid Reference	Category	Area (ha)	Distance (m)
Hazel Grove	TL216071	ASNW	3.21	1940
Hooks Wood	TL188095	ASNW	5.78	1500
Oak Wood	TL187092	ASNW	3.42	1350

Herts and Middlesex Wildlife Trust Nature Reserves

File Code	Site Name	Area (ha)	Distance (m)
None			

Local Wildlife Site / Wildlife Sites

Local Wildlife Sites are non-statutory sites designated at a county level as being of conservation importance and often recognised in Local authority development plans. The aim of this identification is to protect such sites from land management changes, which may lessen their nature conservation interest, and to encourage sensitive management to maintain and enhance their importance. Although WS have no statutory protection they need to be considered in the planning process through Planning Policy Guidance like PPG9 which refers to the Town & Country Planning Act 1990 Section 30. This states that nature conservation issues should be included in the surveys of local authority areas to ensure that the plans are based on fully adequate information about local species, habitats, geology and landform. Plans should be concerned not only with designated areas but also with other land of conservation value and the possible provision of new habitats.

Local Wildlife Sites

File Code	Site Name	Grid Reference	Area (ha)	Ratified	Description	Distance (m)
57/021	Furzefield Wood (near Hatfield)	TL201104	18.44	1997	Semi-natural old secondary broadleaved woodland with some interplanting with conifers and replanting with oak (Quercus sp.) in the south-east third of the wood. Probably a former wood pasture (some surviving pollarded oaks). The wood is mainly Pedunculate Oak (Quercus robur), Hornbeam (Carpinus betulus) and Silver Birch (Betula pendula) with Hazel (Corylus avellana) scrub and much invading Sycamore (Acer pseudoplatanus). The wood supports ancient woodland indicators including Bluebell (Hyacinthoides non-scripta), Dog's Mercury (Mercurialis perennis), Broad Buckler-fern (Dryopteris dilatata) and Foxglove (Digitalis purpurea. Herb-rich acidic grassy rides support species such as Heath Bedstraw (Galium saxatile), Upright Tormentil (Potentilla erecta), Bog Stitchwort (Stellaria alsine) and Trailing St. John's-wort (Hypericum humifusum). Regenerating Heather (Calluna vulgaris) and Gorse (Ulex europaeus) along with Rushes (Juncus spp.) and other species have been	1870

					recorded in the replanted area. A pond adds to the habitat diversity of the site. Wildlife Site criteria: Old secondary woodland with a semi-natural canopy and varied structure; >2 ha; shown on Bryant map (1822); woodland indicators.	
68/003	Smallford Pit	TL193068	61.35	1997	A largely infilled former gravel pit supporting well developed secondary grassland along with some former old acid/neutral grassland remnants. Additional habitats include numerous hollows supporting seasonal and more permanent areas of standing water, a pond and a fishing lake. A small brook also runs through the site. The majority of the grassland has developed naturally on the site and is rough and relatively species-poor. Perennial Rye-grass (Lolium perenne) occurs in the sward in places where attempts were made to restore the site. However, overall, a reasonably diverse grassland flora has been recorded, though many of these are ruderal species. Species recorded include Bird's-foot Trefoil (Lotus corniculatus), Lesser Stitchwort (Stellaria graminea), Meadow Buttercup (Ranunculus acris), Common Sorrel (Rumex acetosa), Germander Speedwell (Veronica chamaedrys) and Oxeye Daisy (Leucanthemum vulgare). Pyramidal Orchid (Anacamptis pyramidalis) and Bee Orchid (Ophrys apifera) have been recorded in the north of the site. Remnants of old undisturbed acid/neutral grassland survive to the perimeter of the site and support species such as Red Fescue (Festuca rubra), Common Bent (Agrostis capillaris), Common Sorrel, Agrimony (Agrimonia eupatoria), Meadow Buttercup, Common Knapweed (Centaurea nigra), Sheep's Sorrel (Rumex acetosella) and Lady's Bedstraw (Galium verum). Within the ephemeral/open water habitats a wide range of aquatic/wetland flora has been recorded, including several uncommon species, such as Fan-leaved Water Crowfoot (Ranunculus circinatus), Spiked Water-milfoil (Myriophyllum spicatum), Horned Pondweed (Zannichellia palustris), Lesser Bulrush (Typha angustifolia), Lesser Spearwort (Ranunculus flammula), Common Spike-rush (Eleocharis palustris) and Water-plantain	1150

					(Alisma plantago-aquatica). There is a good variety of self sown and planted trees and shrubs, particularly around the periphery of the site. The site is important for invertebrates, such as butterflies and dragonflies, birds, reptiles and also amphibians, with records for Great Crested Newts (Triturus cristatus). Wildlife Site criteria: Grassland indicators.	
68/006	Hook's Wood (Cooper's Green)	TL188095	5.79	1997	Ancient semi-natural Pedunculate Oak (Quercus robur)/Hornbeam (Carpinus betulus) woodland supporting old Hornbeam coppice with Pedunculate Oak (Quercus robur), Ash (Fraxinus excelsior) and Silver Birch (Betula pendula) as occasional standards. Some Pedunculate Oaks have been planted along the main ride and there are several large Cherry Plum (Prunus cerasifera) at the north end of the wood. The ground flora is dominated by Bluebell (Hyacinthoides non-scripta) and Dog's Mercury (Mercurialis perennis) with few other species recorded. A ditch plus a Hornbeam and Hawthorn (Crataegus monogyna) hedge is present to part of the wood boundary. Wildlife Site criteria: Ancient Woodland Inventory site: woodland indicators.	1500
68/007	Oak Wood (near Beech Farm)	TL187092	3.41	1997	Ancient semi-natural Pedunculate Oak (Quercus robur)/Hornbeam (Carpinus betulus) woodland comprising Hornbeam coppice with Pedunculate Oak, Ash (Fraxinus excelsior) and Silver Birch (Betula pendula) standards. Some Wych Elm (Ulmus glabra) coppice is present at the northern end. The ground flora supports woodland indicators and is dominated by Bluebell (Hyacinthoides non-scripta) and Dog's Mercury (Mercurialis perennis). Other species recorded include Yellow Archangel (Lamiastrum galeobdolon), Wood Meadow-grass (Poa nemoralis) and Wood Sedge (Carex sylvatica). The margin is partly bordered by ditches and hedges, partly of coppiced Hornbeam and Hawthorn (Crataegus monogyna). Wildlife Site criteria: Ancient Woodland Inventory site; woodland indicators.	1340
68/009	Home Covert & Round Wood	TL199090	13.55	1997	Two areas of ancient semi-natural broadleaved woodland. Home Covert is predominantly Pedunculate Oak (Quercus robur) and Ash (Fraxinus	390

					excelsior) with remnant Hazel (Corylus avellana) coppice with some old Hornbeam (Carpinus betulus), including pollards, around the woodland edge. Sycamore (Acer pseudoplatanus) is frequent and Pedunculate Oak has been planted. Other canopy species include Betula pendula, Field Maple (Acer campestre) and rare Beech (Fagus sylvatica). The ground flora supports woodland indicators such as Bluebell (Hyacinthoides non-scripta), Dog's Mercury (Mercurialis perennis), Yellow Archangel (Lamiastrum galeobdolon) and Common Dog-violet (Viola riviniana) along with a good fern flora of Broad Buckler-fern (Dryopteris dilatata) and Male Fern (Dryopteris filix-mas). Round Wood is primarily a Hornbeam coppice with some Ash and Silver Birch standards and an occasional Holly (Ilex aquifolium) with Bluebell below. The bank along the eastern margin supports old coppiced Hornbeam, and Pedunculate Oak and Field Maple also occur at the woodland edge. Wildlife Site criteria: Ancient Woodland Inventory site; woodland indicators.	
68/014	Woodland by House Lane	TL179087	0.30	1997	Small fragment of ancient Hornbeam (Carpinus betulus) coppiced woodland supporting a ground flora which includes Bluebell (Hyacinthoides non-scripta), Dog's Mercury (Mercurialis perennis), Pignut (Conopodium majus) and Wood Meadow-grass (Poa nemoralis). There is an old wood bank and a hedge along the eastern edge. Wildlife Site criteria: Ancient woodland with some semi-natural canopy and field evidence suggesting an ancient origin; shown on Bryant map (1822); woodland indicators.	1970
68/015	Oaklands Gravel Pit	TL185081	7.68	1997	Former gravel workings supporting a diverse habitat of grassland, small flooded pits, scrub and wet land. The grassland areas support a diverse flora with records for species such as Bird’s-foot Trefoil (Lotus corniculatus), Common Knapweed (Centaurea nigra), Agrimony (Agrimonia eupatoria), Oxeye Daisy (Leucanthemum vulgare), Meadow Vetchling (Lathyrus pratensis), Common Sorrel (Rumex acetosa) and Grass Vetchling (Lathyrus nissolia). Southern Marsh Orchid and Common	1180

					Spotted Orchid, and hybrids between the two species, have been recorded. The grassland is becoming invaded with scrub. There are three deep ponds on uneven ground in the north surrounded by patches of rough grass, willow scrub and tall herbs. To the south there is an area of scrub and developing secondary woodland with a large pond in the south-west corner. Woody species present include Hawthorn (Crataegus monogyna), Blackthorn (Prunus spinosa), Elder (Sambucus nigra), Pedunculate Oak (Quercus robur), Silver Birch (Betula pendula) and in the damper parts willows (Salix spp.) A variety of dragonflies and amphibians have been noted on the site. Wildlife Site criteria: Grassland indicators.	
68/034	Sleeve Hall Wood	TL192095	4.88	2000	Broadleaved woodland with some characteristics of an ancient semi-natural Pedunculate Oak (Quercus robur)/Hornbeam (Carpinus betulus) woodland. Sycamore is dominant and some old conifer planting is present, mainly to the north of the wood, of Scots Pine (Pinus sylvestris) and European Larch (Larix decidua). The shrub layer of Holly (Ilex aquifolium) and Elder (Sambucus nigra) is sparse. Bramble (Rubus fruticosus agg.) is dominant on the ground though the ground flora supports a number of indicator species including much Bluebell (Hyacinthoides non-scripta) and other species such as Pignut (Conopodium majus), Yellow Archangel (Lamiastrum galeobdolon), Enchanter's Nightshade (Circaea lutetiana) and Common Dog-violet (Viola riviniana). The wood is partly surrounded by ditches and hedge banks with many old coppiced Hornbeams and a number of large Pedunculate Oaks. An internal remnant bank is present at the west end of the wood. Wildlife Site criteria: Old secondary woodland with a semi-natural canopy and varied structure; >2 ha; woodland indicator.	1280
68/037	Land near Smallford Nurseries	TL193072	5.49	2005	Area of semi-improved neutral grassland with scattered willow dominated scrub and a small remnant of Pedunculate Oak (Quercus robur)/Hornbeam (Carpinus betulus) coppiced woodland in the west. The trees present in the woodland, apart from Pedunculate Oak and Hornbeam, include Silver	1110

					Birch (Betula pendula), Ash (Fraxinus excelsior) and Cherry. There is an old ditch and bank along the eastern edge of the wood with a remnant Hornbeam and Hazel (Corylus avellana) hedge. A further small wooded area to the east is dominated by Wild Cherry. The grassland is moderately herb rich with species recorded such as Bird's-foot Trefoil (Lotus corniculatus), Common Sorrel (Rumex acetosa), Tufted Vetch (Vicia cracca), Common Knapweed (Centaurea nigra), Meadow Buttercup (Ranunculus acris), Red Clover (Trifolium pratensis), Meadow Vetchling (Lathyrus pratensis), Agrimony (Agrimonia eupatoria), Lady's Bedstraw (Galium verum) and Oxeye Daisy (Leucanthemum vulgare). There is a partially scrub lined stream (Boggymead Spring) along the eastern boundary, part of which widens into a pond, that supports some aquatic flora. Wildlife Site criteria: Grassland indicators.	
68/044	Smallford Trail/Alban Way	TL177069	8.82	1997	Dismantled railway route used as a public path/bridleway. The site is predominantly lined with secondary broadleaved woodland and scrub, including some very old coppiced specimens, with remnant areas of grass and tall herbs, mainly along the edges of the path in the east. Mature Pedunculate Oak (Quercus robur) is dominant with frequent Ash (Fraxinus excelsior) and Sycamore (Acer pseudoplatanus) plus some Field Maple (Acer campestre) and Silver Birch (Betula pendula) along with frequent shrubs including Hawthorn (Crataegus monogyna), Hazel (Corylus avellana), Blackthorn (Prunus spinosa), Dogwood (Cornus sanguinea) and Elder (Sambucus nigra). The ground flora is locally dominated by Ivy (Hedera helix) but supports numerous woodland indicators including Bluebell (Hyacinthoides non-scripta), Dog's Mercury (Mercurialis perennis), Wood Melick (Melica uniflora), Wood Sedge (Carex sylvatica), Wood Anemone (Anemone nemorosa), Yellow Archangel (Lamiastrum galeobdolon) and Pignut (Conopodium majus). The areas of rough unimproved grassland and taller herbs support a moderately diverse community including several grassland indicators such as Oxeye Daisy	1120

					(Leucanthemum vulgare), Common Knapweed (Centaurea nigra) and Bird's-foot Trefoil (Lotus corniculatus). Wildlife Site criteria: Old secondary woodland with a semi-natural canopy and varied structure; >2 ha; woodland indicators; grassland indicators.	
68/056	Oaklands Wood	TL187079	1.88	1997	Old, possibly ancient broadleaf woodland. The north of the wood is typically coppiced Hornbeam (Carpinus betulus) and a carpet of Bluebell (Hyacinthoides non-scripta) with additional Pedunculate Oak (Quercus robur) and Hazel (Corylus avellana) to the north-west side. The southern, main component of the wood is more mixed, and part planted, with a high canopy of Pedunculate Oak plus some Ash (Fraxinus excelsior), Silver Birch (Betula pendula) and rare Wych Elm (Ulmus glabra). Below there is a shrub layer of Hazel (Corylus avellana) and Elder (Sambucus nigra) with Bramble (Rubus fruticosus agg.) and Bluebell on the ground. An old bank with Hawthorn (Crataegus monogyna) along the northern edge and a pond with some aquatic vegetation add to the habitat diversity. Wildlife Site criteria: Old/ancient woodland with some semi-natural canopy and field evidence suggesting an ancient origin; >1 ha.	1130
69/003	Sleapshyde Gravel Pit	TL202064	24.27	1997	Former gravel pit restored to an amenity/wildlife park. The area supports a mosaic of habitats with open water, wet neutral grassland, tall herbs, scattered scrub and plantation. Species recorded in the grassland include Common Knapweed (Centaurea nigra), Red Fescue (Festuca rubra), Meadow Buttercup (Ranunculus acris), Bulbous Buttercup (Ranunculus bulbosus), Common Sorrel (Rumex acetosa), Common Spotted-orchid (Dactylorhiza fuchsii) and Oxeye Daisy (Leucanthemum vulgare). A flooded pit and connecting stream support bank side trees and scrub, including Hawthorn (Crataegus monogyna), Goat Willow (Salix caprea) and White Willow (Salix alba). Species such as Remote Sedge (Carex remota), Lesser Pond-sedge (Carex acutiformis), Meadowsweet (Filipendula ulmaria), Gypsywort (Lycopus europaeus), Water Mint (Mentha aquatica) and Yellow Water-lily (Nuphar lutea) have been recorded along the margins	1690

					and in the open water. The site has ornithological interest and a good diversity of dragonflies has been noted. Wildlife Site criteria: Grassland indicators; fen and swamp indicators.	
69/013	Hazel Grove	TL216070	6.04	1997	Ancient semi-natural Pedunculate Oak (Quercus robur)/Hornbeam (Carpinus betulus) woodland supporting mainly Pedunculate Oak standards and old Hornbeam coppice with some Wild Cherry (Prunus avium), Ash (Fraxinus excelsior), Beech (Fagus sylvatica) and Sycamore (Acer pseudoplatanus). The shrub layer is generally sparse. The ground vegetation in the wood is predominantly Bluebell (Hyacinthoides non-scripta) and Bramble (Rubus fruticosus agg.) with additional indicator species such as Yellow Archangel (Lamiastrum galeobdolon), Wood Anemone (Anemone nemorosa), Pignut (Conopodium majus) and Wood Meadow-grass (Poa nemoralis). Remnant boundary hedge banks and ditches with some Hornbeam are present. Wildlife Site criteria: Ancient Woodland Inventory site; woodland indicators.	1900
69/022	Copse at Nast Hyde	TL207073	2.54	1997	Ancient semi-natural woodland remnants partly surrounded by more old secondary woodland and broadleaved plantation. The ancient woodland areas support Pedunculate Oak (Quercus robur) and Hornbeam (Carpinus betulus) coppice with some coppiced Hazel (Corylus avellana) and Field Maple (Acer campestre). The ground flora is dominated by Bluebell (Hyacinthoides non-scripta) and Bramble (Rubus fruticosus agg.).They are surrounded by old woodbanks with some laid Hornbeam. The ancient compartments are partly encompasses by secondary, predominantly scrubby Pedunculate Oak, woodland with a patchy shrub layer of mainly Hawthorn (Crataegus monogyna) and Elder (Sambucus nigra) and Bramble (Rubus fruticosus agg.) dominant on the ground. A boundary bank and ditch encloses the whole site. The wood supports a varied structure for a small site. Wildlife Site criteria: Part ancient woodland part old secondary wood with a semi-natural canopy and varied structure and field evidence	1180

					suggesting an ancient origin; shown on Bryant's map (1822); woodland indicators.	
69/050	Sleapshyde Farm	TL203069	0.00	2000	Buildings and environs important for protected species. Wildlife Site criteria: Species.	1360

Regionally Important Geological / Geomorphological Site (RIGS)

Regionally Important Geological/Geomorphological Sites are non-statutory earth science sites. The RIGS networks are locally based voluntary groups drawing on both professional and interest groups identifying sites using a methodical and rational approach. RIGS are analogous to non-statutory biological sites - they are not a second tier but sites of regional or local importance in their own right.

RIGS

File Code	Site Name	Grid Reference	Area (ha)	Distance (m)
None				

Veteran & Mature Trees from HERC database

Record No	Survey Date	Tree Species	Girth (cm)	Site Name	Site Address	Context	Eastings	Northings	Distance (m)
1416	2002/03/09	Peduncula te oak	640	Symondshyde Fm	Hatfield	HR, Hedgerow	520750	210100	1920
304	2000/03/15	Oak species	410	Green Lanes	Fielder Centre, Hatfield	HR, Hedgerow	520700	210100	1900
307	2000/02/15	Oak species	401	Hazel Grove	University of Herts, Hatfield Campus	WL, Woodland	521500	207100	2000

DigitiseID	HabCatNow	HabDescNow	HabTypeNow	ActionReq	TargetHab	HabNet	CoreFocus	Area (ha)
D14442	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Chalk grassland/Neutral grassland/B-l woodland	None	0.210593626
D14461	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	B-l woodland	Acidic	0.222264695
D14462	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	0.013678188
D14469	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Chalk grassland/Neutral grassland/B-l woodland	Acidic	0.027003296
D14470	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Neutral grassland	Acidic	0.146507923
D14535	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Wetland/B-l woodland	Acidic	0.312556693
D14657	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Neutral grassland	Acidic	0.075892107
D28871	3b	No known habitats present (medium priority for habitat creation)	Improved grassland	Create	Acidic open	None	Acidic	0.031243093
D28879	3b	No known habitats present (medium priority for habitat creation)	Other habitat	Create	Acidic open	None	Acidic	0.707368136
D28884	3a	No known habitats present (high priority for habitat creation)	Built-up areas	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.006200719
D14530	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Wetland/B-l woodland	Acidic	2.63928953
D14531	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Wetland/B-l woodland	Acidic	2.453760338
D14529	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Wetland/B-l woodland	Acidic	0.445232817
D14528	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Wetland/B-l woodland	Acidic	0.120833146
D14681	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	0.297827784
D14680	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	1.283499769
D14701	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	0.457308431
D12677	2	Existing habitat not currently qualifying under S41 NERC Act	Poor semi-improved grassland	Restore	Acidic open/Neutral grassland	B-l woodland	Acidic	0.476652157
D14659	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Neutral grassland	Acidic	0.094467762
D14532	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Wetland/B-l woodland	Acidic	1.52282138
D14533	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Wetland/B-l woodland	Acidic	1.324753659
D14567	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Neutral grassland/B-l woodland	Acidic	0.191189138
D14649	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	None	Acidic	0.212492052
D14648	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	None	Acidic	0.104151428
M00014	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	2.230994455
D14688	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	None	Acidic	0.136490885
M00034	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	0.07783468
D14435	2	Existing habitat not currently qualifying under S41 NERC Act	Scrub - dense/continuous	Restore	Acidic open/B-l woodland	Neutral grassland/Wetland/B-l woodland	Acidic	0.085329232
D14436	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Neutral grassland/Wetland/B-l woodland	Acidic	0.728395098
D14538	2	Existing habitat not currently qualifying under S41 NERC Act	Poor semi-improved grassland	Restore	Acidic open/Neutral grassland	Neutral grassland/Wetland/B-l woodland	Acidic	35.36099197
D14540	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland/Wetland/B-l woodland	Acidic	88.24880533
D14565	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Acidic open/Neutral grassland/B-l woodland	Acidic/Wetland	4.248399767
D14624	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Neutral grassland/B-l woodland	Acidic	0.078796869
D14568	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Neutral grassland/B-l woodland	Acidic	0.298066151
D14635	2	Existing habitat not currently qualifying under S41 NERC Act	Scrub - dense/continuous	Restore	Acidic open/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.979911328
D14622	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Neutral grassland/B-l woodland	Acidic	2.36297176
D14695	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	4.271380185
D14440	3c	No known habitats present (lower priority for habitat creation)	Other tall herb and fern - ruderal	Create	Any appropriate S41 NERC Act habitat	None	None	0.369092496
D14440	3a	No known habitats present (high priority for habitat creation)	Other tall herb and fern - ruderal	Create	B-l woodland	B-l woodland	None	0.063823577
D14646	3b	No known habitats present (medium priority for habitat creation)	Other tall herb and fern - ruderal	Create	Acidic open	None	Acidic	0.164282292
D14646	3a	No known habitats present (high priority for habitat creation)	Other tall herb and fern - ruderal	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.047858643
D28877	3a	No known habitats present (high priority for habitat creation)	Bare ground	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.21950671
D12578	3a	No known habitats present (high priority for habitat creation)	Other tall herb and fern - ruderal	Create	Acidic open/B-l woodland	B-l woodland	Acidic	0.13798507
D12578	3a	No known habitats present (high priority for habitat creation)	Other tall herb and fern - ruderal	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.034750533
D14471	3a	No known habitats present (high priority for habitat creation)	Scrub - scattered	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.475943093
D14471	3a	No known habitats present (high priority for habitat creation)	Scrub - scattered	Create	Acidic open/Neutral grassland/Wetland	Neutral grassland	Acidic/Wetland	0.056595925
D28876	3a	No known habitats present (high priority for habitat creation)	Other habitat	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.078758887
D28876	3a	No known habitats present (high priority for habitat creation)	Other habitat	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.149347653
M00298	3a	No known habitats present (high priority for habitat creation)	None	Create	B-l woodland	B-l woodland	None	3.379043419
M00299	3a	No known habitats present (high priority for habitat creation)	None	Create	B-l woodland	B-l woodland	None	53.6632482
M01499	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	52.43409926
M01508	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	1117.986844
M01517	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	695.1052766
D12510	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	B-l woodland	Acidic	0.021988326
M01635	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	0.199010905
M01636	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.142597007
M01650	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	0.163612922
M01651	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.112923638
M02106	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	7.827659198
M02107	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Wetland/B-l woodland	B-l woodland	Acidic/Wetland	0.972149793
M02108	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Wetland/B-l woodland	B-l woodland	Acidic/Wetland	1.474850174
D14551	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Neutral grassland	Acidic/Wetland	0.480271805
M02180	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland	Neutral grassland	Acidic/Wetland	13.99187595
M02625	3a	No known habitats present (high priority for habitat creation)	None	Create	Wetland/B-l woodland	Wetland/B-l woodland	None	0.095396816
M03179	3a	No known habitats present (high priority for habitat creation)	None	Create	Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	None	6.611189036
D14445	2	Existing habitat not currently qualifying under S41 NERC Act	Bracken - continuous	Restore	Acidic open/Neutral grassland	Neutral grassland/B-l woodland	None	0.071984917
M03183	3a	No known habitats present (high priority for habitat creation)	None	Create	Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	None	0.36487643
M03184	3a	No known habitats present (high priority for habitat creation)	None	Create	Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	None	0.080021095
M03895	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	79.73073806
M03896	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Chalk grassland/Neutral grassland	Chalk grassland/Neutral grassland	Acidic	0.833833796
M04014	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	Acidic open/B-l woodland	Acidic	28.28855282
M04310	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Wetland/B-l woodland	Wetland/B-l woodland	Acidic	2.129656147
D14534	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Neutral grassland/Wetland/B-l woodland	Acidic	13.03259878
M04316	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Wetland/B-l woodland	Wetland/B-l woodland	Acidic	5.055738718
M04505	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	0.203408788

