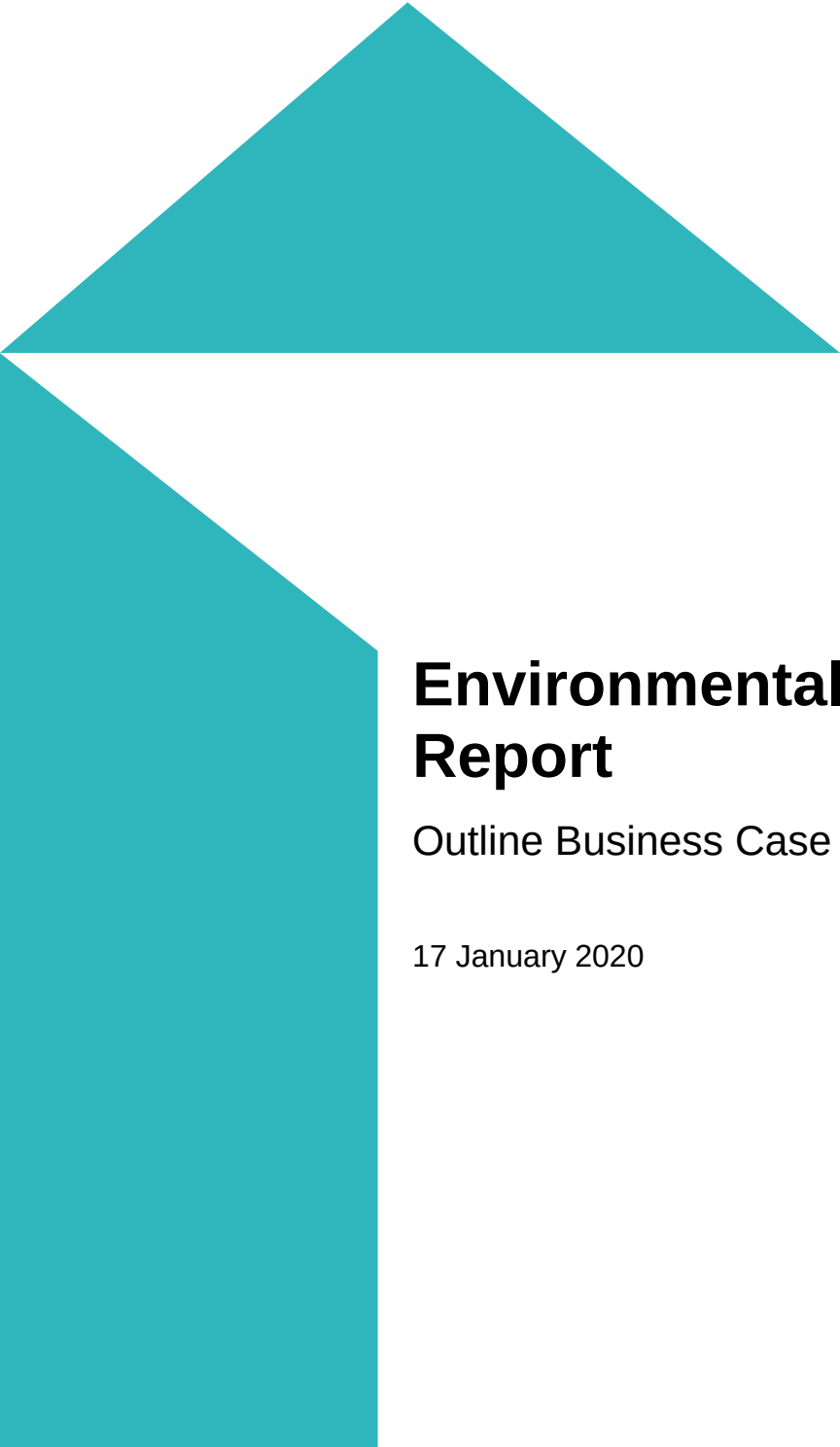




Environmental Appraisal Report

Outline Business Case - Appendix I

17 January 2020

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17 January 2020

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1 Introduction

1.1 Purpose of this document

This document is the Environmental Appraisal Report (EAR) produced to support the Outline Business Case (OBC) being developed for the Cambourne to Cambridge (C2C) Better Public Transport scheme. The OBC process identifies a preferred scheme using inputs from the environmental appraisal, amongst other criteria, for decisions makers to approve to be taken forward for the next stage of planning.

It is important to note that the WebTAG process sets out a process for environmental assessment of options, of which a clear requirement is for the assessment to be proportional to the stage of scheme development. The WebTAG appraisal process seeks to identify the key environmental assets that could be affected by different options to assist in identifying the best option to take forward into scheme development. Once a scheme is approved to proceed