M04506	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.332238172
M04507	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	2.506561349
M04762	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.477495176
M04763	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.259208121
M04764	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.069224368
M04813	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.105791586
M04944	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	0.223609854
M04945	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.294522224
M04946	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	2.073458842
M04947	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	1.055969584
D14630	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland/Wetland	Neutral grassland/B-l woodland	Acidic/Wetland	16.9769095
M04948	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.166259815
M04949	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland	Acidic open/Neutral grassland	Acidic	0.308893408
M04950	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.115691657
M05687	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland/B-l woodland	Neutral grassland/B-l woodland	Acidic/Wetland	0.330537221
M05688	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland/B-l woodland	Neutral grassland/B-l woodland	Acidic/Wetland	1.101787295
M05689	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland/B-l woodland	Neutral grassland/B-l woodland	Acidic/Wetland	0.265413065
D14625	2	Existing habitat not currently qualifying under S41 NERC Act	Scrub - dense/continuous	Restore	Acidic open/Wetland/B-l woodland	Acidic open/Neutral grassland/B-l woodland	Acidic/Wetland	2.406138376
M05690	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland/B-l woodland	Neutral grassland/B-l woodland	Acidic/Wetland	1.473356268
D14443	1	Existing S41 NERC Act habitat	Neutral grassland - unimproved	Maintain and enhance	Neutral grassland - unimproved	Chalk grassland/Neutral grassland/B-l woodland	None	0.827387805
M05884	3a	No known habitats present (high priority for habitat creation)	None	Create	Chalk grassland/Neutral grassland/B-l woodland	Chalk grassland/Neutral grassland/B-l woodland	None	1.899585959
M06225	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Acidic open/Neutral grassland/B-l woodland	Acidic	0.416513165
M07489	3b	No known habitats present (medium priority for habitat creation)	None	Create	Acidic open	None	Acidic	377.108704
M07499	3b	No known habitats present (medium priority for habitat creation)	None	Create	Acidic open	None	Acidic	10.38563387
M07500	3b	No known habitats present (medium priority for habitat creation)	None	Create	Acidic open	None	Acidic	0.352295517
M07513	3b	No known habitats present (medium priority for habitat creation)	None	Create	Acidic open	None	Acidic	982.1258197
M07514	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	0.878992713
M07515	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	0.795268212
M07516	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	0.137895986
M07517	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	0.849781612
M07750	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland	Neutral grassland	Acidic/Wetland	0.343053009
M07751	3b	No known habitats present (medium priority for habitat creation)	None	Create	Acidic open/Wetland	None	Acidic/Wetland	11.68040174
M07755	3b	No known habitats present (medium priority for habitat creation)	None	Create	Acidic open/Wetland	None	Acidic/Wetland	0.505493603
M07757	3b	No known habitats present (medium priority for habitat creation)	None	Create	Acidic open/Wetland	None	Acidic/Wetland	1.159683579
M07981	3c	No known habitats present (lower priority for habitat creation)	None	Create	Any appropriate S41 NERC Act habitat	None	None	2.04467026
M07982	3b	No known habitats present (medium priority for habitat creation)	None	Create	Acidic open	None	Acidic	1.981228377
M07993	3c	No known habitats present (lower priority for habitat creation)	None	Create	Any appropriate S41 NERC Act habitat	None	None	669.7089614
D12508	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Acidic open/B-l woodland	Acidic	0.622663043
D12509	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Acidic open/B-l woodland	Acidic	0.309536383
D12515	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Acidic open/B-l woodland	Acidic	17.02036971
D12520	2	Existing habitat not currently qualifying under S41 NERC Act	Poor semi-improved grassland	Restore	Acidic open/Neutral grassland	Neutral grassland/B-l woodland	Acidic	30.38038318
D12577	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland/B-l woodland	Acidic	2.102168956
D14426	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Neutral grassland	None	None	0.051520064
D14427	2	Existing habitat not currently qualifying under S41 NERC Act	Scrub - dense/continuous	Restore	B-l woodland	None	None	0.051961965
M09220	3a	No known habitats present (high priority for habitat creation)	None	Create	Neutral grassland	Neutral grassland	None	0.12127503
D14428	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Neutral grassland	Neutral grassland	None	0.282921404
D14433	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Neutral grassland/Wetland/B-l woodland	Acidic	2.0801208
D14434	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland/Wetland/B-l woodland	Acidic	0.510604311
D14437	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Neutral grassland/Wetland/B-l woodland	None	0.271934038
D14438	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Neutral grassland/Wetland	Neutral grassland/Wetland/B-l woodland	None	0.34340053
D14439	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Neutral grassland	Neutral grassland/B-l woodland	None	0.477378802
D14441	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Chalk grassland/Neutral grassland/B-l woodland	None	3.908410035
D14444	1	Existing S41 NERC Act habitat	Neutral grassland - unimproved	Maintain and enhance	Neutral grassland - unimproved	Chalk grassland/Neutral grassland/B-l woodland	None	0.1097103
D14446	2	Existing habitat not currently qualifying under S41 NERC Act	Scrub - dense/continuous	Restore	Chalk grassland/Neutral grassland/B-l woodland	Chalk grassland/Neutral grassland/B-l woodland	None	2.439954427
D14447	1	Existing S41 NERC Act habitat	Neutral grassland - unimproved	Maintain and enhance	Neutral grassland - unimproved	Chalk grassland/Neutral grassland/B-l woodland	None	0.526316004
D14448	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Chalk grassland/Neutral grassland/B-l woodland	Acidic	2.020865493
D14449	2	Existing habitat not currently qualifying under S41 NERC Act	Mixed woodland - plantation	Restore	Acidic open/B-l woodland	B-l woodland	Acidic	0.886758336
D14459	2	Existing habitat not currently qualifying under S41 NERC Act	Poor semi-improved grassland	Restore	Acidic open/Neutral grassland	Neutral grassland/B-l woodland	Acidic	5.084969148
D14460	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Neutral grassland/B-l woodland	Acidic	1.064240419
D14463	1	Existing S41 NERC Act habitat	Broadleaved Parkland/scattered trees	Maintain and enhance	Broadleaved Parkland/scattered trees	Neutral grassland/B-l woodland	Acidic	0.105418057
D14464	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland/B-l woodland	Acidic	2.596028613
D14472	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Neutral grassland/Wetland/B-l woodland	Acidic/Wetland	1.87008058
D14466	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland/Wetland	Neutral grassland/Wetland/B-l woodland	Acidic/Wetland	3.814225193
D14467	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland/Wetland	Chalk grassland/Neutral grassland/Wetland/B-l woodland	Acidic/Wetland	55.56650393
D14468	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Chalk grassland/Neutral grassland/B-l woodland	Acidic	1.07850334
M09221	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland	Neutral grassland	Acidic/Wetland	0.111922534
D14473	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Neutral grassland/Wetland/B-l woodland	Acidic/Wetland	1.350979873
M09222	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Wetland/B-l woodland	Wetland/B-l woodland	Acidic	0.503761453
D14525	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Wetland/B-l woodland	Acidic	0.369482165
D14537	3a	No known habitats present (high priority for habitat creation)	Other habitat	Create	Acidic open/Wetland/B-l woodland	Wetland/B-l woodland	Acidic	7.486229866
D14526	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Wetland/B-l woodland	Acidic	1.105732531
D14527	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Wetland/B-l woodland	Acidic	2.997030259
D14537	3a	No known habitats present (high priority for habitat creation)	Other habitat	Create	Acidic open/B-l woodland	B-l woodland	Acidic	2.922229755
D14536	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Wetland/B-l woodland	Acidic	7.505078612
D14539	2	Existing habitat not currently qualifying under S41 NERC Act	Poor semi-improved grassland	Restore	Acidic open/Neutral grassland	Neutral grassland	Acidic	14.22018518
D14541	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland/B-l woodland	Acidic	0.568892998
D14542	2	Existing habitat not currently qualifying under S41 NERC Act	Mixed woodland - plantation	Restore	Acidic open/Wetland/B-l woodland	Neutral grassland/B-l woodland	Acidic/Wetland	2.394375837
D14543	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland/Wetland	Neutral grassland/B-l woodland	Acidic/Wetland	4.312919737
D14544	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Neutral grassland/B-l woodland	Acidic/Wetland	0.763033865

D14546	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Neutral grassland/B-l woodland	Acidic	0.011633643
D14564	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Acidic open/Neutral grassland/B-l woodland	Acidic/Wetland	4.435032685
D14623	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland/Wetland	Acidic open/Neutral grassland/B-l woodland	Acidic/Wetland	6.317375729
D14626	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland/Wetland	Acidic open/Neutral grassland/B-l woodland	Acidic/Wetland	1.633093362
D14627	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland/Wetland	Acidic open/Neutral grassland/B-l woodland	Acidic/Wetland	3.917277711
D14628	2	Existing habitat not currently qualifying under S41 NERC Act	Scrub - dense/continuous	Restore	Acidic open/Wetland/B-l woodland	Neutral grassland/B-l woodland	Acidic/Wetland	0.187325714
D14629	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Neutral grassland/B-l woodland	Acidic/Wetland	0.719230407
M09224	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Wetland/B-l woodland	B-l woodland	Acidic/Wetland	1.770166405
D14631	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Neutral grassland/B-l woodland	Acidic/Wetland	0.703355041
D14632	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Acidic open/Neutral grassland/B-l woodland	Acidic	0.154944582
D14634	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Neutral grassland/B-l woodland	Acidic/Wetland	0.425371504
D14637	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland/B-l woodland	Acidic	0.181264248
D14638	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Neutral grassland/B-l woodland	Acidic/Wetland	2.533972694
D14639	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland/Wetland	Neutral grassland/B-l woodland	Acidic/Wetland	1.433259536
D14641	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Neutral grassland/B-l woodland	Acidic/Wetland	0.305502824
D14642	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland/Wetland	Neutral grassland/B-l woodland	Acidic/Wetland	1.74529908
M09225	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.103970877
D14643	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland	Acidic	1.346036515
D14645	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland	Acidic	2.114309199
D14650	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland	Acidic	1.779428658
M09226	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	2.149205526
D14651	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Neutral grassland	Acidic	0.223396525
D14652	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Neutral grassland	Acidic	0.453174067
D14656	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland/B-l woodland	Acidic	3.163737385
D14658	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Neutral grassland	Acidic	0.097610968
D14660	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland/B-l woodland	Acidic	0.62912057
D14661	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Neutral grassland/B-l woodland	Acidic	0.891567497
M09227	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	0.636649374
D14676	2	Existing habitat not currently qualifying under S41 NERC Act	Scrub - dense/continuous	Restore	Acidic open/B-l woodland	B-l woodland	Acidic	0.673964455
D14677	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Neutral grassland/B-l woodland	Acidic	1.376050515
D14678	2	Existing habitat not currently qualifying under S41 NERC Act	Scrub - dense/continuous	Restore	Acidic open/B-l woodland	B-l woodland	Acidic	0.406164676
D14679	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic/Wetland	0.546600445
D14682	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland	Acidic	2.24577233
M09228	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.443188795
D14683	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland/Wetland	Neutral grassland	Acidic/Wetland	0.307363747
D14693	2	Existing habitat not currently qualifying under S41 NERC Act	Coniferous woodland - plantation	Restore	Acidic open/B-l woodland	Neutral grassland/B-l woodland	Acidic	1.339031979
D14694	2	Existing habitat not currently qualifying under S41 NERC Act	Mixed woodland - plantation	Restore	Acidic open/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.819577243
D14704	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Neutral grassland/B-l woodland	Acidic	0.009183406
D14702	2	Existing habitat not currently qualifying under S41 NERC Act	Mixed woodland - plantation	Restore	Acidic open/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.594295002
D14703	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland/B-l woodland	Acidic	3.222327318
M10216	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	0.751954105
D14644	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.884260903
M10316	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	1.793936015
D14647	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Neutral grassland	Acidic	0.021378604
M10327	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	71.01711687
D14633	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Neutral grassland/B-l woodland	Acidic/Wetland	0.141989237
D14566	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	Neutral grassland/B-l woodland	Acidic	0.104651689
M10328	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland/B-l woodland	Neutral grassland/B-l woodland	Acidic/Wetland	0.112414243
M10499	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland	Neutral grassland	Acidic/Wetland	3.376377137
D14563	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland/Wetland	Neutral grassland/B-l woodland	Acidic/Wetland	9.676433432
M10500	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland	Neutral grassland	Acidic/Wetland	0.083608194
M10653	3a	No known habitats present (high priority for habitat creation)	None	Create	Wetland/B-l woodland	Wetland/B-l woodland	None	0.281185283
M11137	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland	Neutral grassland/Wetland	Acidic	0.130041622
M11181	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.102724261
M11182	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.165756292
M11183	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.941142772
M11184	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	1.759312885
M11238	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.3285488
M11266	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	0.532745402
M11267	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	1.26182193
M11268	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	19.30574081
M11269	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	5.103495007
M11448	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland	Neutral grassland/Wetland	Acidic/Wetland	0.217588393
M11461	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland/B-l woodland	Neutral grassland/B-l woodland	Acidic/Wetland	0.492326586
M11463	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland/B-l woodland	Neutral grassland/B-l woodland	Acidic/Wetland	0.719167506
M11464	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland/B-l woodland	Neutral grassland/B-l woodland	Acidic/Wetland	0.391954058
M11465	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland/B-l woodland	Neutral grassland/B-l woodland	Acidic/Wetland	0.322268607
M11541	3a	No known habitats present (high priority for habitat creation)	None	Create	Neutral grassland/Wetland/B-l woodland	Neutral grassland/Wetland/B-l woodland	None	0.068494327
M11599	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Chalk grassland/Neutral grassland/B-l woodland	Chalk grassland/Neutral grassland/B-l woodland	Acidic	0.502734071
M11706	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland/B-l woodland	Neutral grassland/Wetland/B-l woodland	Acidic/Wetland	0.134595495
M11707	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/Wetland/B-l woodland	Neutral grassland/Wetland/B-l woodland	Acidic/Wetland	0.158640038
D14691	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	B-l woodland	Acidic	0.892015655
D14690	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	B-l woodland	Acidic	0.100516199
M11965	3b	No known habitats present (medium priority for habitat creation)	None	Create	Acidic open	None	Acidic	1593.457008
M11968	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.33656847
D14692	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	0.25626951
D14697	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	0.112205983
D14698	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	0.43912623
D14699	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	0.323533447

D12511	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	B-l woodland	Acidic	0.040859588
D12519	2	Existing habitat not currently qualifying under S41 NERC Act	Poor semi-improved grassland	Restore	Acidic open/Neutral grassland	B-l woodland	Acidic	0.168010918
D12512	2	Existing habitat not currently qualifying under S41 NERC Act	Mixed woodland - plantation	Restore	Acidic open/B-l woodland	B-l woodland	Acidic	0.098511906
D14666	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	0.246656703
D14662	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	B-l woodland	Acidic	0.035948426
D14663	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	B-l woodland	Acidic	0.029708153
D14664	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	B-l woodland	Acidic	0.0204982
D14665	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	B-l woodland	Acidic	0.023052314
D14524	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	4.858077039
D14417	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	5.805495849
D14414	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	3.402196448
D14422	2	Existing habitat not currently qualifying under S41 NERC Act	Poor semi-improved grassland	Restore	Acidic open/Neutral grassland	B-l woodland	Acidic	0.823856628
D14423	2	Existing habitat not currently qualifying under S41 NERC Act	Poor semi-improved grassland	Restore	Acidic open/Neutral grassland	B-l woodland	Acidic	0.949486258
D14432	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	B-l woodland	Acidic	0.613345391
D14465	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	Neutral grassland	Acidic	0.253697309
D14640	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	B-l woodland	Acidic/Wetland	0.032265105
D12574	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	Wetland/B-l woodland	Acidic	1.387967711
M12266	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/Neutral grassland/B-l woodland	Neutral grassland/B-l woodland	Acidic	2.185062832
D14668	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	None	Acidic	0.147686162
D14669	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	None	Acidic	0.046838739
D12518	2	Existing habitat not currently qualifying under S41 NERC Act	Mixed woodland - plantation	Restore	Acidic open/B-l woodland	None	Acidic	0.116812243
D14673	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	None	Acidic	0.037605869
D14667	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	None	Acidic	0.06482784
D14654	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	None	Acidic	0.145728556
D14655	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	None	Acidic	0.132956261
D14653	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	None	Acidic	0.07894074
D14675	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	None	Acidic	0.056007198
M12320	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	1.207181473
M12321	3a	No known habitats present (high priority for habitat creation)	None	Create	Acidic open/B-l woodland	B-l woodland	Acidic	5.127277277
D14685	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	None	Acidic	0.198938675
D14684	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	None	Acidic	0.164153527
D14686	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	None	Acidic	0.191548194
D14687	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	None	Acidic	0.145311123
D14689	1	Existing S41 NERC Act habitat	Broadleaved woodland - plantation	Maintain and enhance	Broadleaved woodland - plantation	None	Acidic	0.181363966
D14425	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.913637234
D14674	1	Existing S41 NERC Act habitat	Standing water	Maintain and enhance	Standing water	None	Acidic	0.131094681
D14545	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.32200633
D14636	2	Existing habitat not currently qualifying under S41 NERC Act	Neutral grassland - semi-improved	Restore	Acidic open/Neutral grassland	Neutral grassland	Acidic	0.253178901
D14424	1	Existing S41 NERC Act habitat	Broadleaved woodland - semi-natural	Maintain and enhance	Broadleaved woodland - semi-natural	None	Acidic	0.256638172

HEALTH IMPACT ASSESSMENT

Hatfield Aerodrome Quarry

Prepared for: Brett Aggregates Limited

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1.0 INTRODUCTION

1.1 Background

This Health Impact Assessment (HIA) has been prepared in support of a planning application for a new sand and gravel quarry which would operate over a period of some 32 years, hereafter referred to as the 'proposed development'. The site is located on the north-western edge of Hatfield and to the east of St Albans on land associated with the former Hatfield Aerodrome.

The HIA is presented as a standalone document supporting the planning application, which is being submitted on behalf of Brett Aggregates Limited (the Applicant). The HIA is complementary to other documents submitted in support of the planning application including a Planning Statement and an Environmental Statement (which reports the findings of the Environmental Impact Assessment that has been undertaken for the proposed development). The relationship between HIA and Environmental Impact Assessment (EIA) is explained in section 1.5. below.

The report has been prepared by Anne Dugdale MRTPI FIQ, who has over five years' experience in undertaking socio-economic and health impact assessments for major projects throughout the UK.

1.2 Aims and Objectives of this HIA Report

The aims and objectives of this HIA are to understand how the proposed development could directly and indirectly impact on the key determinants of health and wellbeing of workers working at the site and people living and working in the local area.

1.3 Report Structure

This HIA provides an overview of the policy context and reviews baseline conditions in relation to health and wellbeing, including socio-economic data. It briefly explains the basis for the assessment methodology and scope, and undertakes an assessment of impacts with regard to the proposed development. The structure of the Report is as follows:

Section 1.0 Introduction.

Section 2.0 Site and Project Description.

Section 3.0 Planning Policy Context.

Section 4.0 Assessment Methodology and Scope.

Section 5.0 Baseline Conditions.

Section 6.0 Assessment of Health Impacts.

Section 7.0 Conclusions and Recommendations.

1.4 Definition of Health

The World Health Organisation (WHO) defines health as not only the absence of disease or infirmity, but also as 'a state of complete physical, mental and social wellbeing.' It emphasises that all people have right to the highest attainable standard of health and wellbeing, stating that health is 'one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition.' It is now accepted that an individual or community's health is determined not only by the availability and quality of healthcare services, but that a range of economic, social, psychological and environmental influences play an equally important role.

1.5 Assessment of Health in EIA

It is a requirement of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) that the EIA process must (amongst other matters) "*identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on the following factors—*

(a) *population and human health*".

Human health, along with other matters such as effects on biodiversity, land, soil, water, air and climate, material assets, cultural heritage and the landscape, is therefore at the heart of Environmental Impact Assessment.

The process of EIA requires the consideration of effects across a wide range of potential impacts. Health effects on the population are assessed with regard to all relevant potential impacts, including air quality, noise, traffic.

The planning application for the proposed development is accompanied by an Environmental Statement that reports on the findings of the EIA and, in doing so, addresses all relevant issues as required by the EIA Regulations, including effects of the proposed development on population and human health.

The aim of EIA is to protect the environment, including the population, by ensuring that a local planning authority when deciding whether to grant planning permission for a project does so in the full knowledge of the likely significant effects, and takes this into account in the decision-making process. It is therefore the primary mechanism for supporting the decision-making process for development proposals that are likely to result in significant environmental effects. Consequently, this HIA report draws on the findings of the EIA and seeks to avoid duplication of assessment, instead providing signposting, where appropriate, to detailed assessment of health effects reported in the Environmental Statement.

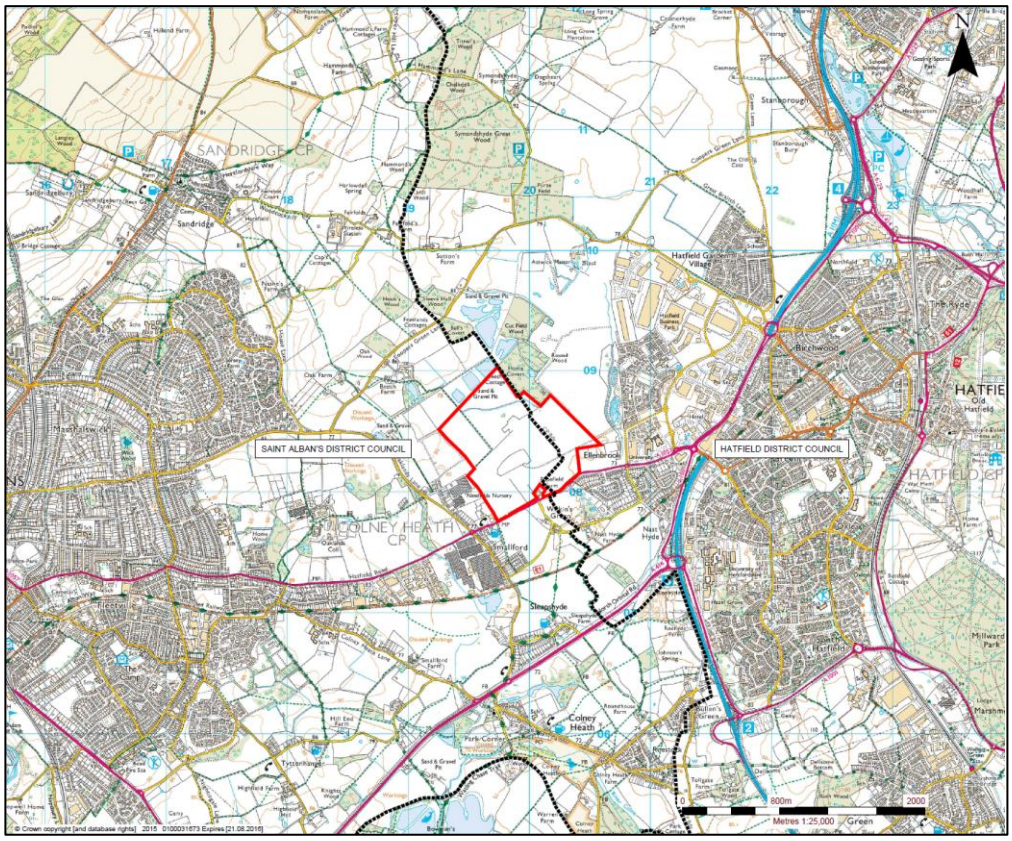
It should be noted that EIA is an iterative process. With regard to the proposed development the assessments undertaken as part of the EIA have been used to inform the design of the proposed development, and proposed mitigation measures. The development proposals have evolved over a considerable period of time, starting in c. 2015, and have taken account of both technical assessments and consultation feedback from stakeholders, including the local community. Further information is provided in this regard in section 4.0.

2.0 SITE AND PROJECT DESCRIPTION

2.1 Site Location

The application site is located on the north-western edge of Hatfield and to the east of St Albans on land associated with the former Hatfield Aerodrome. Figure 2-1 illustrates the location of the applications site.

Figure 2-1
Site Location



2.2 Site description

The application site covers an area of approximately 87.1ha and comprises the southern part of the former aerodrome. The application site comprises a broadly rectangular area of unoccupied land that is partly used as an informal public open space and partly for grazing. As such, the application site does not have any dominant land use at the current time following the closure of the aerodrome.

The application site is bounded by the A1057 (Hatfield Road) to the south, the boundary of which is characterised by a mature hedgerow. To the north lies CEMEX's Hatfield Quarry, and more specifically a set of silt lagoons. To the west the boundary is predominantly formed by a mature hedgerow, particularly in the vicinity of a garden centre and nursery, with the northern section being more open in aspect. At the north eastern corner is Home Covert, a small area of broadleaf woodland. The eastern boundary cuts across the former aerodrome to join up with the sports pitches located at the south eastern corner of the application site.

2.3 Surrounding areas

To the south of the application site the area is rural, interspersed with small settlements, areas of woodland and the highway network; clusters of housing can be found fronting the highway network, often being developed around road junctions. An area of industrial development lies to the south of the A1057, west of Station Road (in the vicinity of Smallford). To the southwest of the application site are a garden centre (operated by Notcutts), a public house, a petrol station, some large glass houses (nurseries) and a small residential area.

To the north, the area is similarly rural. Immediately to the north are a series of lagoons associated with an existing mineral working (Hatfield Quarry, CEMEX); the processing plant lies to the northwest of the application site, having its access off Oaklands Lane. Also immediately to the north is an area of woodland (Home Covert).

To the east of the application site is the urban area of Hatfield, with an industrial/distribution estate, residential development and the University of Hertfordshire campus present. Between the application site and Hatfield lie the remainder of the former aerodrome, surface water drainage infrastructure (an open drain and series of lagoons, known as Ellenbrook Linear Park) and some sports pitches and associated pavilion. An outline planning application has been lodged for a large-scale mixed use development including 1,100 new homes and supporting infrastructure including a primary school, local centre and open space within this area (application 6/2018/2768/OUTLINE).

Finally, to the east the rural aspect gives way to the urban area of St Albans.

2.4 Residential / human receptors

The nearest property to the application site is Popefield Farm, which fronts the northern side of the A1057. Further to the south is Wilkinsgreen Farm, beyond which is a small cluster of properties.

To the south-west are a number of properties on the south side of Hatfield Road and east of Station Road, with a further small row of properties located off Oaklands Lane to the west of the application site. A recent housing development has been established off Oaklands Lane (Pasture View) to the west of the application site, and planning permission has been granted on appeal for a small residential development on land to the north of the garden centre.

A small residential area lies to the southeast of the application site centred on Poplars Close, Poplar Avenue and Bramble Road (known as Ellenbrook). Other residential properties front the northern side of Wilkins Green Lane to the south of this area. A larger residential area can be found on the western edge of Hatfield, with the nearest properties being on Nimrod Drive, Flamingo Close and Walker Grove (all off Cunningham Avenue).

2.5 Development Proposals

The proposed development comprises a resubmission of a planning application for the establishment of a new quarry on land at the former Hatfield Aerodrome. The site forms part of an allocated site referred to in the adopted Minerals Local Plan as *Preferred Area 1*. The proposals would involve the winning and working, together with processing for sale, of some 8 million tonnes of sand and gravel over a period of around 32 years (based on an annual output of around 250,000 tonnes a year).

In parallel with the extraction of minerals would be the importation of low permeability inert material to infill the mineral workings to facilitate the restoration of the site to a beneficial after use, combining recreation and nature consideration. The imported material would typically comprise excavation wastes from construction and engineering projects (soils, overburden, clays etc.) within the region. The quarry would be worked on a phased basis to allow for progressive restoration.

Excavated material would be processed at the quarry using a combination of screening and washing plant to produce a range of graded aggregates and sands. Processed aggregates would be dispatched from the site in HGVs. Processed aggregates (together with the import of inert waste) would be exported via a new access constructed onto the A1057 (Hatfield Road) on the southern side of the quarry.

Other ancillary development would include a weighbridge, office accommodation, electrical transformer, electrical switch-room, and small stores and maintenance building, fresh water and silt lagoons.

In order to demonstrate the acceptability of the development proposals, a comprehensive development scheme has been prepared which incorporates 'good practice' and bespoke mitigation. The scheme addresses the establishment, phased operation and restoration of the quarry together with detailing the ancillary infrastructure needed to support the operation. The development has been designed to ensure that the potential environmental impacts are avoided or minimised. This underlines the applicant's intentions and responsibilities to conduct its activities as a responsible neighbour and in a manner which is sympathetic to local amenity and causes minimal disruption to the local community.

An Environmental Impact Assessment (EIA) has been undertaken to identify any significant environmental effects arising from the proposed development, and this is reported in the Environmental Statement (ES) that accompanies the planning application. The mitigation measures identified as being necessary during the course of the EIA form part of the development proposals. In preparing the working scheme, consideration has been given to the following:

- proximity of dwellings (existing and proposed) and the likely environmental impacts in terms of noise and air quality;
- archaeological considerations;
- ecological considerations;
- visual and landscape impact;
- hydrology and hydrogeology; and
- traffic generation and movements.

Mitigation measures that form part of the proposals are taken into account in the assessment of health impacts in **section 6.0** below.

3.0 PLANNING POLICY CONTEXT

3.1 National Planning Policy and Guidance

3.1.1 National Planning Policy Framework (NPPF)

The NPPF sets the framework for planning policy in England, and states that the purpose of the planning system is to contribute to the achievement of sustainable development. The three stated overarching objectives to sustainable development - economic, social and environmental - include building a strong, responsive and competitive economy, including identifying and coordinating development requirements including the provision of infrastructure; supporting strong, vibrant and healthy communities with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and by protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

Section 8 relates to the promotion of healthy and safe communities. Paragraphs 92 and 93 refer to planning decisions, as follows:

92 "*Planning policies and decisions should aim to achieve healthy, inclusive and safe places*" which, amongst other things, *"enable and support healthy lifestyles, especially where this would address identified local health and well-being needs" – for example through the provision of safe and accessible green infrastructure, sports facilities, local shops, access to healthier food, allotments and layouts that encourage walking and cycling*".

Paragraph 93 states that "*To provide the social, recreational and cultural facilities and services the community needs, planning policies and decisions should…*

take into account and support the delivery of local strategies to improve health, social and cultural well-being for all sections of the community".

3.1.2 Planning Practice Guidance (PPG)

Planning Practice Guidance is a web-based resource and that is updated as necessary. It advises that a health impact assessment may be a useful tool to use where there are expected to be significant impacts.

The range of issues to be considered in decision-making in respect of health and health infrastructure include:

"*opportunities for healthy lifestyles have been considered (e.g., planning for an environment that supports people of all ages in making healthy choices, helps to promote active travel and physical activity, and promotes access to healthier food, high quality open spaces, green infrastructure and opportunities for play, sport and recreation);*

potential pollution and other environmental hazards, which might lead to an adverse impact on human health, are accounted for in the consideration of new development proposals; and

access to the whole community by all sections of the community, whether able-bodied or disabled, has been promoted".

3.1.3 Health Impact Assessment in Spatial Planning

Public Health England (PHE) published a Guide for use of HIA in the land use planning system in September 2020. According to PHE, socio-economic and physical environments determine 60% of health outcomes, and focusing on these determinants of health is essential for improving population health and wellbeing and reducing inequalities. The Guide sets out how, in the case of planning applications, applicants should determine the approach to HIA depending on the scale and nature of the proposed development, and how HIA should contribute to informing planning decisions.

The Guide provides information to support:

- "*the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG) on promoting healthy and safe communities.*
- *local adoption of planning policies and guidance on the use of HIAs*
- *consideration of how the planning process impacts population health, wellbeing and inequalities through the wider determinants of health.*
- *consideration of whether an HIA is required; what the trigger points should be; the type of HIA needed; and alignment with other planning assessments.*
- *consideration of the range of health and wellbeing issues to be included in an assessment.*
- *engagement of relevant practitioners when considering health in impact assessments, including environmental health officers and impact assessment practitioners operating in the private sector*".

3.1.4 Putting Health into Place

This document was prepared on behalf of the NHS in 2019 as part of the Healthy New Towns Programme set up in 2015 with the aim of addressing the following objectives:

- Planning and designing a healthier built environment
- Enabling strong, connected communities
- Creating new ways of providing integrated health and care services.

The report sets out The 10 Principles that capture learning from the Healthy New Towns programme. The 10 Principles are primarily aimed at the built environment, but the following principles are relevant to the proposed development:

Principle 3

3.1 Engage early and regularly with new and existing communities to involve residents

Principle 5

5.1 Embed active travel from the earliest stages of planning

Principle 7

7.3 Create workplaces that stimulate productivity, efficiency and resilience.

3.2 Local Planning Policy and Guidance

3.2.1 Hertfordshire Health and Wellbeing Strategy 2016-2020

The Hertfordshire Health and Wellbeing Strategy illustrates the Council's strategic direction to reduce health inequalities and improve the health and wellbeing of their population through four "*life stages*", as follows:

- Starting Well
- Developing Well
- Living and Working Well
- Ageing Well.

This assessment is particularly relevant to the third stage: Living and Working Well.

3.2.2 Hertfordshire Minerals Local Plan Review 2002-2016

The Minerals Local Plan (MLP) sets out five aims:

1. *"to encourage the efficient use of materials, particularly maximising the use of recycled and secondary aggregates and reducing the use of primary aggregates, thereby reducing reliance on land won sources of material.*
2. *to identify and safeguard mineral resources to ensure that there are sufficient environmentally acceptable sources to maintain an appropriate level of current and future supply in accordance with Government guidance and to prevent the unnecessary sterilisation of mineral resources.*
3. *to ensure that the adverse impacts on the environment and people caused by mineral operations and the transport of minerals are kept, as far as possible, to an acceptable minimum.*
4. *to ensure sensitive working, reclamation and aftercare practices so as to preserve or enhance the overall quality of the environment and promote biodiversity where appropriate.*
5. *to enable stakeholders to contribute to planning for minerals supply in Hertfordshire".*

Expanding on the third aim, the County Council describes the appropriate actions to minimise the impacts on health and the environment:

1. *"Safeguarding existing rail facilities used for the importation of aggregates and the production and distribution of these and associated value-added products and seek the provision of suitable new rail or water based facilities if needed;*
2. *ensuring that the adverse effects of mineral traffic, both on and off-site, are minimised;*
3. *protecting residents of the County from noise, dust, visual intrusion and other amenity effects of mineral extraction;*
4. *preventing excessive environmental and cumulative impacts;*
5. *carrying out regular monitoring and review of operating quarries and other sites;*
6. *taking prompt action to resolve breaches of planning control satisfactorily;*
7. *providing appropriate constraints on land affected by international, national and regional policy designations;*
8. *providing appropriate constraints on land affected by local policy constraints and other site specific considerations; and*
9. *treating impacts on adjoining uses, including residential areas, as a key constraint."*

3.2.3 Welwyn Hatfield District Plan 2005

The Welwyn Hatfield District Plan was adopted in 2005 and is the current adopted local plan until the Welwyn Hatfield Local Plan is formally implemented (currently undergoing examination)[1]. The District Plan forms part of the statutory development plan for the site. It aims to improve the quality of life in the area through sustainable development.

The key issues highlighted in the District Plan are:

- *"Protecting the Environment and Preserving Natural Resources*
- *Maintaining and Developing a Sense of Community*
- *Reducing the Need to Travel and Dependence on the Car*

[1] Welwyn Hatfield Borough Council - Welwyn Hatfield District Plan 2005

- *Meeting Local Housing Needs*
- *Maintaining Economic Prosperity and Jobs*
- *Sustaining the Countryside and Rural Communities*
- *Revitalising Town and Village Centres".*

Welwyn Hatfield District has prepared Supplementary Planning Guidance in respect of Hatfield Aerodrome (adopted November 1999). The document includes a masterplan for future development of the Aerodrome in accordance with Sustainability principles including health and safety.

3.2.4 Draft Local Plan Proposed Submission 2016

According to Welwyn Hatfield Borough Council[2], the current District Plan provides the planning framework for development within the Borough, until the new local plan is published. The draft Local Plan was submitted for Examination in 2016 and offers more recent information regarding what may be included in future, in particular, relating to the conducting of HIAs. Specifically, it states:

"The use of Health Impact Assessments for large scale development will be incorporated into Environmental Impact Assessments where relevant."

As with its predecessor, the Draft Local Plan also makes specific reference to the regeneration of Hatfield Aerodrome and highlights "Health" as being a key issue of the Plan.

The policies with specific reference to health and wellbeing are:

Policy SP 1 - Delivering Sustainable Development

Policy SADM 9 - Loss of residential

Policy SP 9 - Place Making and High-Quality Design

Policy SADM 18 - Environmental Pollution

3.2.5 Adopted St Albans District Local Plan Review (Saved Policies)

The current local plan for St Albans District was implemented in 1994, as the St Albans District Local Plan Review. In 2007, St Albans City and District Council sought to retain several policies beyond this date by gaining the Secretary of State's agreement to issue a direction to 'save' them and submitted a list recommending those policies it wished to save to the Government Office for the East of England. These policies were 'saved' under the Adopted St Albans District Local Plan Review[3].

The newest incarnation of the St Albans District Local Plan (New Local Plan 2020-2038) is currently undergoing consultation, whilst this process is occurring, the previous, saved policies take precedence regarding planning applications.

There are no specific relevant policies relevant to health and wellbeing in the saved policies, or relevant supplementary planning guidance.

3.2.6 Assessment of the Requirement for Health Impact Assessment (HIA)

Hertfordshire County Council prepared this report as a background paper in December 2018 to accompany the Hertfordshire Minerals Local Plan Review. The report confirms that while the Minerals Local Plan itself is a policy

[2] Welwyn Hatfield Borough Council - https://www.welhat.gov.uk/districtplan
[3] St Albans City and District Council - Current local plan | St Albans City and District Council

framework that will not have a direct impact on health and wellbeing, individual site proposals that come forward may have the potential to impact on health and wellbeing. Consequently, it recommends that

> *"The need to undertake a full Health Impact Assessment for site specific proposals should be assessed via the screening process and in consultation with the county council".*

3.2.7 Position Statement: Health Impact Assessments (HIAs)

The Position Statement outlines Hertfordshire County Council's position on the requirement for HIAs, in relation to planning. Of particular importance for the proposed development is Section 3.1.3 – Minerals, where the Council details the threshold for when an HIA is needed:

"New rail aggregate depots

New minerals workings where the surface area of the workings is being increased

Other permanent infrastructure such as coated stone plants or ready mix plants."

The proposed development falls within the requirement for HIA by virtue of comprising a new mineral working.

The Position Statement also recommends the methodology for conducting HIA, based on the Wales Health Impact Assessment Support Unit (WHIASU) methodology.

4.0 SCOPE AND CONSULTATION

4.1 Introduction

As a starting the point for undertaking a health impact assessment of the proposed development, a scoping exercise was undertaken that took account of the nature of the proposals as outlined in **section 2.0**, and the legislative and national and local policy requirements outlined in **section 3.0**.

The scoping process took account of extensive consultation undertaken in the course of developing the current project, which has helped identify potential impacts on the local population. In order to explain the extent of the consultation undertaken to date, it is necessary to explain some of the background to the current planning application. This is set out in section 4.2 below.

4.2 Background to the proposed development

A planning application was submitted in January 2016 (application reference 5/0394-16) for the extraction of 8 million tonnes (Mt) of sand and gravel along with the installation of ancillary buildings, plant and machinery (including a concrete batching plant) on land at the former Hatfield Aerodrome. Despite an initial resolution to approve (in January 2017), the planning application was refused by the planning committee at its meeting on 24 September 2020, with the decision notice issued on 6 January 2021.

The reasons for refusal related to Green Belt (in particular with regard to the proposed concrete batching plant); the length of the proposed period of working; impact of traffic; and impact on the aquifer due to historic pollution (bromate plume) in the general area. The resubmission addresses these issues as follows:

- the erection and operation of a concrete batching plant has been removed from the proposals;
- the standoff for mineral extraction operations in the Lower Mineral Horizon (LMH) to the bromate plume (also in the LMH) has been increased from 50m to 100m;
- there will be no dewatering (pumping) of the LMH; and
- The access road from the quarry entrance has been moved by 5m to the east to allow additional acoustic screening.

During the course of the original application, extensive consultation was undertaken with technical stakeholders and local communities, and detailed feedback was provided that has led to the current revised proposals. A comprehensive report[4] on consultation undertaken and responses received was submitted with the original planning application in 2016. Further consultation has been undertaken in respect of the current application during 2021.

The key milestone events in the consultation process are summarised below:

First Planning Application 2016

(See SCI in the original Planning Application dated Jan 2016)

Public Exhibition

Held at St Albans Rugby Club on 28/10/2015

[4] Statement of Community Involvement, January 2016

300 household leaflets delivered on 16/10/2015 to invite residents to the Exhibition

Invitation letters sent to Councillors at Herts CC, Welwyn Hatfield BC, St Albans DC, Colney Heath Parish Council and Hatfield Town Council

Newspaper Advertising

St Albans and Harpenden Review – 14/10/2015 & 21/10/2015

Welwyn Hatfield Times – 15/10/2015 & 22/10/2015

Liaison Meetings

Ellenbrook Area Residents Associations

University of Hertfordshire

Welwyn Hatfield Borough Council

Grant Shapps MP

Anne Main (former MP)

Second Planning Application 2021

Dedicated Website

www.hatfieldquarry.co.uk

Went live on 10/05/2021

189 user hits to 16/08/2021

Direct Contacts

500 household leaflets delivered on 11/5/2021

Letters to Councillors at Herts CC, Welwyn Hatfield BC, St Albans DC, Colney Heath Parish Council and Hatfield Town Council

Letters to Grant Shapps MP & Daisy Cooper MP

Letters to Ellenbrook Area Residents Association & University of Hertfordshire

Newspaper Advertising

Welwyn Hatfield Times – 13/05/2021 & 20/05/2021

County Council Liaison

Scoping request was made on 10/05/2021.

Scoping opinion dated 14/07/2021.

4.3 Scope of HIA

The consultation exercise described above helped define the scope of the potential environmental impacts including impacts on human health that would be addressed within the EIA, and the outcome of these assessments are reported in the ES accompanying the planning application.

In scoping the HIA, given the extent of matters addressed in the EIA, it is therefore deemed appropriate that this HIA report should signpost detailed reports provided within the ES and other planning application documents rather than duplicate this work. However, this HIA provides a comprehensive overview of health and wellbeing impacts associated with the proposed development that draws together the available information into one place,

thereby supporting better understanding of the health and wellbeing effects of the proposed development (both beneficial and adverse). The HIA also seeks to identify whether the health and wellbeing of any particular population groups might be disproportionately disadvantaged or benefitted by the proposed development.

4.4 Methodology

Whilst there is no statutory regional or national guidance for undertaking HIA, Hertfordshire County Council's Position Statement (see section 3.2.6) advises that the guidance provided by the Welsh Health Impacts Assessment Support Unit (WHIASU) should be used to inform HIA.

The WHIASU approach is further supplemented by the Applicant's and SLR's experience of other similar projects throughout the UK.

4.5 WHIASU Toolkit

Produced by WHIASU, this toolkit provides the definitions and frameworks for producing an HIA and is the Hertfordshire County Council's recommended format for screening and scoping HIA. The Toolkit sets out three types of HIAs available:

- *"Prospective HIA – at the start of the development of a project, proposal or plan.*
- *Concurrent HIA – runs alongside the implementation of the project (or policy)*
- *Retrospective HIA – assesses the effect of an existing project or policy and can be used as an evaluation tool. Retrospective assessments can also be made of unexpected events, as a way of learning lessons for future similar events".*

Within these three types, HIAs can be further narrowed down to three sub-categories:

- *"A Desktop HIA exercise can take hours or a day and can encompass a small number of participants around a table using existing knowledge and evidence to assess a proposal, policy or plan.*
- *A Rapid HIA can take days or weeks and usually includes the establishment of a small steering group and often uses the approach of a participatory stakeholder workshop – it typically involves a brief investigation of health impacts, including a short literature review of quantitative and qualitative evidence and the gathering of knowledge and further evidence from a number of local stakeholders.*
- *Comprehensive HIAs are more in-depth and can take months to complete. They may be time intensive, financially costly, require extensive literature searches and the collection of primary data. This type of HIA is more suited to more complex proposals"*.

WHIASU acknowledge that some HIAs will cover one or more of these subcategories. It further details the five main steps to be undertaken when conducting an HIA:

- *"Screening*
- *Scoping*
- *Appraisal of Evidence/Assessment*
- *Reporting and Recommendations*
- *Monitoring and Evaluation"*

Finally, the Toolkit offers a Health and Wellbeing Checklist and a Vulnerable/Disadvantaged Groups Checklist – these act as references for the potential impacts on health and wellbeing that a development may pose and the potential group receptors that the Toolkit highlights as being vulnerable e.g., children, religious groups, unemployed.

The assessment of health effects undertaken in section 6.0 of this document uses the basic framework provided by the Health and Wellbeing Checklist, and has regard to the Vulnerable/Disadvantaged Groups Checklist.

As recommended by WHIASU, the HIA takes a proportionate approach to the consideration of any health-related impacts which could arise from the proposed minerals extraction and subsequent restoration at the site.

5.0 BASELINE CONDITIONS

This section provides information on the current conditions in relation to health and wellbeing for people who live within the local area, including age, health issues, and qualifications. It also provides information on the community, through data on transport, access to recreation facilities and open space, induces of deprivation, and crime. It is necessary to understand the baseline conditions in order to assess how the proposed development would impact on health and wellbeing of the local community, including people working at the proposed quarry in the future.

As the proposed development spans across two Local Authority jurisdictions, the geographical scope of the baseline review is based primarily on these local authority areas, Welwyn Hatfield Borough Council and St Albans City and District Council. This area is identified as the Local Area of Influence (LAI), within which most effects on the local community would be experienced, although adjustment is made where necessary depending on the type of impacts and receptors.

For comparative purposes, data is also provided for Hertfordshire as a whole and nationally (Great Britain and England), where available.

5.1 Population Baseline

The site is located on the boundary of the districts of Welwyn Hatfield and St Albans, and data is drawn from both authorities in order to understand the socio-economic baseline conditions in the vicinity of the site.

5.1.1 Resident population

Both Welwyn Hatfield and St Albans are areas of steady growth in population. The most recent population statistics from 2019[5] show that the resident population of Welwyn Hatfield was 123,000, an increase of around 11% from the 2011 Census[6].

In St Albans[7], the population has increased by approximately 9% in the same time frame, compared to East of England (8.5%) and England (8.8%).

Approximately 80,800 or 65.7% of these people are aged 16-64, i.e., within the Working Age Population. This is higher than the average for the Hertfordshire (62.2%) and Great Britain (62.5%).

Welwyn Hatfield Borough has two main population centres:

- Welwyn Garden City - 51,357 (41.7%); and
- Hatfield - 47,386 (38.5%).

Similarly, St Albans District also has two main urban settlements:

- St Albans – 57,000 (38.18%); and
- Harpenden – 30,000 (20.1%).

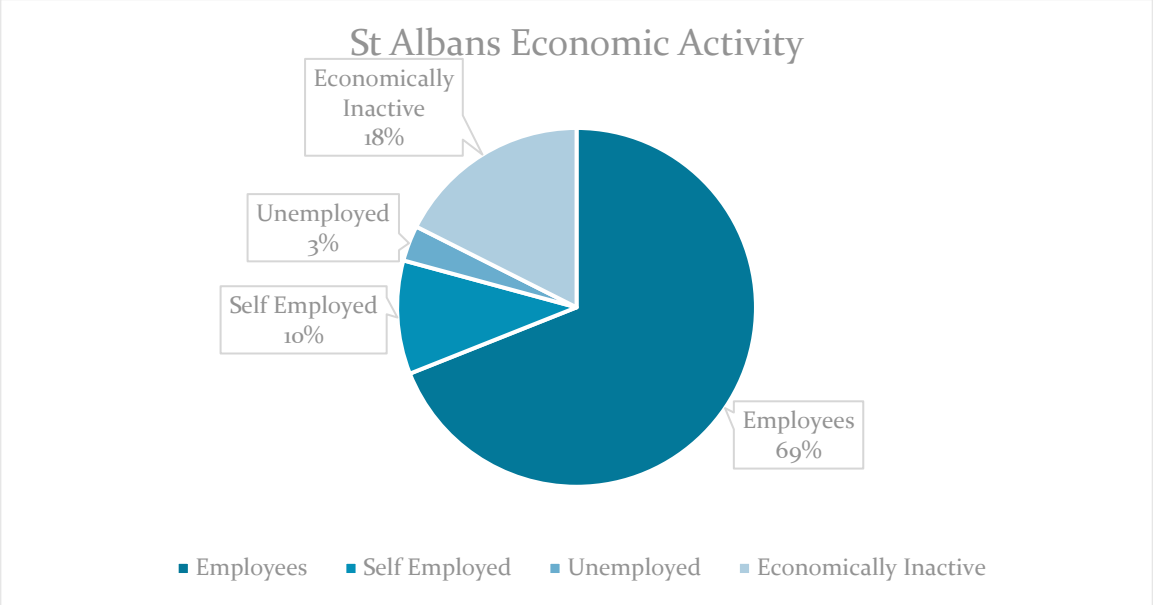
Welwyn Hatfield has a population density of approximately 9.56 (number of people per hectare) and St Albans has a population density of approximately 9.26, whilst Hertfordshire's is 7.28 and England 4.34[8].

[5] NOMIS - Labour Market Profile - Welwyn Hatfield
[6] ONS – United Kingdom Population Mid-Year Estimate
[7] NOMIS - Labour Market Profile – St Albans
[8] LG Inform – Population Density - Population density, persons per hectare in Hertfordshire | LG Inform (local.gov.uk)

5.1.2 Employment and unemployment rates

The population of Welwyn Hatfield shows an economic activity rate of 84.1%[3] (January - December 2020) that is higher than that of the Hertfordshire (82%) and Great Britain (79.1%), whilst St Albans has a lower economic activity rate of 82.5% than Welwyn Hatfield, but similar to the region as a whole. **Figures 5-1** provides further data on the composition of economic activity, whilst **Figure 5-2** offers a comparison within a geographic context - it should be noted that this unemployment figure is model based[9].

Figure 5-1
Economic Activity Composition



[9]As unemployed form a small percentage of the population, the APS unemployed estimates within local authorities are based on very small samples so for many areas would be unreliable. To overcome this ONS has developed a statistical model that provides better estimates of total unemployed for unitary authorities and local authority districts (unemployment estimates for counties are direct survey estimates). Model-based estimates are not produced for male or female unemployed.

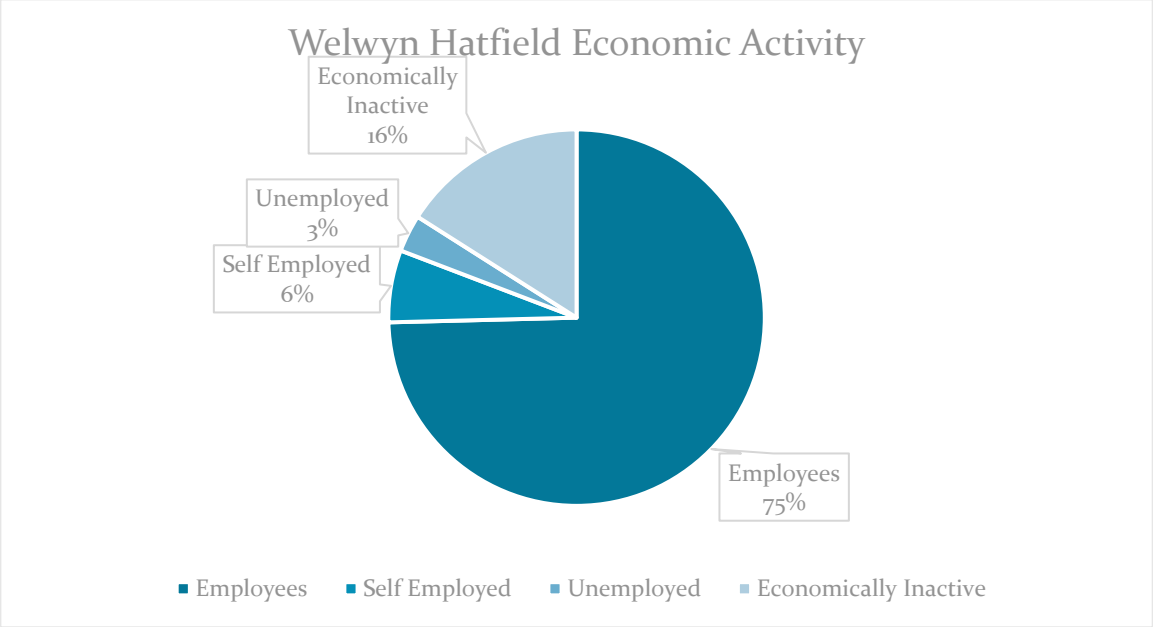
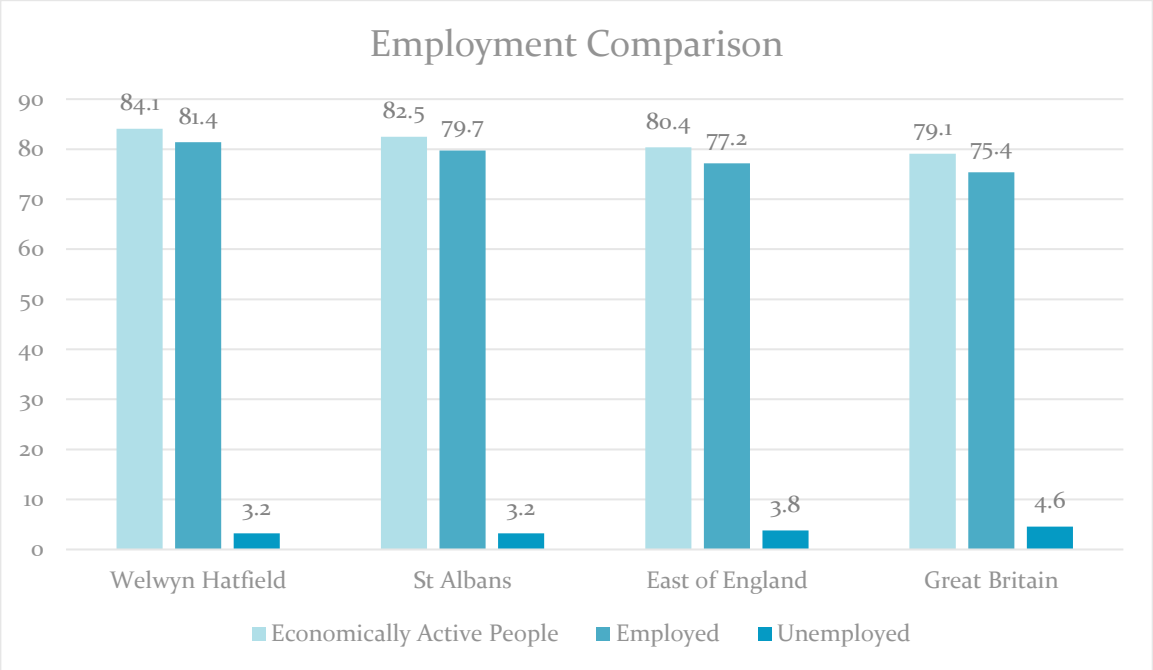


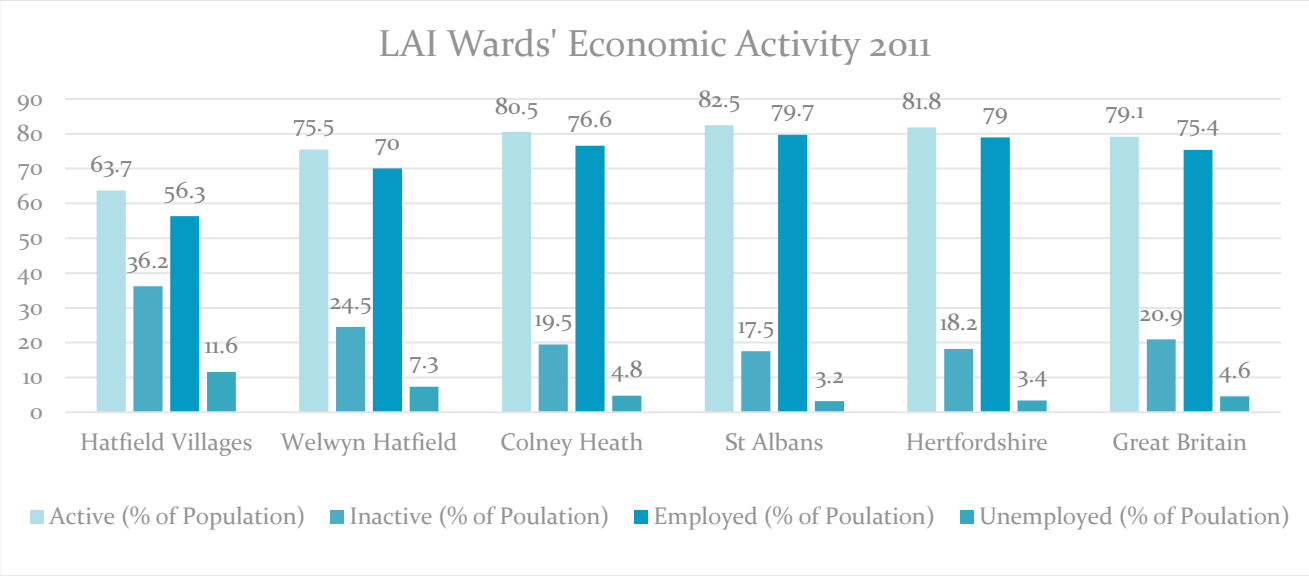
Figure 5-2
Employment



As mentioned above, the site spans across the border of two local authorities; the respective ward the site is located in within Welwyn Hatfield is Hatfield Villages, whilst in St Albans it is Colney Heath. The most recent employment figures for the wards of Welwyn Hatfield are from NOMIS data from January to December 2011[10] . Of the five wards that pertain to the closest town to the LAI, Hatfield, the percentage of people that are economically active is highest in Hatfield East (78.1%) and lowest in Hatfield South (59.2%). Employment statistics from the 2011 Census for each ward within Hatfield are summarised below in **Figure 5-3**.

[10] NOMIS - 2011 Ward Labour Market Profile

Figure 5-3
Ward Economic Activity

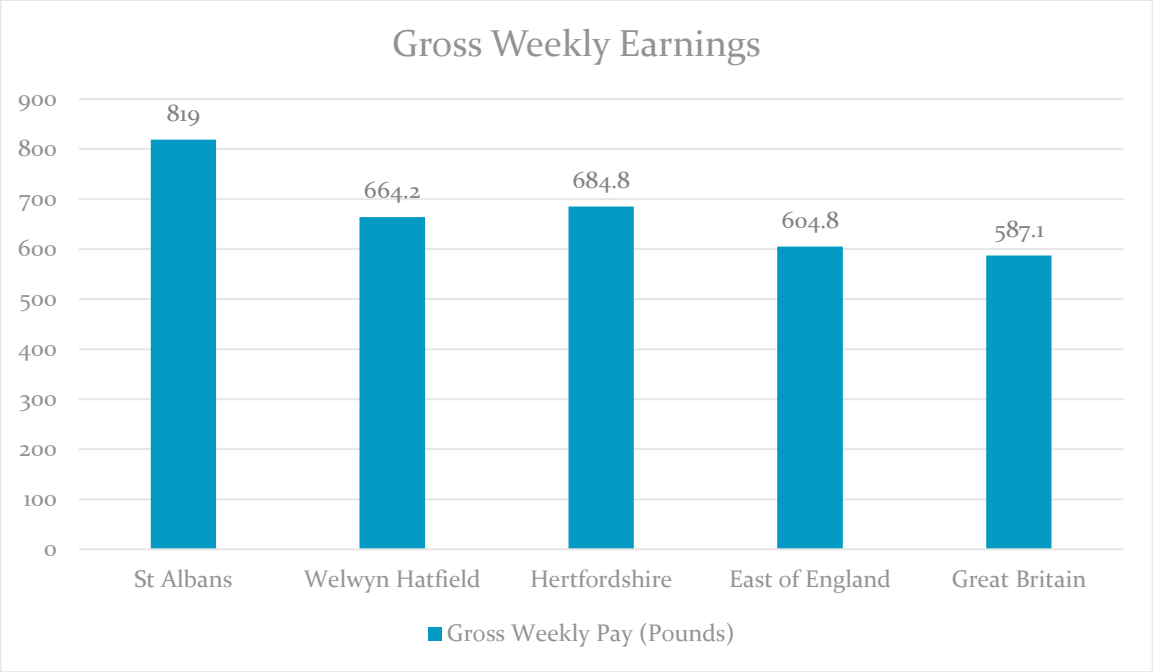


As shown above, the populations of both LAIs have a lower percentage of economically active people and those in employment than the county as a whole.

Gross weekly pay for full-time workers in Welwyn Hatfield and St Albans in 2020[11], was higher than that of East of England and Great Britain, detailed in **Figure 5-4**, below. However, Welwyn Hatfield is lower than the Hertfordshire average, but St Albans is significantly higher than all areas. Contemporary data on earnings for the individual wards is not available.

[11] ONS - Annual Survey for Hours and Earnings 2020

Figure 5-4
Weekly Earnings Comparison



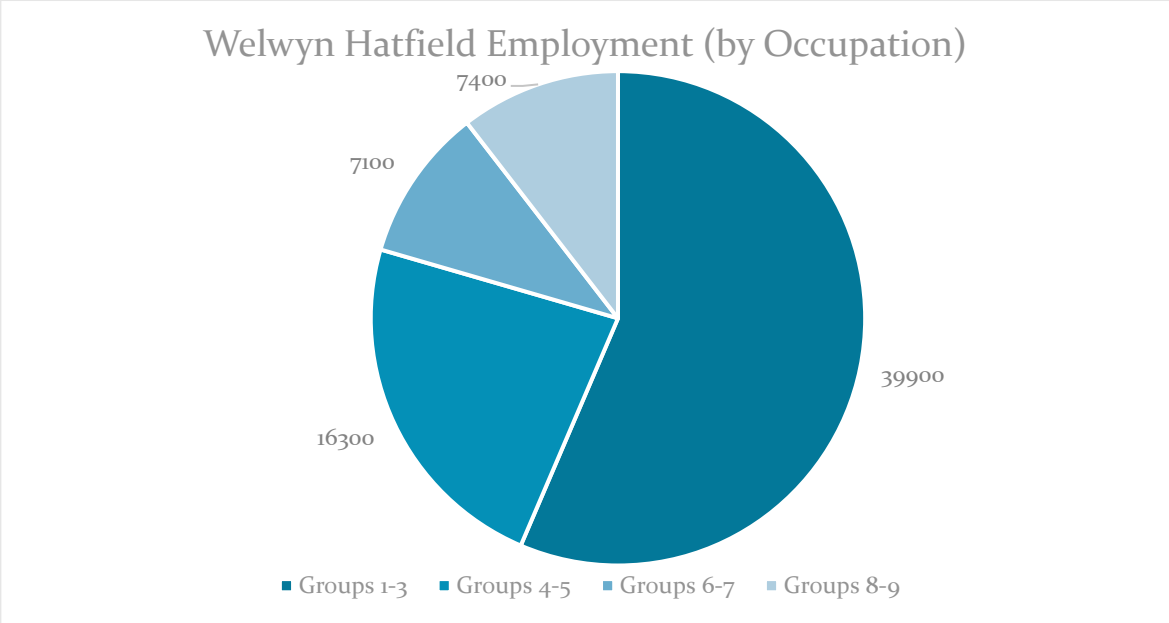
5.1.3 Occupations

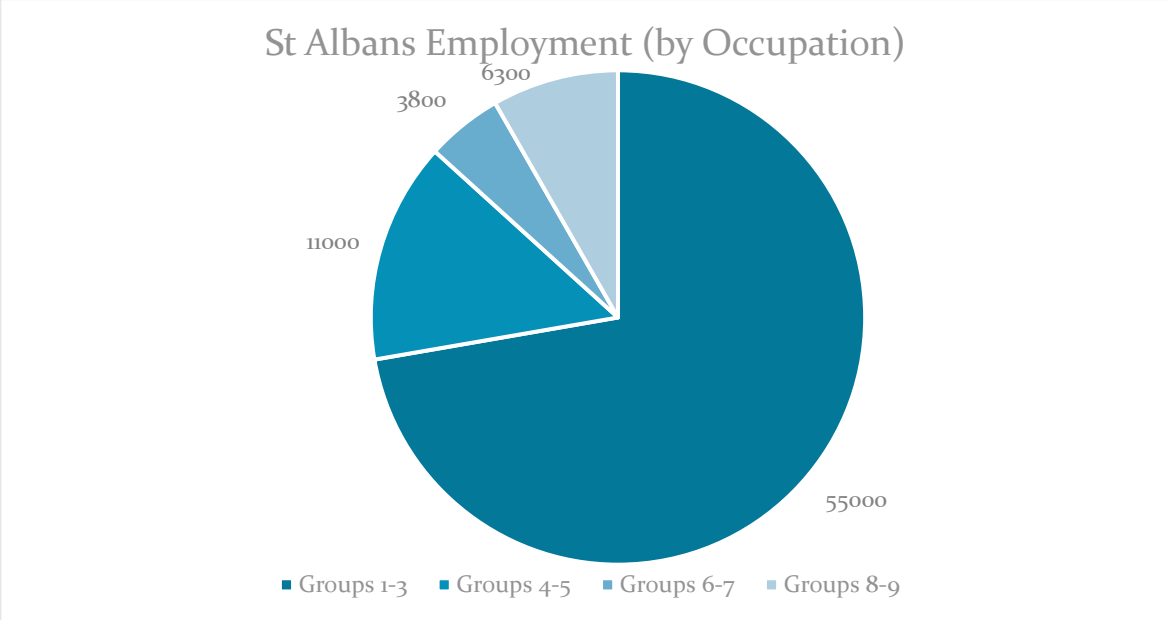
The data, provided by ONS from 2020[12], details the *types* of employment, split into SOC Major Groups (see **Table 5-1** below) and shows that in Welwyn Hatfield, 56.4% work in Groups 1-3, 23.1% work in Groups 4-5, 10.1% work in Groups 6-7 and 10.4% work in Groups 8-9.

The figures in St Albans[13] were significantly higher for Groups 1-3 (72.3%) and lower for Groups 4-5 (14.4%), Groups 6-7 (5.0%) and Groups 8-9 (8.3%), with the full figures displayed in **Figures 5-5**, below.

[12] NOMIS - Labour Market Profile - Welwyn Hatfield
[13] NOMIS - Labour Market Profile – St Albans

Figure 5-5
Employment Types





For reference, the descriptions of the individual SOC Employment Groups[14] is tabulated below, in **Table 5-1**.

Table 5-1
SOC Major Employment Groups

SOC Major Groups	Description
Groups 1-3	Major Group 1 - Managers, Directors and Senior Officials.

[14] Occupations are classified according to the Standard Occupation Classification 2010. Descriptions of the job titles included in each code are available in the SOC manuals.

SOC Major Groups	Description
	Major Group 2 - Professional Occupations. Major Group 3 - Associate Professional and Technical Occupations.
Groups 4-5	Major Group 4 - Administrative and Secretarial Occupations. Major Group 5 - Skilled Trades Occupations.
Groups 6-7	Major Group 6 - Caring, Leisure and Other Service Occupations. Major Group 7 - Sales and Customer Service Occupations.
Groups 8-9	Major Group 8 - Process, Plant and Machine Operatives. Major Group 9 - Elementary Occupations.

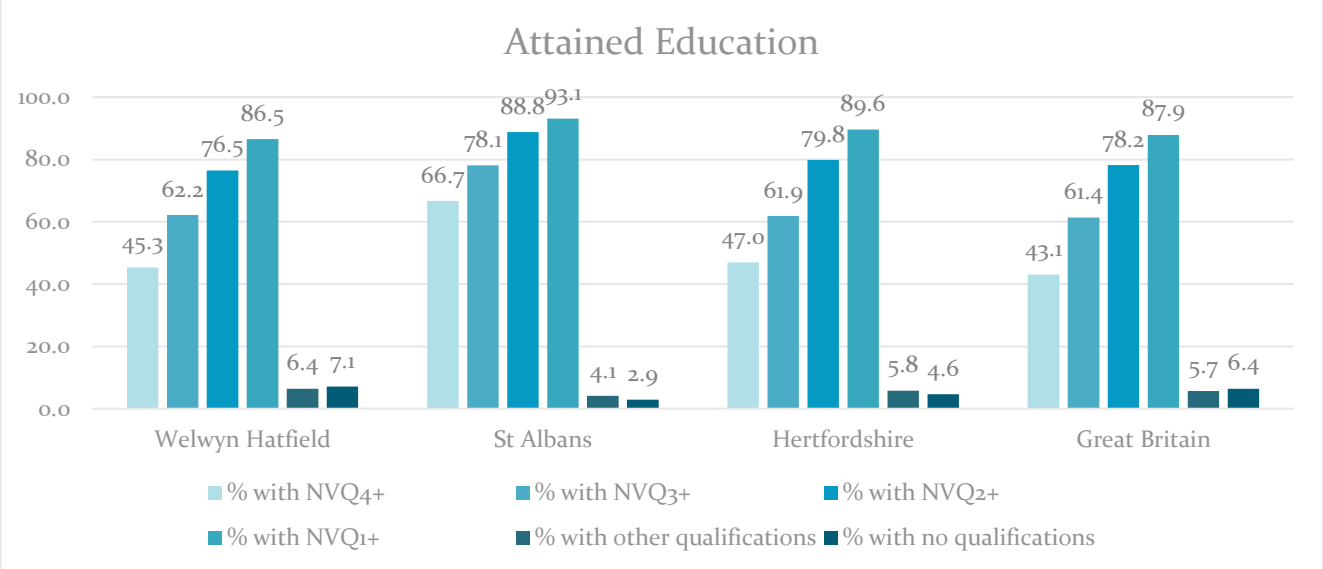
5.1.4 Qualifications

According to the ONS Annual Population Survey (January - December 2020)[15], the average proportion of Welwyn Hatfield residents aged 16-64 with no qualifications was 7.1%; this is higher than the average for Hertfordshire (4.6%) and of England (6.2%).

The proportion of people with qualifications at level NVQ4 and above in Welwyn Hatfield (45.3%) is slightly lower than Hertfordshire (47%) but higher than the average for England (42.8%). However, St Albans had a significantly higher proportion of their population that have an NVQ4 and above (66.7%) than all.

Data of qualifications for Welwyn Hatfield, St Albans, Hertfordshire, and England are summarised below, in **Figure 5-6**.

Figure 5-6
Education Attained in Welwyn Hatfield



[15] ONS – 2020 Annual Population Survey

5.1.5 Community Safety

The reported crime rate for Hatfield during the 12-months of 2020 was 81 crimes per 1000 people[16]. This is 26% higher than the rate for Hertfordshire (60 crimes per 1000 people), making Hatfield in the top 20% highest crime rates of the county. It is also higher than the average for England (71 crimes per 1000 people).

St Albans has the lowest crime rate (52 crimes per 1000 people) of Hertfordshire's major towns and was 47th highest out of all 141 settlements. This is 15% lower than the rate for Hertfordshire and is among the top safest major towns in the UK.

5.1.6 Health

The local authority health profiles, produced by Public Health England[17] for 2017 – 2109, show that the average healthy life expectancy in Welwyn Hatfield for both males (80.9 years) and females (84.2 years) is slightly below St Albans, 82.0 and 85.4, respectively.

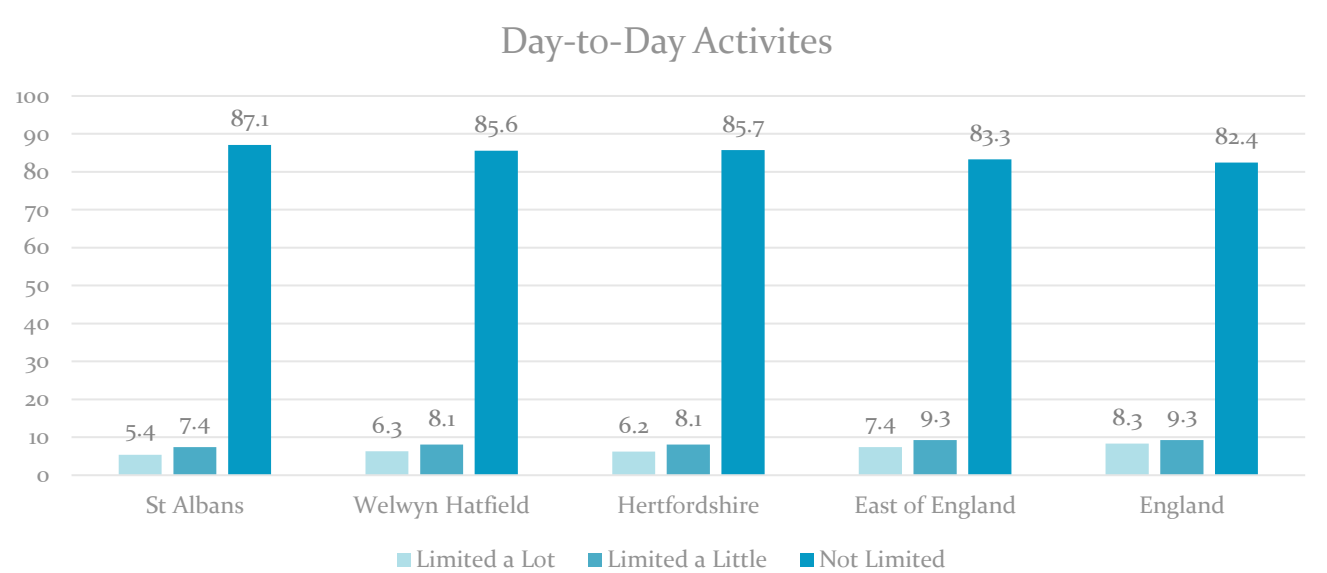
Life expectancy in Welwyn Hatfield is very slightly lower than the average for Hertfordshire (81.0 and 84.3 years respectively), and above the English national average of 79.8 and 83.4, respectively, however, St Albans is higher still.

The percentage of adults classified as overweight or obese between 2019 and 2020 in Welwyn Hatfield was 60.2% and in St Albans it was lower, at 51.15. Compared with Hertfordshire (59.5%), Welwyn Hatfield was slightly higher, however, St Albans was significantly lower. The population of Welwyn Hatfield also has a higher percentage of adults who smoke (14.1%) than the wider region (11%) in 2019 and the national average of 13.9% - again, all were significantly higher than St Albans (4.1%).

Data gained from the 2011 Census percentage[18] of the population who say that their day-to-day activities are limited are lower in St Albans (12.8%), than Welwyn Hatfield (14.4%). St Albans is lower than Hertfordshire (13.4%) and England (17.6%), whilst Welwyn Hatfield was higher than Hertfordshire but lower than England. A full review of this data is illustrated in **Figure 5-7**, below.

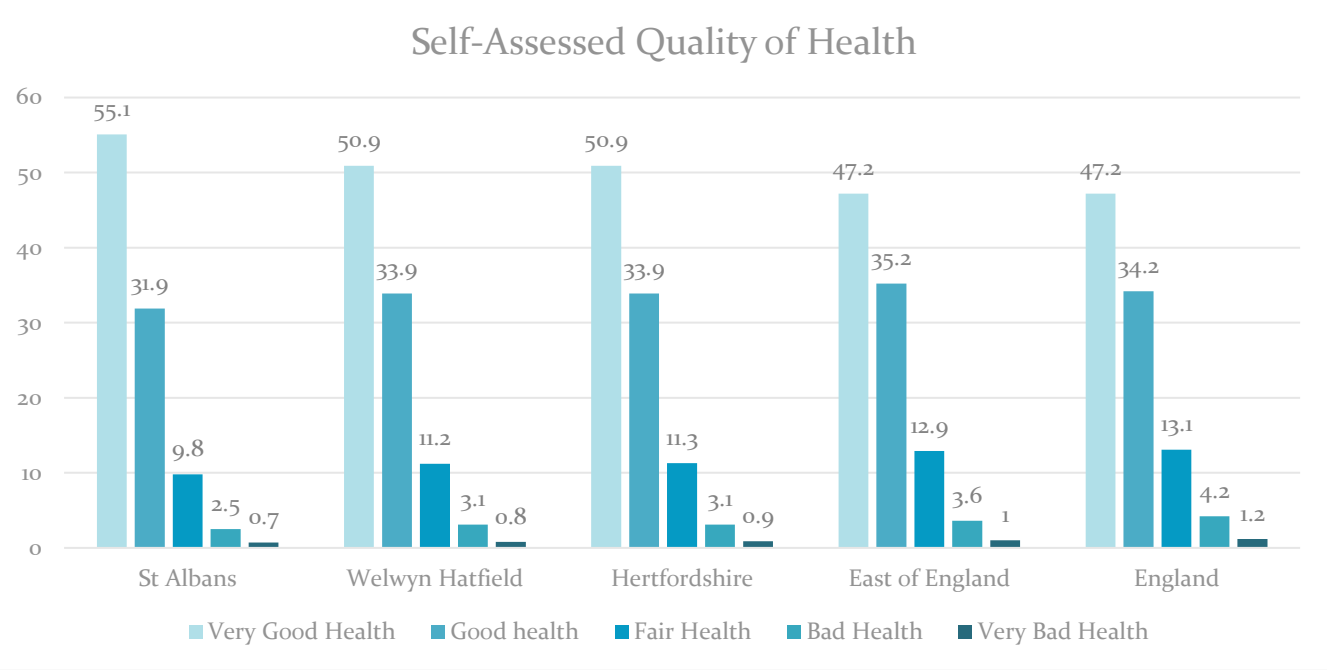
[16] data.police.uk
[17] Fingertips.phe.org.uk
[18] ONS, 2011

Figure 5-7
How Limited are Resident's Day-to-Day Activities



0.7% of the population of St Albans think they are in very bad health; 55.1% of the population think they are in very good health. For Welwyn Hatfield, these figures were 0.8% and 50.9%, respectively, and Hertfordshire was 1% and 50.9%. The national average for England is 1.2% and 47.2%, respectively, and have been displayed in **Figure 5-8**, below.

Figure 5-82
Self-Assessed Quality of Health



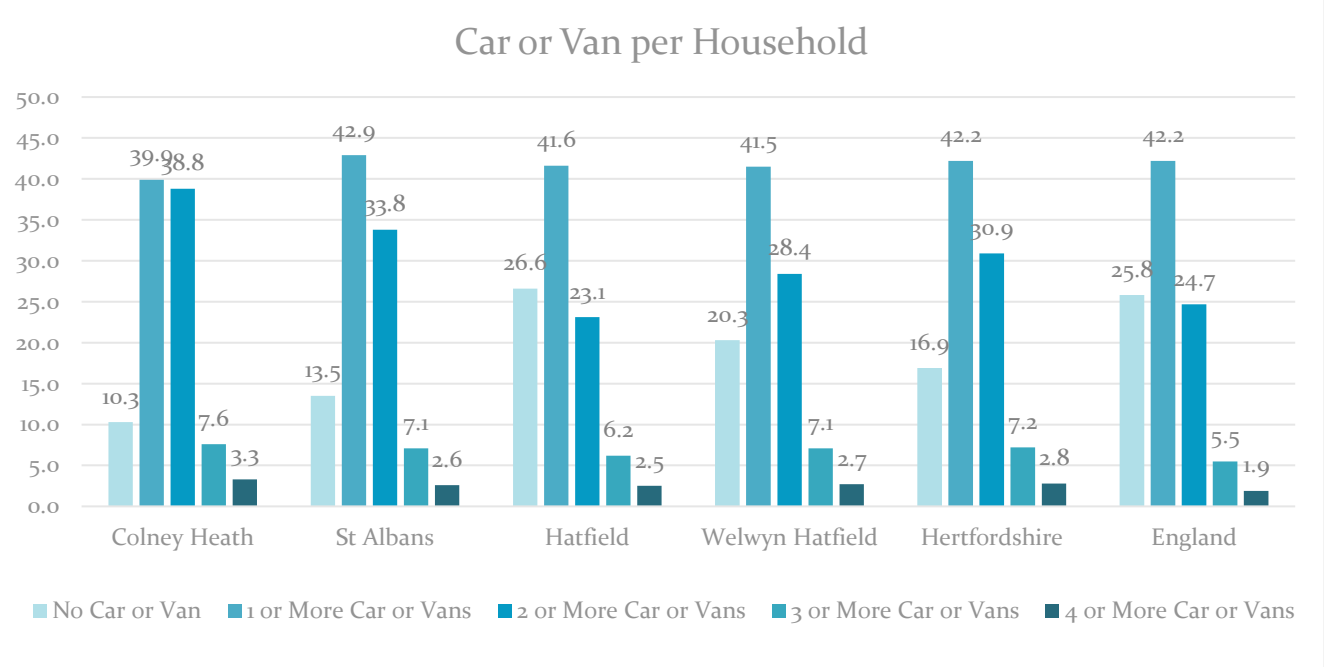
As an indicator of environmental health, the fraction of mortality attributable to particulate air pollution in 2019 for both, St Albans and Welwyn Hatfield was 5.8%[19], higher than Hertfordshire (5.1%) and England (5.4%).

From 2011-2012[20], of all local authorities in Hertfordshire, Welwyn Hatfield had the lowest prevalence of diagnosed asthma amongst their population (4.9%), whilst St Albans was equal (5.8%) to the county average, compared to 5.9% nationally. There were 0.8 asthma deaths per 1,000 people in Hertfordshire, compared to 1.1 nationally, with a relative risk of asthma death in 2012[21] in Welwyn Hatfield of approximately 0.9071, higher than St Albans at approximately 0.466.

5.1.7 Transport

According to the 2011 Census data, 26.6% of households in Hatfield do not own a car or van. This is higher than St Albans (13.5%), Welwyn Hatfield (20.3%), Hertfordshire County (16.9%) and England (25.8%). For Colney Heath, the percentage of the population who does not own a car was lower, 10.3%, as was those who own 1 or more cars, however, these figures are higher for multiple car ownership, the full statistics on car availability is shown below, in **Figure 5-9.**

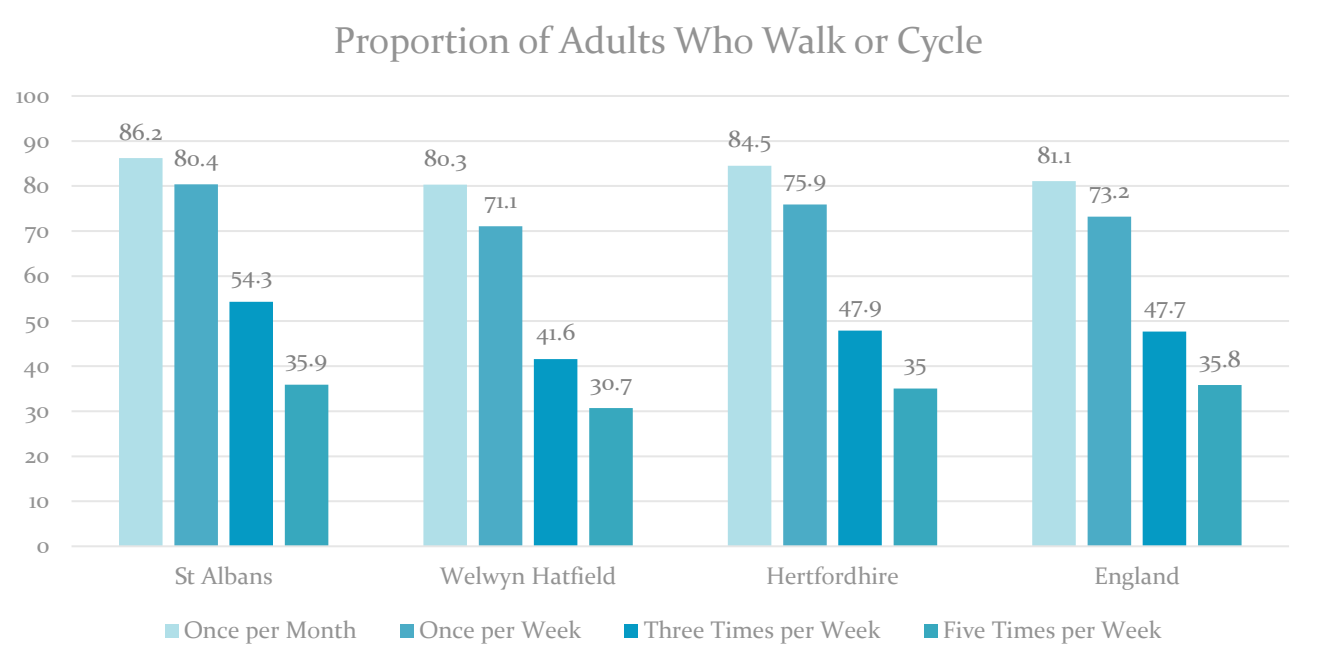
Figure 5-3
Car or Van Availability



According to the latest government published statistics (August 2020), the percentage of adults who cycle or walk at least once a month is higher in St Albans (86.2%) than in Welwyn Hatfield (80.3%) and the averages for Hertfordshire and England which are 84.5% and 81.1% respectively[22]. Further information on how active the LAIs are compared to the region and nationally can be seen below, in **Figure 5-10**.

[19] Fingertips.phe.org.uk
[20] Hertfordshire County Council - Needs Assessment for Respiratory Diseases in Hertfordshire
[21] British Lung Foundation - Asthma statistics
[22] https://www.gov.uk/government/collections/walking-and-cycling-statistics

Figure 5-10
Percentage of Adults Who Walk or Cycle



5.1.8 Greenspace

A report for Welwyn Hatfield Borough Council[23] highlighted that only 468 ha or 3.6% of the Borough is Accessible Natural Greenspace (ANG) – areas of greenspace which are readily accessible to residents. The report also stated that:

> *"Access to freely available natural and semi-natural space is more restricted in Hatfield than in other parts of the Borough. There is also significant deficiency in lateral links and access routes"*.

Whilst in St Albans, a 2011 report on Green Infrastructure[24] stated that:

> *"75% of the population lack access to an accessible natural green space within a 300m walk".*

Regarding total open space, a 2009 report from Welwyn Hatfield Borough Council[25] and a 2011 report for St Albans City and District Council[26] state that following composition of open space in Welwyn Hatfield Borough, detailed below in **Table 5-11**.

Table 5-11
Open Space Compositions

Type of Open Space	St Albans Total Area (ha)	St Albans (ha per 1,000 Residents)	Welwyn Hatfield Total Area (ha)	Welwyn Hatfield (ha per 1,000 Residents)
Allotment	47.3	0.13	13	0.13

[23] Welwyn Hatfield Borough Council - https://www.welhat.gov.uk/media/12942/1050356-Appendix-A-Green-Corridor-Ecosystem-Services-report-docx/pdf/1050356_Appendix_A_Green_Corridor__Ecosystem_Services_report._docx.pdf?m=636516143058170000
[24] St Albans City and District Council - Microsoft Word - 4993_St Albans_GIP_Final_Appendices_11_03_24.doc
[25] Welwyn Hatfield Borough - An Assessment of Welwyn Hatfield's Open Space, Outdoor Sport and Recreation
[26] St Albans City and District Council – Green Space Strategy 2011

Type of Open Space	St Albans Total Area (ha)	St Albans (ha per 1,000 Residents)	Welwyn Hatfield Total Area (ha)	Welwyn Hatfield (ha per 1,000 Residents)
Natural Green Space	359.1	2.41	629	6.29
Parks and Gardens	145.3	0.97	1,404	14.4
Provision for Children/Teenagers	9.0	0.06	5.68	0.06
Amenity Green Space	163.6	1.1	132.77	1.36
Outdoor Sports Facility	N/A	N/A	207	2.12
Green Corridors	N/A	N/A	200.78	N/A
Civic Spaces	N/A	N/A	1.3	N/A
Cemeteries	22.0	0.15	9.62	N/A

Table 5-12, from the Welwyn Hatfield report, gives the spatial distribution of open space in the district, in terms of site quality.

Table 5-12
Spatial Distribution of Open Space

Settlement Area	Very Good	Good	Average	Poor	Very Poor	Not Classified	Total Number of Sites
Welwyn Garden City	8	16	34	6	4	12	78
Hatfield and The Villages	3	29	40	6	3	5	86
Northern Villages	0	8	8	1	2	4	22
Southern Villages	2	10	10	2	0	8	30

This report further details the quality and composition of open space for the individual wards; the ward which the site is within (Hatfield North in this report) is shown below, in **Table 5-13** for the quality of open space and **Table 5-14** for the composition of open space.

Table 5-13
Quality of Open Space for Hatfield North

Type of Open Space	Quality
1 Allotments	Good
1 Cemetery	Average
1 Provision for Children/Teenagers (NEAPs)	Good
3 Provision for Children/Teenagers (LEAPs)	1 Very Good 2 Good
2 Provision for Children and/or Teenagers (LAPs)	1 Very Good 1 Average
3 Outdoor Sports Facilities (in community use)	1 Good 1 Average 1 Not Classified
3 Outdoor Sports Facilities (private)	3 Average
1 Park and/or Garden Limited to Public Rights of Way	Very Good

Table 5-14
Hatfield North Open Space Composition

Open Space Typology	Hectare per 1000 Population
Allotments	0.26
Parks	41.45
Amenity Green Space	2.75
Formal Play Provision	0.04
Accessible Natural/Semi-Natural Green Space	18.70
Outdoor Sports Facilities	All - 3.49 Community Facilities – 2.98

For St Albans, similar data was not available, however, the following data has been gathered for the LAI, Colney Heath, shown in **Table 5-15** below.

Table 5-15
Colney Heath Greenspace

Type of Space	Quantity Standard Need (ha)	Total Area (ha)	Shortfall (ha)	Distance Threshold	Population within Threshold (%)	Population within Threshold for Sites Rated 'Good' (%)
Allotment	3.3	1.8	1.5	10 min walk	52	48
Amenity Greenspace	N/A	Limited	N/A	300 metres	47	13
Natural Greenspace	2.75	0.75	2.0	600 metres	43	7
Toddler's Play	N/A	6.2	N/A	300 metres	25	0
Older Children's Play	N/A	6.2	N/A	450 metres	34	0
Teenagers	N/A	6.2	N/A	Walking; Cycling	Walking – 43 Cycling - 85	0

5.1.9 Deprivation

Indices of Multiple Deprivation[27] are published by government and are derived from a combination of income, employment, education, health, skills and training, barriers to housing and services, and crime to create an overall score of deprivation. They therefore provide a useful summary of many of the issues noted above.

Welwyn Hatfield

The most recent (2019) indices rank Welwyn Hatfield between 215th overall out of 317 local authorities in England (where 1 is the most deprived), a decrease from the ranking of 235th in 2015. This is mid-range for Hertfordshire, which is a diverse county, with several districts/boroughs in the top 25 least deprived areas, but also several in the bottom 150. The average of the LSOAs[28] within Welwyn Hatfield is 12,203 out of 32,844, ranking it slightly below average in terms of deprivation.

The proposed site spans across LSOAs Welwyn Hatfield 002F and 010G. LSOA 002F is in decile 7 of the LSOAs in Hertfordshire at a rank of 474th out of 690, an increase from 450th in 2015. Compared to the rest of Hertfordshire, 002F lowest scoring (most deprived) indices of "Outdoors" (73). The highest ranked indices, compared to Hertfordshire, was "Wider Barriers" (553).

LSOA 010G is lower, in decile 4 of the LSOAs in Hertfordshire at a rank of 269th out of 690, a decrease from 288th in 2015. Compared to the rest of Hertfordshire, 010G lowest scoring (most deprived) indices of "Barriers" (22).

[27] Data from https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019
[28] Lower-layer super output area, or LSOA, is a statistical area of approximately 1,700 residents used by the Office for National Statistics.

The highest ranked induces, compared to Hertfordshire, was “Crime” (553). **Figures 5-16** and **5-17** display the figures in detail.

Figure 5-16
LSOA 0002F in Hertfordshire

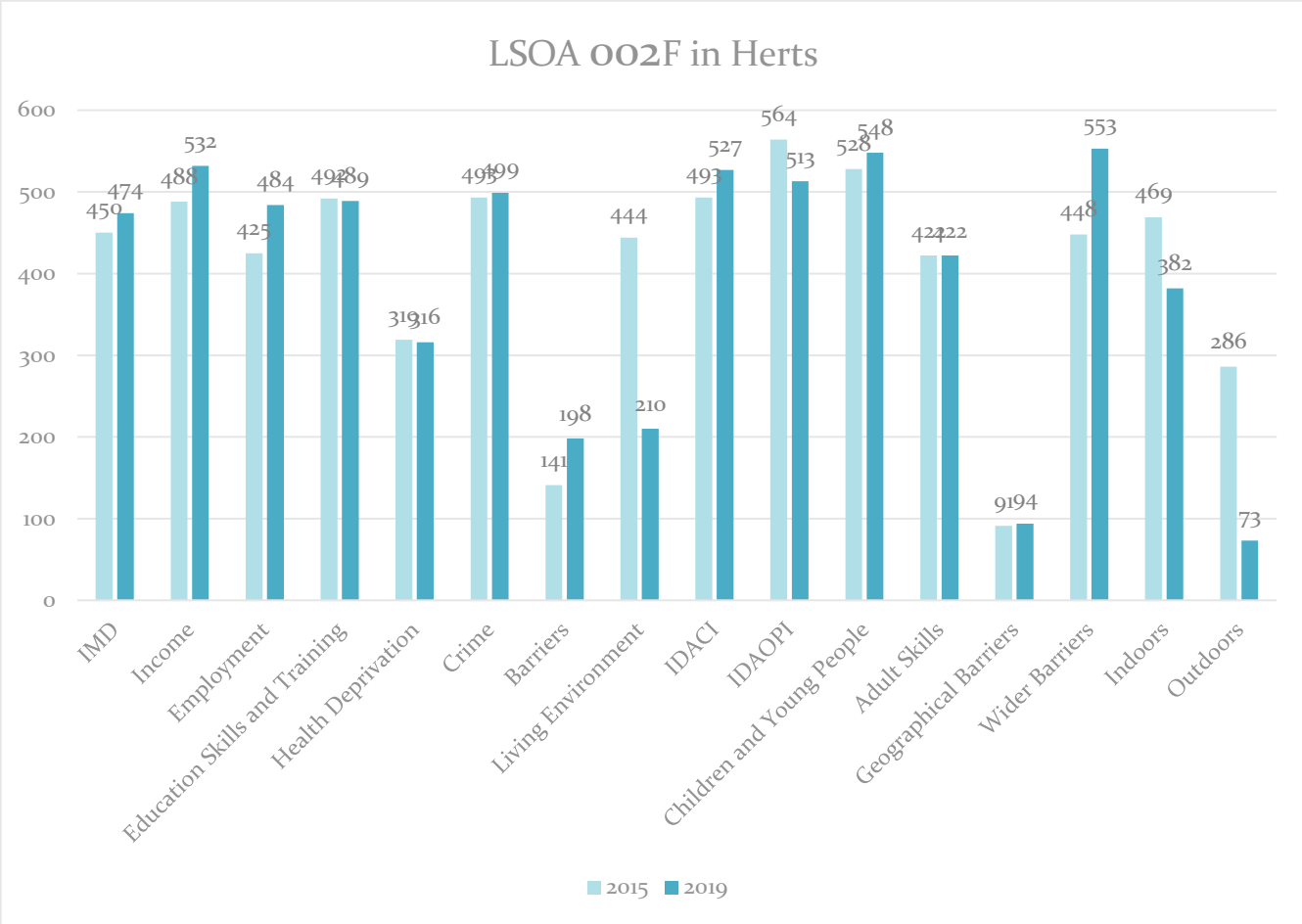
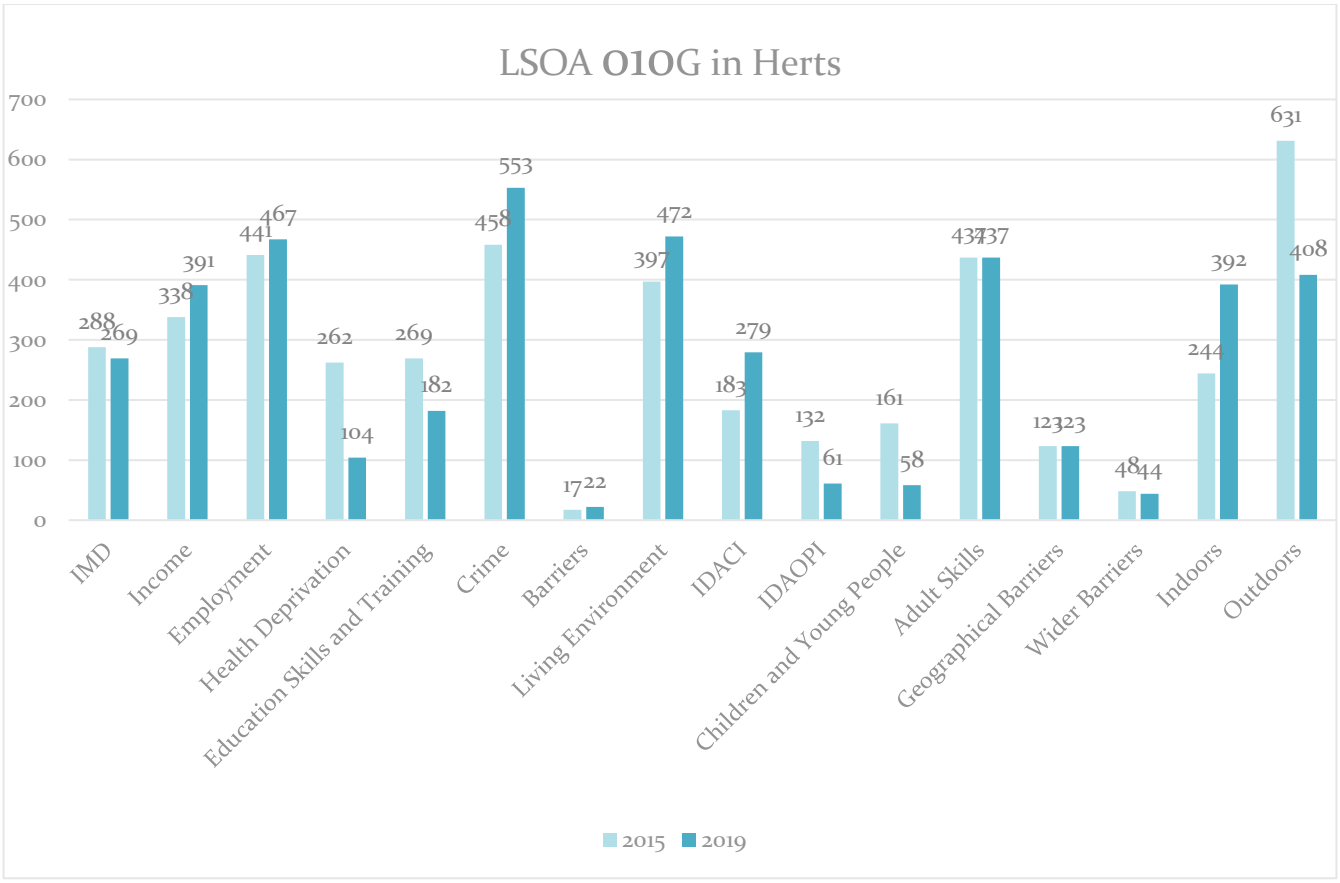


Figure 5-4
LSOA 010G in Hertfordshire



LSOA 0010F saw the greatest decrease (more deprived) from 2015 in "Outdoors" (-213) and "Living Environment" (-234) and the greatest increase (less deprived) was "Wide Barriers" (+105). Whilst LSOA 010G saw a substantial decrease in "Outdoors" (-223) and its greatest increase was "Indoors" (148).

Compared to the rest of England, 002F is in Decile 9 with a rank of 28,266 out of 32,844, whereas 010G is in Decile 6, with a rank of 19,631. The full data in a wider, English context is available below, in **Figures 5-18** and **19**.

Figure 5-18
002F in England

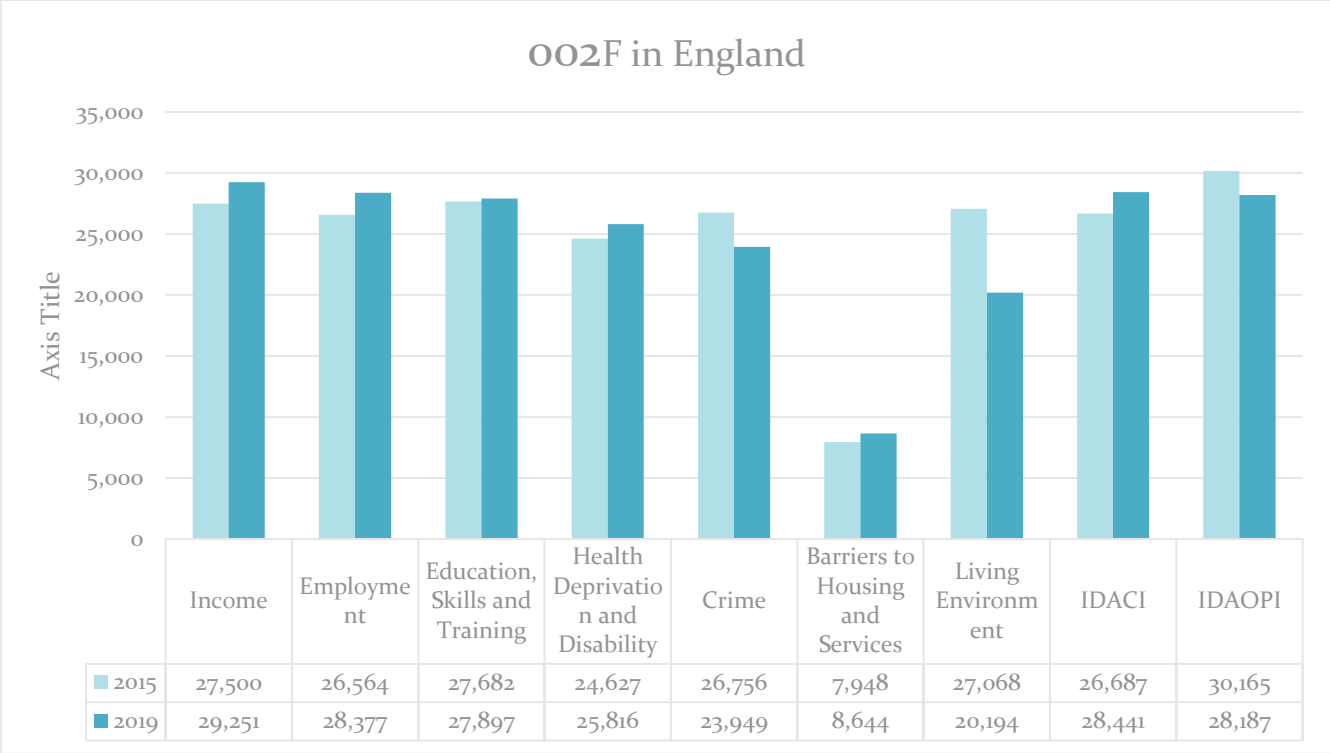


Figure 5-19
010G in England



For 0010F, "Barriers to Housing and Services" was the only induce ranked below 20,000 out of 32,844 (8,644) and "Income" was the highest ranked (29,251). The greatest decrease from 2015 (more deprived) was "Living Environment" (-6,874), whilst the greatest increase (less deprived) was "Employment" (+1,813).

Whilst in LSOA 010G, several induces ranked below 20,000, with the lowest being "Barriers to Housing and Services" at 1,735 and a high of 27,727 for the "Employment" induces. The greatest decrease was for "Health Deprivation and Disability" (5,364) and the greatest increase was IDACI (Income Deprivation Affecting Children Index) (3,657).

St Albans

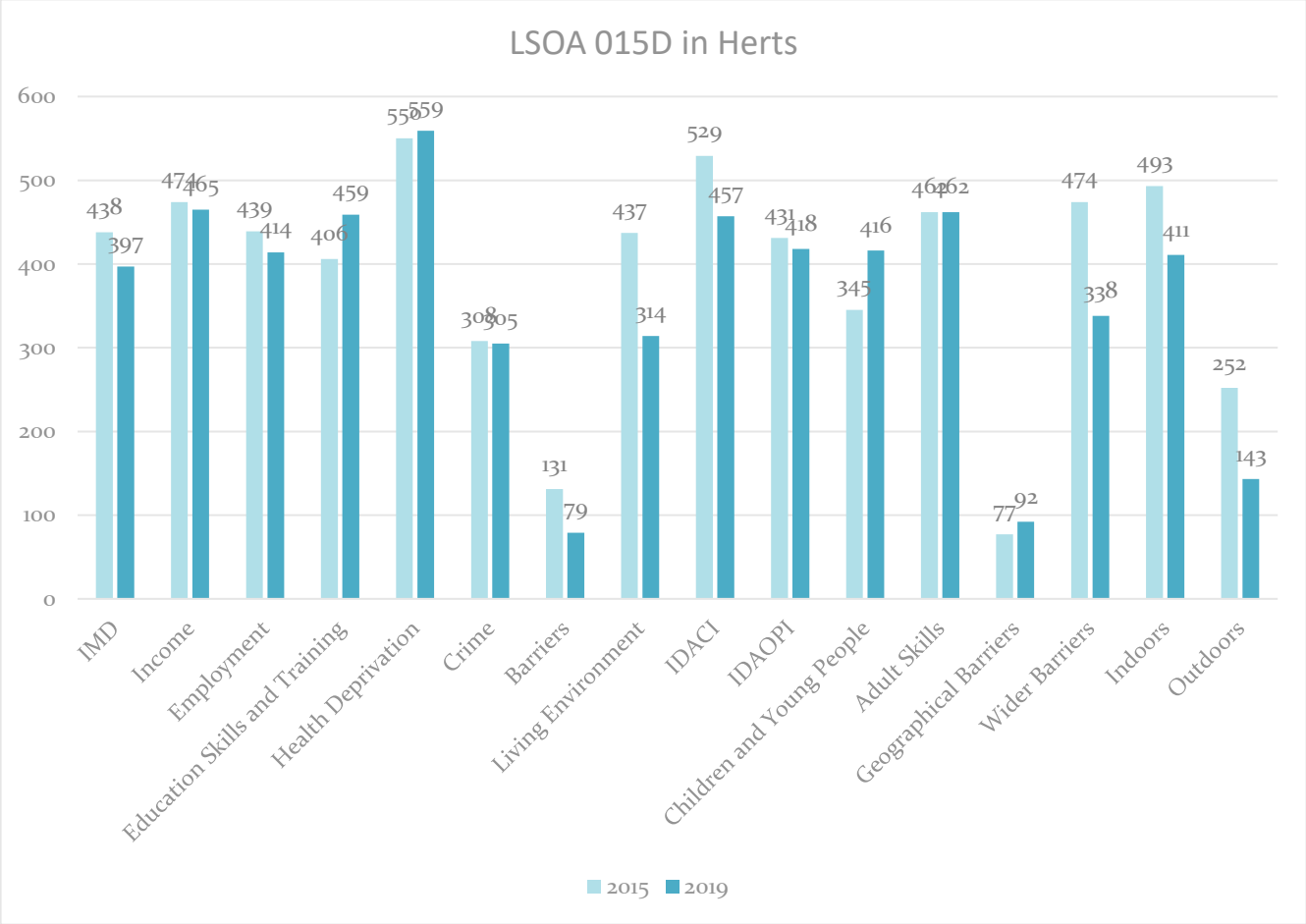
For St Albans District, data for the ward, Colney Heath, has been gathered to provide an insight into the levels of deprivation around the proposed development. The LAI lies partially within St Albans LSOA[29] 015D, extending from St Albans, east over the proposed development, to the suburb of Ellenbrook, in Hatfield.

Data from 2016[30] showed that St Albans as a whole was one of the least deprived towns/cities of England, with 55.1% of the town in the least deprived 20% deciles and 0 areas in the top 20% most deprived areas of England. In terms of LSOAs, St Albans has 75.5% in the top 20% of the least deprived LSOAs in England.

The most recent (2019) indices rank St Albans district 306th overall out of 317 local authorities in England (where 1 is the most deprived), a decrease from the ranking of 320th in 2015. This is mid-range for Hertfordshire, which is a diverse county, with several districts/boroughs in the top 25 least deprived areas, but also several in the bottom 150.

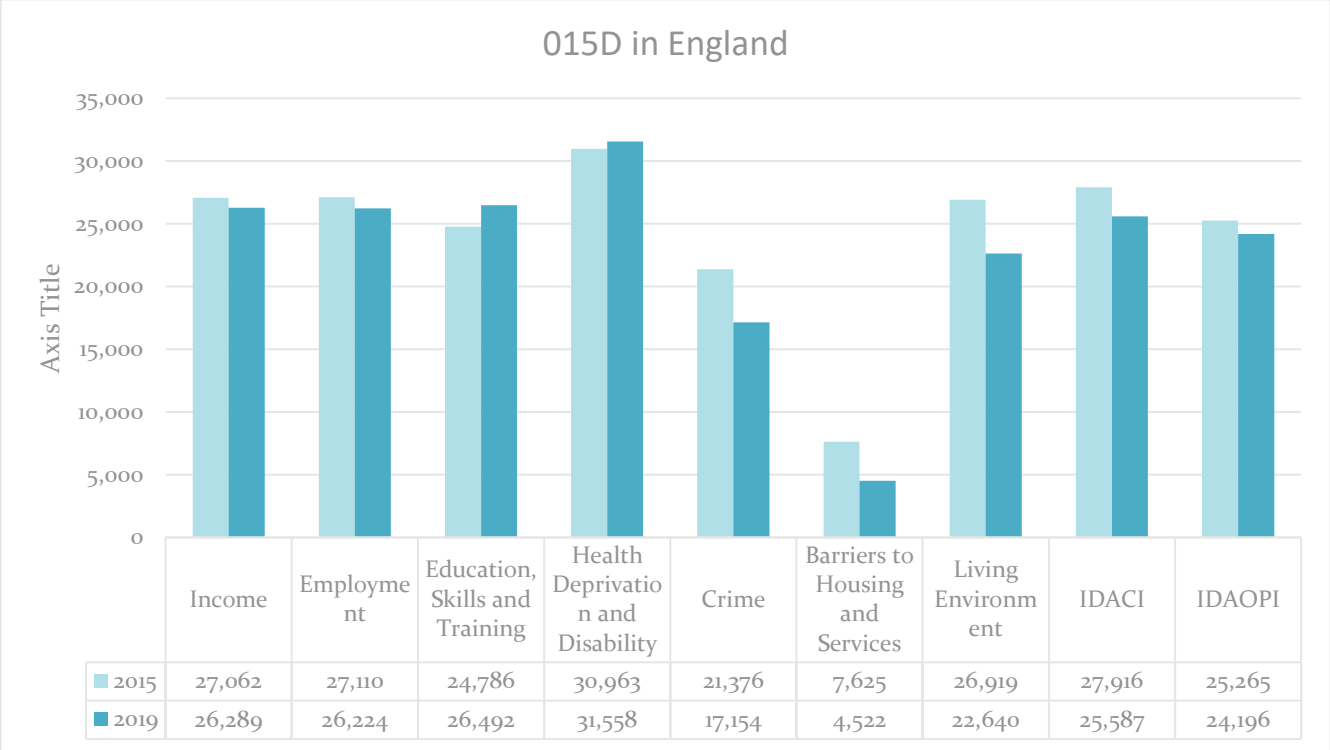
As mentioned, within St Albans district the proposed site crosses over from Welwyn Hatfield into LSOA 015D. Relative to the wider Hertfordshire County, 015D is mid-range in terms of deprivation, in decile 6, it is ranked 397th out of the 690 LSOAs in Hertfordshire. Compared to the rest of Hertfordshire, 015D's lowest scoring (most deprived) was "Barriers" (79) and its highest scoring domain (least deprived) was "Health Deprivation" (559), **Figure 5-20** displays the information in greater detail.

[29] Lower-layer super output area, or LSOA, is a statistical area of approximately 1,700 residents used by the Office for National Statistics.
[30] ONS - Home People, population and community Housing Towns and cities analysis, England and Wales, March 2016
Towns and cities analysis, England and Wales, March 2016.



LSOA 015D saw the greatest decrease (more deprived) from 2015 in “Wider” (-136) and the greatest increase (less deprived) was “Children and Young People” (+71).

Compared to the rest of England, 015D is in Decile 8 with a rank of 25,404 out of 32,844. The full data in a wider, English context is available below, in **Figure 5-21**.



	Income	Employment	Education, Skills and Training	Health Deprivation and Disability	Crime	Barriers to Housing and Services	Living Environment	IDACI	IDAOPI
2015	27,062	27,110	24,786	30,963	21,376	7,625	26,919	27,916	25,265
2019	26,289	26,224	26,492	31,558	17,154	4,522	22,640	25,587	24,196

For 015D, “Barriers to Housing and Services” and “Crime” were the only induce ranked below 20,000 out of 32,844 (4,522 and 17,154, respectively) and “Health Deprivation and Disability” was the highest ranked (31,558). The greatest decrease from 2015 (more deprived) was “Living Environment” (-4,279), whilst the greatest increase (less deprived) was “Education, Skills and Training” (+1,706).

6.0 ASSESSMENT OF HEALTH IMPACTS

Based on the scoping exercise summarised in **section 4.0**, and the baseline review undertaken in **section 5.0**, an assessment and summary of the relevant potential health and wellbeing effects is included in **Table 6-1** below. Much of the information is based on the findings of the comprehensive ES which accompanies the planning application. The table therefore provides a summary of the assessment for each health and wellbeing determinant and a cross reference is provided where appropriate to the relevant ES chapter, technical appendices and other planning application documents. **Table 6-1** is based on the Health and Well-being Determinants Checklist set out in Appendix 1 of the WHIASU Toolkit.

Where applicable, the assessment identifies if there is a disproportionate effect on vulnerable or disadvantaged groups in the local communities, thereby impacting health inequalities. A guide to vulnerable or disadvantaged groups is provided in Appendix 2 to the WHIASU Toolkit, and comprises the following:

Age related groups

- Children and young people
- Older people

Income related groups

- People on low income
- Economically inactive
- Unemployed/workless
- People who are unable to work due to ill health

Groups who suffer discrimination or other social disadvantage

- People with physical or learning disabilities/difficulties
- Refugee groups
- People seeking asylum
- Travellers
- Single parent families
- Lesbian and gay and transgender people
- Black and minority ethnic groups
- Religious groups

Geographical groups

- People living in areas known to exhibit poor economic and/or health indicators
- People living in isolated/over-populated areas
- People unable to access services and facilities.

Table 6-1
Assessment of Potential Health and Wellbeing Impacts

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
Lifestyles			
Diet	Not applicable to the proposed development		No
Physical activity	The proposed development includes provision for public access including walking and cycling as part of the restoration scheme. Sustainable and active travel options are available for site staff, in particular walking using the pedestrian footways along the A1057.	Cycling options are less favourable, as there is no separate cycle track available and the road is relatively narrow, although it should be noted that average traffic speeds are relatively low at 33-35 mph (see ES **Chapter 7: Transport**).	It is recommended that support is given to employees who wish to use sustainable / active travel options, including covered cycle parking, lockers and showers.
Use of alcohol, cigarettes, non-prescribed drugs	Not applicable to the proposed development	n/a	No
Sexual activity			
Other risk-taking activity			
Social and Community influences on health			
Family organisation and roles	Not applicable to the proposed development	n/a	No
Citizen power and influence			
Social support and social networks			

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
Neighbourliness			
Sense of belonging			
Local pride			
Divisions in community			
Social isolation			
Peer pressure			
Community Identity	The application site does not have any formal land use since closure of Hatfield Aerodrome in c. 1994. The site forms part of, and is identified with, the former aerodrome which is the subject of informal access and other recreational activities, such as the Hatfield Aerodrome History Trail which was opened in November 2010 to mark the 60th anniversary of the opening of the airfield by the de Havilland Aircraft Company. A small part of the application site (on the eastern edge) is used for conservation cattle grazing, with areas within the western part of the application site forming hay meadow. The majority of the application site is used by the local communities for informal recreational uses through a network of linking permissive footpaths, suitable for walkers and cyclists, created by the landowner. A formal public footpath is routed in the vicinity of the western boundary of the application site. As a result of the permissive uses described above, the site has	The Restoration Scheme would provide benefits in terms of a net increase in habitats and additional woodland planting. It would also returning the land to public access, creating a Country Park. Cycle and pedestrian routes around the site would be improved as part of the development. To minimise the loss of land for public use the operations would be phased, with changes made to the layout of paths within the site to maintain access to unworked areas and connectivity to other rights of way outside of the site. Local air quality monitoring would help to provide the younger generation with an educational experience of relevance to the local area within which they live. It would provide an opportunity for them to cascade this information to their guardians and bring forward positive environmental behaviour in the future. It would also help to provide greater understanding and	No

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
	gained a level of community value in the years since closure of the aerodrome. Extraction and restoration would be carried out in phases, reducing the area available to the public. Inevitably areas would therefore be removed from community use for some time until they are restored to a suitable condition for public access.	discussion of any air quality questions related to the proposed mineral extraction. The School has been offered the opportunity to take part in this project. CEMEX/GCE await a response from the School, and their offer to them remains.	
Cultural and spiritual ethos	Not applicable to the proposed development	n/a	No
Racism			
Other social exclusion			
Living/ environmental conditions affecting health			
Built environment	Not applicable to the proposed development	n/a	No
Neighbourhood design			
Housing			
Indoor environment			
Noise	An assessment of noise has been undertaken and is reported in **Chapter 10 of the ES**. The assessment has considered the potential impacts generated by the proposed development on the nearest noise-sensitive receptors, taking account of initial site set-up (construction) and operation including noise generated by the processing plant. It should be noted that working hours are limited to the normal working week and therefore noise would	The assessment found that the maximum level of noise produced would be at or below the accepted limits in the relevant guidance (i.e. below 70dB(A) for construction and 55dB(A) for operations). Good site design measures have been incorporated into the scheme and additional good practice management measures are	No

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
	not be an issue in the evening, night time or Saturday afternoon and Sundays. People who are at home during daytime hours including the unemployed, older people, those with ill health and people working shifts may be disproportionately affected by noise associated with the proposed development.	suggested in **Chapter 10** that would further reduce any nuisance resulting from site noise.	
Air and water quality **(NO_2 emissions)**	A detailed technical assessment has been undertaken of air quality associated with the proposed development, including traffic movements, and is reported in full in the **ES Chapter 9**, together with **Appendices 9/1 and 9/2 of the ES**. In accordance with relevant UK guidance, the impact of the development on annual mean nitrogen dioxide (NO_2) concentrations has been assessed at all existing receptors and is considered to be 'negligible'. Furthermore, NO_2 levels are calculated to be 'well below' the Environment Agency's relevant Air Quality Assessment Levels (AQAL). Effects associated with annual mean NO_2 concentrations at all assessed receptor locations are therefore considered to be 'not significant', despite the conservative nature of the applied assessment methodology. The ambient air quality standards of relevance to human receptors in this assessment (collectively termed (AQALs) are provided in Error! Reference s ource not found. of the ES.	No additional mitigation required over and above the standard 'good practice' measures set out in **Table 9/11 of the ES**.	No

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
	People with underlying health conditions may be disproportionately affected by NO_2 emissions		
Air and water quality **(Windblown dust (particulate matter) from onsite activities (health effect))**	As above for NO_2 detailed technical assessment has been undertaken of air quality associated with the proposed development, including traffic movements, and is reported in full in the **ES Chapter 9**, together with **Appendices 9/1 and 9/2 of the ES**. In accordance with relevant guidance, the impact of the development on annual mean particulate matter (PM_{10} and $PM_{2.5}$) concentrations at all assessed existing receptors is considered to be 'negligible'. Furthermore, PM_{10} and $PM_{2.5}$ levels are calculated to be 'well below' the AQAL. Cumulative effects associated with annual mean PM_{10} and $PM_{2.5}$ concentrations at all assessed receptor locations are therefore considered to be 'not significant', despite the conservative nature of the applied assessment methodology. People with health conditions such as asthma may be disproportionately affected by dust emissions.	No additional mitigation required over and above the standard 'good practice' measures set out in **Table 9-11 of the ES (Chapter 9)**.	No
Air and water quality **(Dust from HGVs)**	PM10 and PM2.5 emissions (tailpipe, brake, tyre and wear) from vehicles generated by operational activities at the proposed development have been accounted for within the dispersion modelling assessment using the latest edition of Defra's Emission Factor Toolkit (v10.1) and reported in **ES Chapter 9**, together with **Appendices 9/1 and 9/2 of the ES**. This considered both HGVs generated by the	No additional mitigation required over and above the standard 'good practice' measures set out in **Table 9-11 of the ES (Chapter 9).**	No

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
	site, as well as baseline traffic on the public road network. Furthermore, fugitive emissions of total suspended dust (TSP), PM10 and PM2.5 generated from on-site HGVs/mobile machines travelling along internal unpaved road lengths were considered within the modelling assessment, with use of emission factors provided within US EPA AP42.		
Air and water quality **(Dust deposition (amenity or well-being effect))**	From review of results presented in **Appendix 9/1** of the ES, the maximum modelled dust deposition rate at any human receptor considered was 7.5mg/m^2/day. This equates to only 3.7% of the applied assessment limit of 200mg/m^2/day. Effects associated with dust disamenity can therefore be classed as insignificant. There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist as it is a subjective concept, and its perception is highly dependent upon the existing conditions and the change which has occurred. The EA's dust monitoring guidance (M17) proposes uses a limit of 200mg/m^2/day as a guide at which the onset of nuisance might be experienced.	Dust deposition can be considered an 'amenity' issue that has implications for well-being. No additional mitigation required over and above the standard 'good practice' measures set out in **Table 9-11 of the ES**	No
Air and water quality **(Silica)**	Detailed modelling in relation to respirable crystalline Silica (RCS) has been undertaken for the emissions from the proposed works as detailed in **ES Chapter 9** and **Appendix 9/2**. The modelling assumed (as a worst case) that all PM_{10} was Silica, and the results were compared to the US standard of	The Applicant undertakes occupational exposure monitoring and assigns Personal Protective Equipment (PPE) as appropriate. Experience at other sites operated by the Applicant is that they have never had an exceedance, and are rarely above detection limits.	No

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
	3ug/m3 as an annual mean (AQAL) as there is no standard for the UK. The results showed that no sensitive receptor including nearby residential properties exceeded 10% of the AQAL. In accordance with standard guidance, the air quality assessment for the purposes of EIA does not take account of impacts on site workers. Site workers are protected by compliance with Health and Safety at Work legislation, which includes a requirement for monitoring. People with health conditions such as asthma may be disproportionately affected by silica emissions.	No mitigation is required for the general public.	
Air and water quality **(Water quality incl. bromate contamination)**	A comprehensive assessment of the water environment has been undertaken and is reported in **Chapter 6** of the ES. The application site is located within the Total Catchment Zone (SPZ3) and Outer Source Protection Zone (SPZ2) of two public water supply wells (Hatfield and Colney Heath) located 1,500m south-east and 2,200m south south-east from the application site, respectively. There are eight active licensed groundwater abstractions and no active licensed surface water abstractions within 2km of the application site. The site is within an area considered to be at risk of incursion from historical contamination of the underlying Chalk aquifer.	Proposed mitigation measures especially with regard to the historical bromate contamination up are set out in **Chapter 6** and associated appendices, including a Groundwater Management Plan. As there will be no pumping of groundwater from the Lower Mineral Horizon (LMH) the potential for drawing impacted groundwater into the site is considered to be low. However, wet digging of mineral from beneath the LMH could create short lived local changes in groundwater head which could conceivably induce a local gradient towards the site. Consequently, the following design and operational measures are proposed: • the groundwater in the LMH in the proposed mineral extraction area is not impacted by bromate and the location and direction of plume migration is	No

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
		parallel to rather than towards the excavation areas. • a 100m standoff from the closest known bromate impacted groundwater will be implemented to mitigate the potential for 'pulling' the bromate plume towards the excavation site. • Phases A and B, located between the plume and the site, would be worked first, thereby physically isolating subsequent mineral phases from the offsite plume • Infilling of the LMH in Phase A and B with low permeability material will provide a barrier to flow from the eastern side of the site further reducing a pathway for bromate migration, and • a groundwater and water management plan agreed with the Environment Agency and Affinity Water prior to works commencing includes a comprehensive monitoring programme, and a mechanism for stakeholder engagement in advance of mineral works. Together this will ensure that mitigation measures described above are effective and to agree contingency actions, as necessary. As a result of the proposed mitigation measures listed above, the potential effect is mitigated to 'minor' which is not significant.	

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
Air and water quality **(Flood risk)**	A Flood Risk Assessment has been undertaken and is reported in full in the **ES Appendix 6/9**. Whilst part of the site is within Flood Zone 2, the proposed works lie in Flood Zone 1. Moreover, based upon the low vulnerability of the proposed development land uses, any localised and shallow ponding of surface water towards the fringes of the application site poses minimal impact upon the function of the application site. The proposed infilling to achieve the design restoration levels introduces a risk that surface water rates would be increased.	It is proposed that surface water runoff would be discharged offsite using a two-tier approach. The primary mitigation would be for surface water runoff to be intercepted by a network of lined swales and ponds before discharging to the infiltration lagoon in the east of the site. Secondary control would be provided by an overflow arrangement into the River Nast at the south east boundary of the site to ensure that discharged rates are controlled.	No
Attractiveness of area	A landscape and visual impact assessment (LVIA) has been undertaken and is reported in full in **Chapter 8** of the ES and related appendices. The LVIA concluded that there would be limited visual impacts arising from the proposed development; change may be discernible from some residential properties but underlying landscape character or view composition would be similar to existing. A slightly greater level of visual impact would be experienced by users of certain public rights of way and recreational users of Ellenbrook Fields. Any adverse impact would be temporary during operation phases, but becoming beneficial after phased restoration.	The diversion of the rights of way and areas of permissive access around the site perimeters would move visitors to this part of Ellenbrook Fields along landscaped corridors that are of similar character to existing routes and/or across the new internal access roads and over undisturbed areas. These routes would then be progressively reinstated as part of final restoration.	No
Green space	Due to the nature of the development, there would be a temporary loss of accessible greenspace during the operation of the proposed quarry.	The proposed development would result in temporary reduction in green space accessibility but long term benefits in terms of biodiversity and access for the local community. Whilst there would be a loss of access for several years, other	No

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
	The restoration objectives include delivering improvements to biodiversity interest and value at the site. Restoration would be delivered progressively following each phase of extraction to minimise the period of loss of greenspace. Reinstatement of footpaths and public access would also take place during the aftercare period, when it is considered safe to do so and where it won't be detrimental to the establishment of the habitats and land cover. Green spaces in the area beyond the site would not be affected by the proposed development. Access to local green space disproportionately impacts people on lower incomes who may not be able to access paid-for leisure facilities or travel to more remote green space.	recreational land is available and public rights of way would be diverted to maintain accessibility. The phased nature of the operations would keep the loss of green space to a minimum. The phased working scheme (as illustrated on **Drawings HQ 3/3** to **3/15**) allows for access to be maintained to unworked areas, with a further network of paths link with other rights of way in the wider area. Existing footpaths over the extension areas for each phase of extraction would be diverted around the extension area, with appropriate replacement pathways linking existing rights of ways with the broader network. Diversions would have signage and interpretation boards indicating the diversion and workings. Stock proof fencing would be installed along the area boundaries to maintain the safety of recreational users (**Chapter 8** of ES and **Drawings HQ 3/3** to **3/15**). Phase A area is to be infilled and restored with unimproved neutral-acidic grassland, shrub, and tree planting across 5.9ha and parts of the perimeter soil bund, on the southern edge of Phase A area, are to be retained as a low berm around the site for recreational access and allowing for views of the landscape (illustrated on Drawing HQ 3/15). The northern section of the public right of way is to be diverted around the site perimeter, this	

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
		would be along an enhanced ecological corridor and landscape, providing new tree and scrub planting, and hedgerows, detailed in **Chapters 8** and **11** of the ES. New crossing points would be installed, where appropriate, with signage, to connect diverted, new and existing pathways to themselves and the wider network (**Chapter 8** of ES and **Drawing HQ 3/13**).	
Community safety	The proposed development will introduce a new area of mineral working into an area that is used for informal recreation. This may disproportionately impact on people in younger age groups especially children and young people using the green space but not accompanied by adults.	Secure fencing in accordance with Mines and Quarries legislation will be provided. Site management will ensure that the perimeter fence is regularly inspected and any breaches are secured and permanently repaired as soon as possible.	No
Smell / odour	There is no potential for smell / odour arising from the proposed development as the materials being extracted and the imported materials being backfilled would be inert.	n/a	No
Waste disposal	The proposed development includes infilling of the site with imported inert waste materials once backfilling with in situ soils has raised levels above the water table. Materials would be sourced from the construction and demolition waste sector within the region.	Management and control of imported materials would be regulated through the Environmental Permit. Each load imported would be inspected at the weighbridge for compliance with the waste transfer documentation. If the load is found to be inconsistent, the importing vehicle would be turned away such that only inert materials are accepted on the site.	No

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
Road hazards	A detailed audit of the existing highway conditions has been undertaken (see **ES Chapter 7**) which includes a review of the local accident history in the proximity of the application site. It concludes that the proposed operational traffic route is suitable for the development proposals would provide access to the county's principal roads, whilst limiting impact to residential areas. Young people and people using active travel methods (walking, cycling) may be disproportionately impacted by road hazards.	Mitigation measures are proposed to facilitate safe access to the site, whilst also offsetting the potential impact caused by additional HGV traffic on the surrounding road network. These include maintenance of adequate sight lines at the site entrance, measures to ensure that material is not transferred onto the public highway, vehicle routing arrangements and signage.	No
Injury hazards	There is a potential risk of injury to site workers through occupational hazards including trips and spills.	Health and safety at quarry sites is rigorously managed in accordance with the Quarries Regulations 1999 which are strictly enforced by the Health and Safety Executive. The applicant, Brett Aggregates, has an exceptional record in health and safety and maintains a strict management protocol on all its sites for the protection of its employees. Brett operates an integrated management system 'QHEST', which stands for 'Quality, Health, Environment & Safety Together' across its business. The company continually promote a positive SHE (Safety, Health and Environment) culture through a variety of approaches including tool box talks, near miss recording and the 'Alive and Well' (A&W) programme which includes regular discussions about SHE issues with employees at all levels.	No

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
Quality and safety of play area	There are no proposals for public access within the site during the operational phase. The proposed restoration of the site, which includes for infilling with inert waste, is intended to raise the levels of the restored land above the water table to achieve a safe and sustainable after use. Young people are likely to be disproportionately impacted by the quality and safety of play areas.	The proposed final landform (as illustrated on **Drawing HQ 3/15**) would provide a sustainable and safe land use following extraction.	
Economic conditions affecting health			
Unemployment	Unemployment levels generally within the Hertfordshire area are relatively low compared with the regional and national average (see section 5.1.2). However, the average figures can disguise pockets of relatively high unemployment, such that Hatfield Villages which is significantly above the local, regional and national average. The quarry would have a core staff of six employees, increasing to ten during earthmoving works which would be undertaken on a campaign (temporary) basis. Indirect employment opportunities would be generated through the provision of goods and services to the proposed development including haulage, maintenance and engineering contractors, and landscaping contractors. The proposed development would introduce a relatively small number of direct jobs to the local area, but these jobs are nevertheless important in	It is considered that the type of jobs that would be provided on site and in the supply chain could support disadvantaged groups including low income and low skilled workers that would embrace the opportunity to upskill. Opportunities for people who are currently unable to work due to ill heath, including mental health, or disability may be limited by the nature of the work in some positions, but the Applicant has a policy of positively working with existing and potential staff to make the workplace suitable for a wide range of abilities. The company operates an Equal Opportunities Policy which sets out its commitment to promoting equality, diversity and inclusion among its workforce, and eliminating unlawful discrimination in recruitment and employment. This includes a zero-tolerance approach to any form of discrimination.	No, but it is recommended that a programme of skills training is provided for all site employees.

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
	providing opportunities for semi-skilled and unskilled workers seeking full-time employment. Jobs in the quarry industry in general are well supported by provision of skills training, partly in response to the need to ensure health and safety compliance. In addition to direct employment there would be knock-on benefits to jobs in the local supply chain, including hauliers and other suppliers of goods and services.		
Income	As with unemployment there is variability with Hertfordshire, and Welwyn Hatfield is lower than the Hertfordshire average (see section 5.1.2).	The provision of additional jobs especially full-time employment for semi-skilled and unskilled workers can be seen as a significant contribution to the opportunities available to the local labour force. The jobs available represent full time work that is neither seasonal nor zero hours contracts.	No, but it is recommended that measures are adopted to employ workers from the local community, including local advertising of jobs and provision of transport to work if required.
Economic inactivity	The operation of the quarry would result in direct and ongoing employment opportunities and as such would contribute to local employment and skills development. The quarry would have a core staff of six employees, increasing to ten during earthmoving works which would be undertaken on a campaign (temporary) basis.	It is considered that the type of jobs that would be provided on site and in the supply chain would support disadvantaged groups including low income and low skilled workers that would embrace the opportunity to upskill. Opportunities for people who are currently unable to work due to ill heath, including mental health, or disability may be limited by the nature of the work in some positions, but the Applicant	No, but it is recommended that measures are adopted to employ workers from the local community, including local advertising of jobs and provision of

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
	Indirect employment opportunities would be generated through the provision of goods and services to the proposed development including haulage, maintenance and engineering contractors, and landscaping contractors.	has a policy of positively working with existing and potential staff to make the workplace suitable for a wide range of abilities and operates an Equal Opportunities Policy.	transport to work if required.
Type of employment	The type of employment that would be generated by the proposed development represents full time work that is neither seasonal nor zero hours contracts. The type of work required for site staff generally requires a level of physical activities, although certain positions such as weighbridge operator may be less demanding.	The relatively permanent nature of the employment opportunities at the proposed development lend themselves to a programme of skills training and career progression. The Applicant's Equal Opportunities Policy should be applied positively to ensure that disadvantaged groups such as people with physical disabilities, single parents or those with no access to private transport are not deterred from applying for positions at the site.	No, but it is recommended that a programme of skills training is provided for all site employees.
Workplace conditions	Workplace conditions within a quarry environment can be challenging in that much of the work is outdoors and subject to seasonal weather conditions. People with underlying health conditions may be disproportionately impacted by challenging workplace conditions.	As noted above, the quarry industry in general and the Applicant in particular places particular emphasis on health and safety training and skills training to ensure that all staff are equipped to work in the challenging environment. Much of the work is concerned with operation of heavy plant and machinery, much of which is provided with climate control. Nevertheless, workplace conditions at certain times of year may be less than ideal.	No, but it is recommended that staff accommodation on site should be designed in accordance with leading industry standards, including provision of changing rooms, showers, and canteen facilities.
Access and quality of services			
Medical services	Not applicable to the proposed development	n/a	No

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
Other caring services			
Careers advice			
Shops and commercial services			
Public amenities			
Transport including parking	Access to the proposed development would be via the A1057, which has 'A' road status. In the vicinity of the site, the road is a single carriageway road with pedestrian footways and streetlights. There is adequate provision within the site design for car parking for all employees. Employees and potential employees without access to their own vehicle may be disproportionately impacted by the distance of the site from residential areas.	Sustainable and active travel options are available, in particular walking using the pedestrian footways. The A1057 is provided with relatively frequent bus services between Hatfield and St Albans. Cycling options are less favourable, as there is no separate cycle track available and the road is relatively narrow, although it should be noted that average traffic speeds are relatively low at 33-35 mph (see ES **Chapter 7: Transport**).	No, but it is recommended that support is given to employees who wish to use sustainable / active travel options, including covered cycle parking, lockers and showers.
Education and training	Jobs in the quarry industry in general are well supported by provision of skills training, partly in response to the need to ensure health and safety compliance. Other aspects of training relate to management skills, information technology, and the environment.	The Applicant has an excellent track record of providing skills training for its employees. It also operates a graduate training programme.	No but it is recommended that a programme of skills training is provided for all site employees.
Information technology	The quarrying industry is increasingly making use of information technology including in areas of quarry	Opportunities exist for staff to be given experience and training in a variety of information technology applications, adding to	No, but it is recommended that a programme of skills

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
	surveying and planning, machine maintenance, and sales.	their own skills base and that of the local population generally.	training is provided for all site employees.
Macro-economic, environmental and sustainability factors			
Government policies	Government policy as set out in paragraph 203 of the National Planning Policy Framework (NPPF) confirms that "*It is essential that there is a sufficient supply of minerals to provide the infrastructure, buildings, energy and goods that the country needs*". Paragraph 205 of the NPPF requires that, when determining planning applications, "*great weight should be given to the benefits of mineral extraction, including to the economy*". Part b) and c) of paragraph 205 requires mineral planning authorities, when considering proposals for mineral extraction, to ensure that there are no unacceptable adverse impacts on the natural and historic environment, human health or aviation safety.	The proposed development would make a substantial contribution to future supply of minerals for the construction industry. This is set out in Chapter 5 of the Planning Statement (Need). The ES demonstrates that the proposal can be undertaken without significant adverse impacts. There would be benefit from the essential supply of raw materials for construction, ongoing employment and economic growth.	No
Gross Domestic Product	Gross domestic product or GDP is a measure of the size and health of a country's economy over a period of time (usually one quarter or one year). GDP comprises • household spending • investment • government spending, and • net exports.	The proposed development would contribute directly to investment in the construction phase through expenditure on plant, equipment and services (such as landscaping) in setting up the new quarry. A lower proportion of the investment would be procured locally but would help support a number of local businesses such as civil engineering contractors. In the longer term, there will be ongoing expenditure on goods and services such as plant	No

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
		maintenance, purchase of spares, earth moving, and tree planting. These services are more likely to be procured locally. There will also be a long term indirect contribution to household expenditure through payment of wages and contracts with supply chain businesses.	
Economic development	Minerals and mineral products are essential to the development of the built environment, infrastructure and quality of life. More than 210 million tonnes of minerals are extracted in the UK each year, with the annual turnover of extraction estimated to be £15bn. The essential contribution of minerals to the UK economy is demonstrated by the fact that the annual gross value added by mineral extraction, products, manufacture and first-use markets is more than £235bn, resulting in 16 per cent of total the UK economy is attributable to minerals. This contribution supports 4.3 million jobs along the supply chain. https://www.ukmineralsforum.org.uk/downloads/UK_Minerals_Strategy_2018.pdf	In the local context, the proposed development would contribute to the economy of the area through the supply of essential materials for the construction of homes, infrastructure and other developments. The need for the aggregates from the proposed development is explained in detail in the **Planning Statement** that accompanies the planning application. In addition to contributing to construction, the proposed development would also contribute to the local economy through the provision of direct and indirect employment, support for local goods and services, and payment of taxes including business rates and the aggregates levy.	No
Biological diversity	An ecological impact assessment has been undertaken as part of the EIA and is reported in **Chapter 11 of the ES** and associated appendices. Ecological input has been a significant driver in the design of the proposed restoration scheme, including seeking to reinstate the key habitat	**Chapter 11 of the ES** sets out specific targeted mitigation measures in respect of protected species. Management proposals to prevent indirect effects on nearby ecological receptors and to secure long term site management that benefits	No

Health Determinant	Assessment Summary	Comments / Mitigation Required	Likely Significant Effect on this Aspect of Health?
	elements for which the site has current value, exploiting opportunities created by extraction in terms of the exposure of mineral substrates and their potential to develop semi-natural plant communities, exploiting opportunities created by changes to drainage patterns and responding to local and national initiatives in terms of appropriate habitat creation objectives, including taking account the views of the Hertfordshire and Middlesex Wildlife Trust, as canvassed at three meetings with their representatives during the preparation of the original application in 2015/16. This has allowed key objectives to be set towards the creation of semi-natural habitats appropriate to the locality and the geology – in particular acid grassland, and to secure significant opportunities for certain fauna.	biodiversity post-restoration are included in **Chapter 11**.	
Climate	Section 14 of NPPF requires the planning system to plan for climate change and improve resilience. The UK Climate Projections published by the Met Office show that the Hatfield is predicted to experience changes in temperature, rainfall, and frequency of extreme weather events, particularly flooding as a consequence of climate change. The Flood Risk Assessment has considered an allowance for climate change within the assessment for surface water and as a result, appropriate site-specific flood risk mitigation measures have been included with recommendations for a strategy for managing and mitigating any flood risk posed to or resulting from the proposed development.	Assessments of environmental effects and proposed mitigation measures have allowed for climate change as appropriate. In particular, a FRA has been undertaken which makes allowance for increases in rainfall in line with best practice.	No

7.0 MONITORING AND EVALUATION

The assessment of health impacts undertaken in section 6.0 has confirmed that no significant adverse effects are expected as a result of the proposed development once appropriate mitigation has been applied.

There is potential for beneficial effects that are also not significant at the level of the population as a whole, although specific population groups may be disproportionately benefitted, especially if the recommended measures regarding support for local workers including skills training and support for active and sustainable travel are put in place.

The ES proposes the implementation of continued monitoring and reporting with regard to the following matters:

- Air Quality – regular occupational exposure monitoring will be undertaken and any exceedances reported to senior management and a remediation plan put in place.
- Water Quality – A Ground Water Management Plan as detailed in Chapter 6 of the ES will be agreed with the EA and implemented throughout the operational life of the proposed development.

In addition to the environmental monitoring measures proposed in the ES, it is recommended that the Applicant should prepare an Employment and Skills Plan to promote the following:

- Employment - measures to support employment of local people, including support for people without access to a private transport
- Equality – positive support for potential employees and existing employees with regard to access within the site and flexibility of working arrangements
- Procurement - measures to encourage local firms to supply goods and services
- Training – induction and continuous career training to enhance skills with regard to safety, health and environment
- Monitoring and Evaluation – annual report to senior management and commitment for areas of low performance to be reviewed and positive actions put in place.

8.0 CONCLUSIONS AND RECOMMENDATIONS

SLR has undertaken a Health Impact Assessment (HIA) following the standard Hertfordshire County Council preferred format based on the WHIASU Toolkit. The HIA draws heavily on the extensive assessment work undertaken for the Environmental Impact Assessment which is reported in the Environmental Statement (ES) accompanies the planning application, and signposting to other reports is provided where appropriate.

The socio-economic and health profile for the surrounding area has been summarised. This generally shows that whilst Hertfordshire in general is relatively buoyant, there are certain geographical areas in the vicinity of the site that are less prosperous than the county as a whole.

An assessment of health effects is set out in section 6.0 of this HIA and cross-references are provided where appropriate to the detailed studies reported in the ES. Where relevant, the assessment identifies any population groups that may be expected to be disproportionately affected by the proposed development, whether negatively or positively.

During consultation with stakeholders and the local community, concerns have been raised regarding two environmental issues that have the potential for serious health consequences:

- air quality, including the potential effects of silica from air-borne particulate matter. SLR has undertaken detailed emissions modelling of such matters which is reported in full in the ES. The results show that emissions of particulate matter from the operational phases of the quarry would not give rise to significant adverse effects at surrounding receptors. The assessment (based on the worst case assumption that all PM_{10} particulate emissions are silica) assessed emissions against the US standard of 3ug/m^3 as an annual mean to provide a suitable Air Quality Assessment Level (AQAL) as there is no standard for silica in the UK. The results showed that no sensitive receptor including nearby residential properties exceeded 10% of the AQAL.
- water quality, including the potential for historical bromate pollution to be drawn into the quarry when it is being worked sub-watertable. As there will be no pumping of groundwater from the Lower Mineral Horizon (LMH) the potential for drawing impacted groundwater into the site is considered to be low. However, wet digging of mineral from beneath the LMH could create short lived local changes in groundwater head which could conceivably induce a local gradient towards the site and suitable mitigation measures are proposed including the development of a groundwater and water management plan to be agreed with the Environment Agency and Affinity Water prior to works commencing

As a result of the proposed mitigation, no significant effects are predicted.

The assessment concludes that the proposed development is not predicted to give rise to any significant adverse health-related impacts, and that there will be some benefits particularly to the economy during the site operation and to biodiversity and public access in the longer term. The potential benefits are likely to benefit certain groups within local communities through the provision of skills training and career development. An Employment and Skills Plan is recommended to help reduce potential inequalities in access to work and to ensure that local people, particularly those that may be disadvantaged in terms of employment opportunities, gain maximum benefit from the proposed development.

In summary, the proposed development is not expected to have a significant adverse impact on health for those living near the site, working on the site or using nearby areas for recreational purposes. Where required, the proposed development provides for appropriate mitigation measures to minimise adverse effects and enhance beneficial effects.

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HATFIELD AERODROME

Planning application for a new quarry and ancillary facilities

Volume 2C - Non Technical Summary

Prepared for: **Brett Aggregates Limited**

SLR Ref: 403.09885.00024
Version No: FINAL
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BASIS OF REPORT

This document has been prepared by SLR with reasonable skill, care and diligence, and taking account of the manpower, timescales and resources devoted to it by agreement with Brett Aggregates Limited (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

Information reported herein may be based on the interpretation of public domain data collected by SLR, and/or information supplied by the Client and/or its other advisors and associates. These data have been accepted in good faith as being accurate and valid.

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Information, advice, recommendations and opinions in this document should only be relied upon in the context of the whole document and any documents referenced explicitly herein and should then only be used within the context of the appointment.

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Introduction

1. This document comprises a Non Technical Summary ('NTS') and has been prepared by SLR Consulting Limited ('SLR') on behalf of Brett Aggregates Limited ('the applicant'). The NTS forms part of a package of documents being formally submitted to Hertfordshire County Council (as Mineral Planning Authority, or 'MPA') in support of a planning application in respect to land at the former Hatfield Aerodrome, near Hatfield, Hertfordshire.

2. The applicant is re-submitting a planning application for the establishment of a new quarry on land at the former Hatfield Aerodrome (referred to as the application site), being part of the allocated site referred to in the extant Minerals Local Plan[1] (refer to Chapter 4 below for further information on the policy framework for the area). The proposals would involve the winning and working, together with processing for sale, of sand and gravel over a period of around 32 years. In parallel with the extraction of minerals would be the importation of low permeability inert material to infill the mineral workings to facilitate the restoration of the site to a beneficial after use, combining recreation and nature conservation. The imported material would typically comprise excavation wastes from construction and engineering projects (soils, overburden, clays etc.) within the region.

Application Submission Package

3. This NTS comprises the third part of the second volume submitted to the MPA to accompany the planning submission. In addition to the formal planning application forms and certificates, the full submission comprises:

   - Volume 1 - Planning Statement;
   - Volume 2 - Environmental Statement (this document);
     - Volume 2A – ES Text;
     - Volume 2B – ES Technical Appendices; and
     - Volume 2C – A Non-Technical Summary of the ES.

4. This NTS has been produced as a separate, standalone document in line with best practice prescribed by the Institute of Environmental Management and Assessment (IEMA) to accompany the planning submission, being a mandatory part of the ES. The purpose of the NTS is to provide, in non-technical language, a brief summary of the likely significant effects that the proposed development would have on the environment.

Publication

5. Electronic and paper copies of the ES can be obtained from SLR at the following address:

   15 Middle Pavement
   Nottingham
   NG1 7DX

6. The ES is available in both paper and CD-ROM format, for which a charge of £250 and £25 is applicable respectively. A copy of the NTS is available free of charge on request. In addition, the application documents will also be available to download from the Hertfordshire County Council website.

[1] "Preferred Area 1", and illustrated on Inset Map 6 within the Mineral Local Plan

Planning and EIA

7. European legislation (the Environmental Impact Assessment Directive or 'EIA Directive' for short) requires that, before granting 'development consent' for projects authorities should carry out a procedure known as environmental impact assessment (or "EIA") of any project which is likely to have significant effects on the environment. In the UK, development consent includes the grant of planning permission.

8. An ES is a report of an EIA that is required to be submitted with a planning application.

9. An integral aspect of the EIA process is to clearly identify or 'scope' the main environmental issues, as this allows for more detailed and targeted assessment to be carried out. The applicant submitted a formal request to the MPA for their opinion as to the issues that needed to be addressed in the EIA and the opinion was issued on 14 July 2021 (see Appendix 1/1 to the ES).

Planning and Environmental Permit

10. The proposals for the importation of inert fill material would be governed by an Environmental Permit issued by the Environment Agency in addition to a planning permission. The Environmental Permit will contain a number of conditions intended to regulate the day to day management of the site with the aim of minimising the effect of the operation on the environment; it will also contain conditions regulating site management and monitoring.

11. Government advice on planning makes it clear that it is important to avoid unnecessary or confusing duplication. For example, National planning policy states that *"The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities*." (paragraph 188, National Planning Policy Framework).

The Site

12. Land to which the planning application relates (referred to as "the application site") is located on the north-western edge of Hatfield and to the east of St Albans on land associated with the former Hatfield Aerodrome. It lies within an area bounded by the A1057 (Hatfield Road/St Albans Road) to the south, Oaklands Lane to the west, Coopers Green Lane to the north and the western fringe of Hatfield to the east.

13. The application site covers an area of around 87.1ha and comprises the southern part of the former aerodrome. The application site comprises a broadly rectangular area of unoccupied land that is partly used as an informal public open space and partly for grazing.

14. The application site is bounded by the A1057 (Hatfield Road) to the south, the boundary of which is characterised by a mature hedgerow. To the north lie CEMEX's Hatfield Quarry, and more specifically a set of silt lagoons. To the west the boundary is predominantly formed by a mature hedgerow, particularly in the vicinity of the garden centre and nursery, with the northern section being more open in aspect. At the north eastern corner is Home Covert, a small area of broadleaf woodland. The eastern boundary cuts across the former aerodrome to join up with the sports pitches located at the south eastern corner of the application site.

15. In the area surrounding the application site there are no nationally significant ecological designations. There is one Local Nature Reserve (Colney Heath) and 15 Local Wildlife sites within a 2km radius of the application site. The closest is Home Covert, which lies adjacent to the application site. There are no Scheduled Monuments within or surrounding the application site; however there are two listed buildings at Popefield Farm, on the southern boundary of the application site.

16. The nearest residential building to the application site is Popefield Farm. Residential areas exist to the south, east and west of the application site.

Figure 1
Site Location (not to scale)

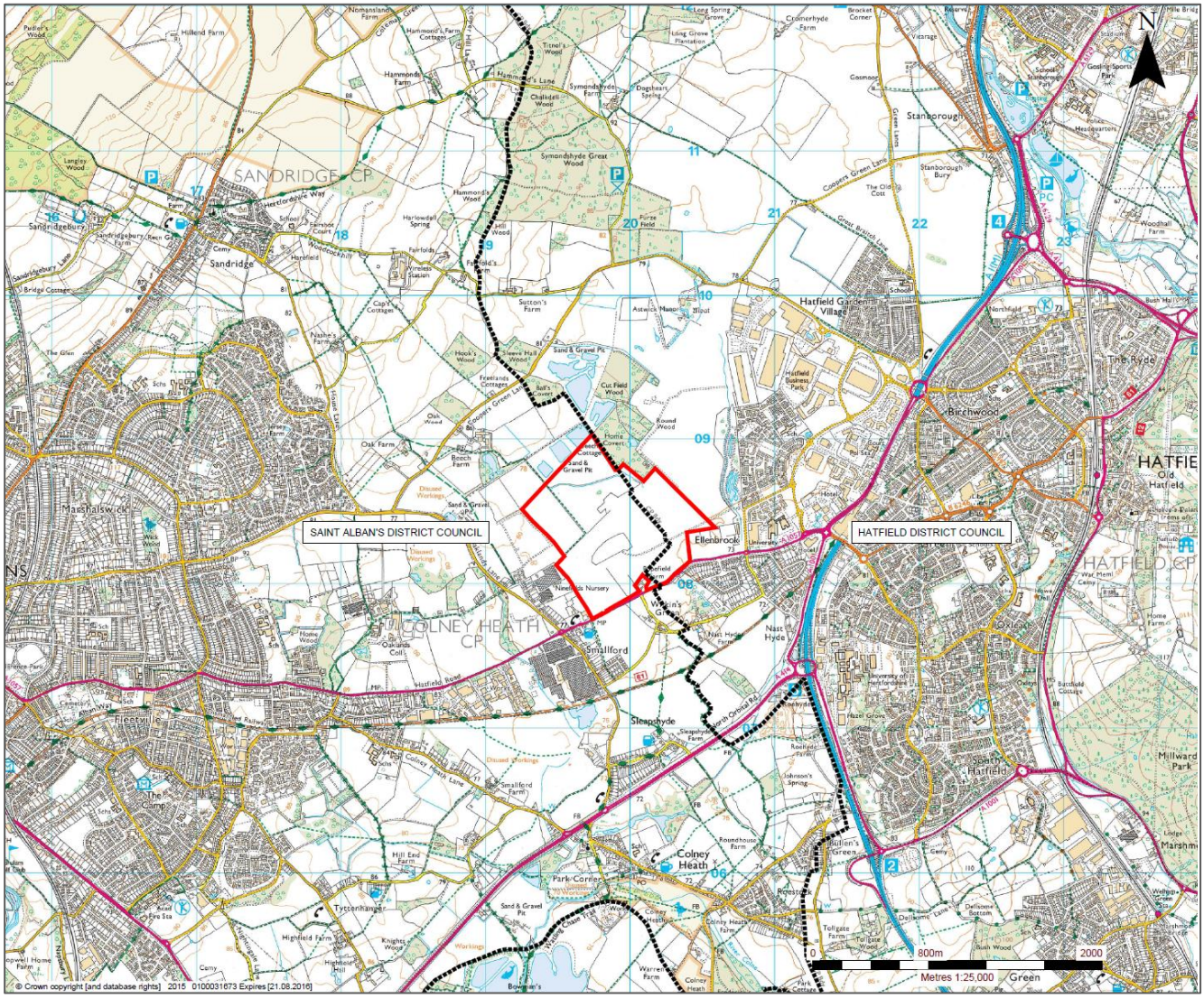


Figure 2
Application Site Context (not to scale)



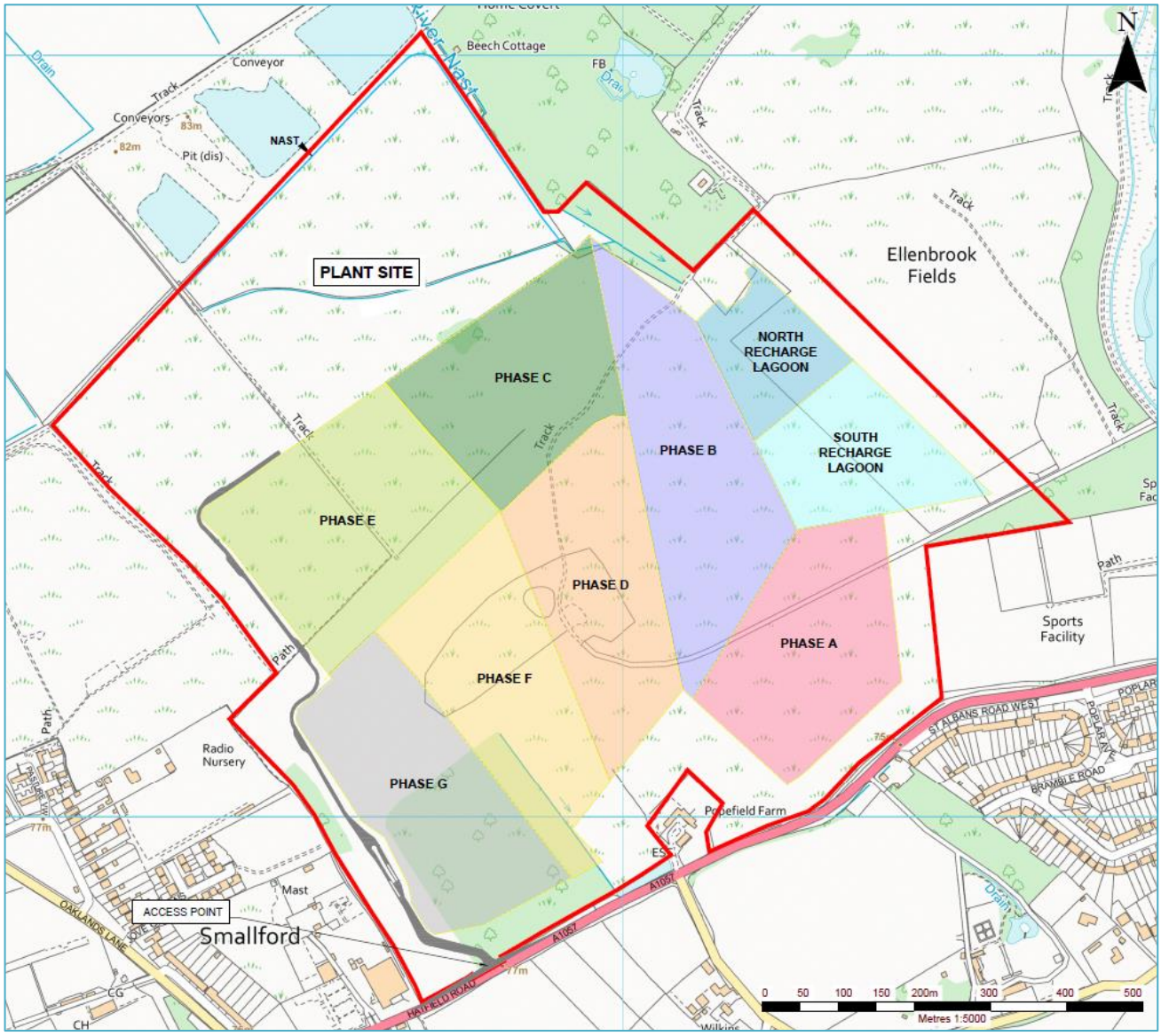
The Proposed Development

17. A planning application was submitted in January 2016 (application reference 5/0394-16) for the extraction of 8 million tonnes (Mt) of sand and gravel along with the installation of ancillary buildings, plant and machinery (including a concrete batching plant) on land at the former Hatfield Aerodrome. The planning application was accompanied by a comprehensive ES (the '2016 ES') which identified the likely significant effect of the development. Despite an initial resolution to approve (in January 2017), the planning application was refused by the planning committee at its meeting on 24 September 2020, with the decision notice issued on 6 January 2021. The reasons cited for refusing the application are set out in the Planning Statement (Volume 1).

18. The applicant is re-submitting a planning application for the establishment of a new quarry. As before, the proposals would involve the winning and working, together with processing for sale, of some 8Mt of sand and gravel over a period of around 32 years (based on an annual output of around 250,000tpa).

19. The quarry would be worked in a phased basis and allow for progressive restoration through the importation of inert materials to backfill the void; this minimises the amount of land taken at any one time. Sand and gravel would be worked from two discrete horizons; the Upper Mineral Horizon ('*UMH'*), which lies predominantly above the water table, would be worked dry whilst the Lower Mineral Horizon ('*LMH'*) would be worked wet (i.e. no dewatering of the workings). The two mineral horizons are separated by a seam of boulder clay (referred to as '*interburden'*) which would be used as part of the restoration scheme for the workings.

Figure 3
Proposed Phasing (not to scale)



20. Excavated material would be processed at the quarry using a combination of screening and washing plant to produce a range of graded aggregates and sands. Processed aggregates would be dispatched from the site in HGVs. Processed aggregates would be exported via a new access constructed onto the A1057 (Hatfield Road) on the southern side of the application site.

21. Other ancillary development would include a weighbridge, office accommodation, fresh water and silt lagoons.

22. In view of the recent refusal to grant planning permission, the applicant has amended the scheme as follows:

- the erection and operation of a concrete batching plant has been removed from the proposals;

- the standoff for mineral extraction operations in the Lower Mineral Horizon (LMH) to the bromate plume (also in the LMH) will be increased from 50m to 100m;
- there will be no dewatering (pumping) of the LMH; and
- The access road from the quarry entrance will be moved by 5m to the east to allow additional acoustic screening.

23. Further details of the proposed development are set out in Chapter 3 of the ES.

Figure 4
Illustrative Restoration Concept (not to scale)



Planning Policy

24. Chapter 4 of the ES sets out how the proposed development has been considered against relevant national and local planning policy.

25. National planning policy is set out in the National Planning Policy Framework[2] (NPPF), which is accompanied by the web based Planning Practice Guidance[3] resource relating *inter alia* to minerals matters. Many sections of the NPPF are not relevant to this proposal since the application site is not located within a sensitive area subject to land use planning constraints (e.g. a National Park, an Area of Outstanding Natural Beauty, a Site of Special Scientific Interest or a Scheduled Monument). The site is though located within a Green Belt.

26. At the heart of the NPPF is a presumption in favour of sustainable development for which three overarching objectives are identified, namely economic, social and environmental. It is considered that the proposed development would create various economic and social benefits without resulting in significant impacts upon the environment.

27. The NPPF does not change the fundamental premise that applications for planning permission must be determined in accordance with the adopted development plan unless material considerations indicate otherwise.

28. The Minerals Local Plan specifically governs mineral development within Hertfordshire and remains in force until the adoption of the emerging Minerals Development Framework.

29. The Development Framework seeks to reconcile the development needs of society against safeguarding the environment and amenity of local communities. In so doing, the Development Framework sets out a series of Policies which seek to guide developments in terms of acceptable limits and design, whilst ensuring interests of archaeological, cultural heritage, ecological interest and importance are protected, and that the local amenity and environment of communities are not derogated through pollution to air, land or water.

30. Through the EIA process, it has been possible to demonstrate that the development proposals would not conflict with the stated aims and policies of the Development Framework. This is explored in greater detail within the Planning Statement which also accompanies the planning application.

Alternatives

31. Chapter 5 of the ES sets out the alternatives to the proposed scheme have been considered as part of the EIA. The EIA Regulations require that an outline of the main alternatives studied and an indication of the main reasons for this choice, taking into account the environmental effects should be included in an ES.

32. Few alternatives were considered as part of the original 2016 EIA. The design evolution involved the following changes:

- changing the location of the recharge lagoons to the eastern boundary (from the southern boundary);
- opting for a traditional static mineral processing plant, with screens and crusher housed within clad enclosures;
- leaving two ponds on the periphery known to contain great crested newts in situ; and

[2] Ministry of Housing, Communities and Local Government. July 2021
[3] http://planningguidance.communities.gov.uk/

- altering the restoration strategy from a heavily biodiversity lead scheme to one involving more public access.

33. As part of the 2021 EIA work, given that the proposals are a re-submission of the 2016 scheme then no additional alternatives have been considered. Notwithstanding this, it should be noted that the applicant has amended the scheme as follows:

- the erection and operation of a concrete batching plant has been removed from the proposals;
- the standoff for mineral extraction operations in the Lower Mineral Horizon (LMH) to the bromate plume (also in the LMH) will be increased from 50m to 100m;
- there will be no dewatering (pumping) of the LMH; and
- The access road from the quarry entrance has been moved by 5m to the east to allow additional acoustic screening.

34. Whilst the option exists to delete one or more of the above changes, this has not been considered as part of the EIA as it would result in an overall reduction in the quality of the scheme; the effect of such an option would bring the scheme in closer alignment with the previous scheme which has previously been considered through the 2016 ES.

35. Finally, the option exists for the 'do-nothing' option whereby proposals to extract sand and gravel are dropped. This would mean that the application site remains in its current state and that 8Mt of sand and gravel are not worked, having an impact on supplies of aggregates within the county and wider region. The implications of this are considered in Chapter 5 of the Planning Statement.

36. The MPA has asked whether it would be possible to use field conveyors for transferring extracted sand and gravel to the processing plant. This has been considered but considered impractical and unfeasible.

Water Environment

37. Chapter 6 of the ES describes the scope, relevant legislation, assessment methodology and the baseline conditions currently existing at the application site and its surroundings. It then considers any potential significant environmental effects the proposed development of the quarry could have on this baseline environment, the mitigation measures required to prevent, reduce or offset any significant adverse effects, and the potential residual effects after these measures have been employed.

38. The operation and restoration of the application site would be undertaken using current technical guidance, relevant Pollution Prevention Guidelines, other codes of best practice and consents, to limit the potential for contamination of both ground and surface waters. Best practice techniques would be incorporated within the management procedures for construction and operation activities onsite in order to protect the water environment from pollution incidents.

39. A hydrogeological risk assessment has been completed to assess the proposed restoration of the site with imported inert wastes. The risk assessment has confirmed that the proposed development of the quarry (and the backfilling of the void) would not have a significant effect on the water quality. No additional mitigation measures are therefore required over and above the technical precautions that are proposed for the construction and management of the site.

40. Groundwater in the Lower Mineral Aquifer (LMA)/Chalk to the north-east of the application site is impacted by bromate from an offsite historical source. There is to be no pumping of groundwater from the LMA so there is no potential for actively drawing the plume towards the site, although wet digging could have a minor but insignificant effect.

41. It is unlikely, but if LMA/Chalk groundwater levels fall below the lowest historically recorded levels on site then this could affect the location of the plume edge. Nine years of monitoring results, however, indicate the plume is stable but precautionary measures incorporated into the design and operation of the site mitigate this risk which would not be significant.

42. All groundwater pumped from the Upper Mineral Horizon (UMH) would be recharged back into the UMH aquifer via discharge lagoon with the option for discharge into the LMH if needed via a second recharge lagoon. There would therefore be no significant loss of resource. The recharge area is relatively close to the points of abstraction, and it is not envisaged that there would be a significant impact on water resources.

43. Restoration of the void with imported inert fill may result in a local rise in groundwater levels, but this would be mitigated by a perimeter back drain to manage water levels during historically high groundwater periods during the operational and restored phases of the site.

44. A flood risk assessment has been prepared to assess the risk that the development itself would be affected by flooding or would exacerbate flood risk elsewhere. Mitigation measures are presented to ensure flood risk is not significantly increased. This includes the recharge of water back into the aquifer during the operational and restored phases of the development.

45. A Water Framework Directive compliance assessment has been undertaken and is included as an appendix to the ES. This concludes that the proposals would not have a significant impact on the objectives of the Directive.

46. Overall, it is concluded that there would be no significant residual effects to groundwater and surface water from the proposed development after inclusion of the identified mitigation measures.

Traffic

47. The ES, in Chapter 7 reports on an assessment of the impacts on the local transportation network as a result of the proposed development.

48. The assessment included a detailed audit of the existing highway conditions and a review of the local accident history in the proximity of the application site. As part of the development proposals a new access would be constructed onto the A1057. The assessment has considered the design of this access and demonstrated that the highway network would continue to operate satisfactorily.

49. The A1057 Hatfield Road is a classified ‘A’ road which currently accommodates an Annual Average Weekday Traffic (AAWT) flow of over 15,000 mixed size vehicles.

50. A link capacity assessment has been undertaken and demonstrated that the A1057 currently operates within its theoretical capacity and it would continue to do so comfortably with the addition of the proposal traffic from the quarry.

51. The link impact assessment has demonstrated that the likely increase would be 1.3% in terms of total vehicles, which is well within the daily fluctuations in traffic levels experienced and is therefore unlikely to be perceptible away from the site access junction.

52. Appropriate mitigation measures are proposed in order to minimise any impacts of the proposed development relating to road safety and dust and dirt.

53. In conclusion, it is considered that the proposed development traffic would operate adequately and have no adverse impact on the surrounding road network.

Landscape and Visual Impact Assessment

54. Chapter 8 of the ES considers the potential landscape and visual implications of the proposed development. The assessment follows recognised guidance issued jointly by the Landscape Institute and Institute of Environmental Management and Assessment.

55. This assessment included a baseline study of the existing site and its surroundings, a study of the landscape and visual characteristics of the development and an assessment of the residual landscape and visual effects likely to be generated after mitigation has been considered and their significance.

56. Overall there are no significant landscape or visual effects predicted as a result of the proposed development, influenced in part by the proposed mitigation and landscape strategy.

57. The physical changes to landscape elements and features is initially considered to be slight, associated with site preparation and establishment stages, rising to moderate and adverse during working phases and when the majority of disturbance would have occurred, but reducing as part of progressive restoration and eventually becoming slight and beneficial after final restoration is achieved.

58. The changes to aesthetic and perceptual aspects are also considered to be no more than moderate and adverse during operation phases, but becoming slight and beneficial after restoration.

59. The overall landscape effects upon the application site and “Area 31 De Havilland Plain” as a whole are considered to be slight as the published character area is relatively large in comparison and the scale of change is limited; the area would continue to be described inter alia as a jumbled, urban fringe landscape, with existing and restored mineral workings across parts of the extensive level plain.

60. There would be no new key characteristics introduced, but the addition of a new area of active quarrying and infilling, with processing plant is nevertheless a detracting element.

61. At a local level, the application site would be classified as “medium to large-scale greenspace with mineral workings” and after restoration would be returned to “medium to large-scale greenspace plain/former aerodrome”.

62. In terms of cumulative landscape effects, the addition of the proposed development to the ongoing operations at Hatfield Quarry would not give rise to changes in landscape character of such an extent as to have major effects on its key characteristics or transform it into a different character type; it is not considered that the development “tips the balance” through its additional effects.

63. The visibility of the application site is influenced at a local level by the screening effects of vegetation in the surrounding area, in particular in conjunction with the flat, level plain which prevents any views down

or over the site. The clearance of existing vegetation and landcover, the formation, working and subsequent backfilling of the mineral extraction void would have very limited visibility.

64. The diversion of the rights of way and areas of permissive access around the site perimeters would move visitors to this part of Ellenbrook Fields along landscaped corridors that are of similar character to existing routes and/or across the new internal access roads and over undisturbed areas. These routes would then be progressively reinstated as part of final restoration.

65. The mineral processing plant would have some visibility from limited locations at gaps in hedgerows, etc to the north and west of the application site, but this is generally backgrounded and/or seen as part of a mainly wooded horizon, with other development such as Ellenbrook, Hatfield or Smallford. The formation of the site entrance and movement of vehicles to and from the site would be visible from a small part of the existing busy Hatfield Road (A1057).

66. Although there are several sensitive receptors in the study area (mainly residential and recreational), most would experience a small degree of change to the baseline condition; change is discernible but underlying landscape character or view composition would be similar to the baseline. The landscape strategy / mitigation proposals would be effective.

67. In cumulative terms effects are restricted in landscape terms due to the nature of the existing landscape character and potential for screening and separation of the considered developments. In visual terms, some visual interconnection would occur, but this would be limited by screening. A wide 335m buffer of open space would be retained between the proposed development and the housing development with soil mounds and a hedgerow included in the proposed development to reduce visibility between the two developments. The detailed consideration of cumulative effects within the proposed large scale housing development confirms this assessment of cumulative effects and conclude cumulative effects would be restricted to socio-economic issues only.

68. In considering the previous planning application no objections were raised in relation to landscape and visual impact by technical consultees, such as the County Landscape officer. The proposed development no longer includes the concrete plant which would have represented the tallest element on the operational mineral site and an increase in the overall level of development. The tallest element is now the mineral processing plant which represents an essential element of the mineral extraction process; with the principal of mineral extraction in the Green Belt being identified in the NPPF (as previously identified in the policy section of the chapter).

69. The review of Green Belt objectives above indicates limited effects on sprawl, coalescence and encroachment may occur. However, the level of these effects is not considered sufficient to have a significant impact on the function of the Green Belt, particularly in the context of the phased restoration proposals and temporary (although long term) nature of the proposed development.

70. The proposed development seeks to improve the recreational and ecological aspects of the development site without removing it from Green Belt through development that is not inappropriate in the Green Belt.

Air Quality

71. Chapter 9 of the ES considers the potential for the proposed development to impact upon air quality in the vicinity of the application site.

72. The chapter describes the scope, relevant legislation, assessment methodology and the baseline conditions at the application site and the surroundings area. The assessment considers any potential significant environmental effects that the proposed development would have on the baseline environment; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual impacts after these mitigation measures have been employed. The assessment has considered both emissions from the quarrying (and associated) activities and from HGVs transporting aggregates or inert waste.

73. The potential impacts of the development have been assessed in terms of potential emissions of particulates (dust). Two assessments have been undertaken; the first to assess and the second to assess the coarse fraction dust which is typically associated with amenity or nuisance issues.

74. A summary of modelled concentrations for worst-case human receptors is provided in turn below for each pollutant assessed, complete results are provided in Appendix 9/1 of the ES. The worst-case receptors presented below refers to the location of maximum change and resultant predicted pollutant concentration.

75. In relation to Nitrogen Oxides in accordance with relevant guidance, the impact of the development on annual mean nitrogen dioxide (NO_2) concentrations at all assessed existing receptors is considered to be 'negligible'. Furthermore, there are no predicted exceedences of the annual mean NO_2 Air Quality Assessment Levels (AQALs), and are calculated to be 'well below' the AQAL. Effects associated with annual mean NO2 concentrations at all assessed receptor locations are therefore considered to be 'not significant', despite the conservative nature of the applied assessment methodology.

76. Turning to the fine particulate fractions (namely dusts with a diameter of less than 10 microns[4] and 2.5 microns) for which Air Quality Standards exist; in accordance with relevant guidance, the impact of the development on annual mean PM_{10} concentrations at all assessed existing receptors is considered to be 'negligible'. Furthermore, there are no predicted exceedences of the annual mean PM_{10} AQAL, and are calculated to be 'well below' the AQAL. Allied to this cumulative effects associated with annual mean PM_{10} concentrations at all assessed receptor locations are therefore considered to be 'not significant', despite the conservative nature of the applied assessment methodology. For $PM_{2.5}$, in accordance with relevant guidance, the impact of the development on annual mean $PM_{2.5}$ concentrations at all assessed existing receptors is considered to be 'negligible'. Furthermore, there are no predicted exceedences of the annual mean $PM_{2.5}$ AQAL, and are calculated to be 'well below' the AQAL.

77. Cumulative effects associated with annual mean $PM_{2.5}$ concentrations at all assessed receptor locations are therefore considered to be 'not significant', despite the conservative nature of the applied assessment methodology.

78. Detailed dispersion modelling of both road traffic and fugitive dust emissions generated by site activities has been undertaken in consideration of potential effects onto both sensitive human and ecological receptors. This has involved the consideration of potential effects on human health associated with increases in ambient pollutant concentrations, as well as the loss of amenity and deterioration of sensitive ecological environments arising from dust deposition.

79. In conclusion, all impacts assessed associated with the operational phase of the quarry were found to be not significant.

[4] Also referred to as micrometre. For dust with a particle size of 10 microns, the acronym PM10 is often used, and for 2.5 microns, PM2.5.

Noise

80. Chapter 10 of the ES considers the potential for the proposed development at Hatfield Aerodrome to impact upon the noise environment in the vicinity of the application site. The chapter describes the scope, relevant legislation, assessment methodology and the baseline conditions that exist around the application site.

81. The noise assessment has used measured background noise levels at three locations around the application site and made a series of noise level predictions based in accordance with relevant standards and guidelines. The predicted noise levels have then been assessed against criteria in accordance with recognised guidance. Predicted noise levels are based on a 'worst case' scenario when operations are being undertaken simultaneously at their closest approach to the noise-sensitive receptor being assessed or highest elevation with the quarry.

82. Noise levels during temporary operations (such as soil stripping and overburden removal) would remain within the specified criterion adopted for the assessment at all locations assessed. It should also be noted that construction noise levels would also remain below the lower 55dB(A) noise limit derived in accordance with the relevant guidance for day to day operations except during construction of the perimeter screening mounds to the south. In view of this no mitigation measures are deemed necessary.

83. Worst case noise levels generated by operational activities, including all truck movements on the access road, would be at or below the noise limits derived in accordance with the relevant guidance at all locations. The cumulative effects of operational noise from both the proposed Hatfield and Hatfield quarries would result in an impact of 'None' at all of the receptors, apart from Location 5b (Nimrod Gardens) where the impact is considered to be 'Minor'. Consequently, the level of effect at all of the receptors is 'None', apart from Location 5b (Nimrod Gardens) where the level of effect is 'Minor.

84. Based on the results of the assessment, it is considered that all practical means have been employed in the design of the site to protect the amenity of the nearby noise-sensitive receptors. A number of good site practice measures have been suggested to further reduce the risk of any potential adverse noise impacts.

85. It is concluded that noise should not pose a material constraint for proposed development.

Ecology

86. Chapter 11 of the ES assesses the potential impacts on valued ecological receptors resulting from the proposed changes to the approved scheme.

87. The assessment has found that the habitats are mainly derived from former airfield grasslands in various stages of development towards rough grassland and scrub, but with areas of disturbance from demolition activities and past use of the site as a film set and areas where habitat succession has been arrested by grazing or mowing. A few hedgerow features and some of the ponds and ditches represent relics from the pre-airfield landscape, and the site adjoins Home Covert, a mature woodland and Local Wildlife Site. The main ecological interest lies in the site's expansive and open grasslands, which although of limited species-diversity, have value due to their scale; their essentially unbroken expanse attracting open country species such as meadow pipit, skylark, kestrel and owls. Certain of the waterbodies also support great crested newts, although reptiles are very sparsely represented, despite the habitat. The invertebrate interest can

be classed as 'developing': whilst it includes formally scarce and rare species, it is not dissimilar to that which would be expected on marginal or abandoned land anywhere in the Home Counties, although populations of the scarcer species are likely to be large.

88. The net residual effect of the proposals in terms of the key ecological receptors is anticipated to be at worst neutral and at best a positive effect measurable at least at the District level of significance. The difference relates to a degree of residual and unavoidable uncertainty over the success of the restoration scheme and subsequent long-term management in securing similar or enhanced habitats to the baseline position and, in particular, the extent of visitor pressure and its management over the long-term.

89. The development would give rise to minor temporary negative effects on certain key faunal receptors (in particular great crested newts) during various stages of the working sequence, but none of these receptors are predicted to be subject to negative effects of high magnitude (e.g. significant in terms of wider local populations), subject to mitigation measures which, in respect of great crested newts, are required under statute in any event. There is no impediment to mitigation proposals being delivered that are in accordance with standard best practice, and in that context there is no cause to believe that the requisite licenses would not be forthcoming in due course. There is also a high certainty that all temporary negative effects on key faunal receptors related to habitat loss would be at least fully compensated in the long-term through the restoration scheme.

90. The proposals for restoration focus on replication of the higher-value elements of the site in its baseline condition, including in particular the large expanses of rough circumneutral grassland, but also seek to exploit opportunities to secure expanded representations of other semi-natural vegetation, in particular acid grassland and wetland habitats, providing replacement and expanded opportunities for species of conservation importance, including declining open-country birds, scarce plants and insects, great crested newts and others. Depending on the success of restoration delivery, and the future management of the site, the project has the potential to ultimately deliver significant positive effects at District level or above, and to qualify the restored site for non-statutory designation within a relatively short time frame.

Cultural Heritage

91. Chapter 12 of the ES presents the findings of a cultural heritage desk-based assessment and field evaluation in connection with the proposed development.

92. Although the Hertfordshire Historic Environment Record would indicate that the application site lies within an area of some archaeological potential, there is clear evidence of significant disturbance through the construction and demolition of Hatfield Aerodrome, and subsequent use as a film set for Saving Private Ryan and Band of Brothers.

93. Even where the ground is undisturbed, geophysical survey and Phase 1 trenching has found scant archaeological remains and none that would appear to pre-date the post-medieval period. No artefacts of earlier date were found.

94. The nature of the proposed mineral extraction however results in the total loss of the archaeological resource wherever extraction takes place, and the potential loss or damage in other areas associated with infrastructure and landscaping.

95. There would be no adverse direct effects upon designated assets such as listed buildings or scheduled monuments.

96. In accordance with planning policy, a precautionary approach should be taken to the potential loss of the archaeological resource. A tiered watching brief within areas undisturbed by modern activities, accompanied by excavation and recording, is therefore proposed. Such mitigation could be carried out in line with the quarry phasing.

97. Should archaeological features be identified these would be recorded and excavated, appropriate to their significance, with subsequent analysis and publication of the results. This would ensure recovery of archaeological information within the application site.

98. The scope of work would be submitted to Hertfordshire County Council before development commences in the form of a Written Scheme of Investigation and would be subject to a planning condition requiring its implementation.

99. Examination of a study area of 1km from the application site was undertaken to assess the potential effects of the proposed development upon the setting of designated heritage assets. Thirty listed structures lie within 1km of the application site boundary, but due to intervening vegetation and development only the listed building complex at Popefield Farm could experience an adverse effect of any magnitude.

100. An assessment of the predicted effects upon Popefield Farm both during operation and after restoration was carried out using Historic England guidance. This concluded that there would be a minor adverse effect upon views of and from Popefield Farm during the operational phase. After restoration, that would include hedge planting to recreate the 1888 historic field pattern with the aim of reinstating the broader landscape setting of Popefield Farm, there would a minor beneficial effect.

101. No additional mitigation is considered necessary in connection with the effects upon offsite designated heritage assets.

102. With the implementation of the proposed mitigation strategy, in respect of archaeology and the historic landscape-led restoration scheme, there would be no adverse residual impacts.

Health

103. A Health Impact Assessment (HIA) has been undertaken following the standard Hertfordshire County Council preferred format based on the WHIASU Toolkit. The HIA draws heavily on the extensive assessment work undertaken for the Environmental Impact Assessment which is reported in the Environmental Statement (ES) accompanies the planning application, and signposting to other reports is provided where appropriate.

104. The socio-economic and health profile for the surrounding area has been summarised. This generally shows that whilst Hertfordshire in general is relatively buoyant, there are certain geographical areas in the vicinity of the site that are less prosperous than the county as a whole.

105. An assessment of health effects is set out in section 6.0 of the HIA and cross-references are provided where appropriate to the detailed studies reported in the ES. Where relevant, the assessment identifies any population groups that may be expected to be disproportionately affected by the proposed development, whether negatively or positively.

106. During consultation with stakeholders and the local community, concerns have been raised regarding two environmental issues that have the potential for serious health consequences:

- air quality, including the potential effects of silica from air-borne particulate matter. SLR has undertaken detailed emissions modelling of such matters which is reported in full in the ES. The results show that emissions of particulate matter from the operational phases of the quarry would not give rise to significant adverse effects at surrounding receptors. The assessment (based on the worst case assumption that all PM10 particulate emissions are silica) assessed emissions against the US standard of 3ug/m3 as an annual mean to provide a suitable Air Quality Assessment Level (AQAL) as there is no standard for silica in the UK. The results showed that no sensitive receptor including nearby residential properties exceeded 10% of the AQAL.
- water quality, including the potential for historical bromate pollution to be drawn into the quarry when it is being worked sub-watertable. As there would be no pumping of groundwater from the Lower Mineral Horizon (LMH) the potential for drawing impacted groundwater into the site is considered to be low. However, wet digging of mineral from beneath the LMH could create short lived local changes in groundwater head which could conceivably induce a local gradient towards the site and suitable mitigation measures are proposed including the development of a groundwater and water management plan to be agreed with the Environment Agency and Affinity Water prior to works commencing .

107. As a result of the proposed mitigation, no significant effects are predicted.

108. The assessment concludes that the proposed development is not predicted to give rise to any significant adverse health-related impacts, and that there would be some benefits particularly to the economy during the site operation and to biodiversity and public access in the longer term. The potential benefits are likely to benefit certain groups within local communities through the provision of skills training and career development. An Employment and Skills Plan is recommended to help reduce potential inequalities in access to work and to ensure that local people, particularly those that may be disadvantaged in terms of employment opportunities, gain maximum benefit from the proposed development.

109. In summary, the proposed development is not expected to have a significant adverse impact on health for those living near the site, working on the site or using nearby areas for recreational purposes. Where required, the proposed development provides for appropriate mitigation measures to minimise adverse effects and enhance beneficial effects.

Cumulative Impacts

110. The final chapter of the ES considers the potential cumulative impacts arising as a result of the proposals described above.

111. Chapters 6 to 13 of the ES set out the findings of the EIA for a range of environmental topics, and in particular, ascertained the potential significance of identified impacts. It is possible for a number of the environmental topics to impact upon nearby receptors; whilst individually, the impacts may be within accepted limits, collectively, and the impacts could potentially be more significant. These are referred to as "*inter-relationships between impacts*". At the same time, potential impacts associated with the proposed development may be acceptable in isolation, but when considered in the context of other developments in the immediate vicinity, may become more significant. These are referred to as "*Cumulative Impacts*".

112. It is noted that there is a sand and gravel quarry (CEMEX Hatfield Quarry) to the north of the application site. The potential cumulative impacts arising through the proposed development of the quarry have been considered and none have been identified.

113. No significant impacts have been identified for any of the environmental topics considered as part of the EIA. Thus, no receptors are likely to experience any significant accumulated impacts from two or more sources.

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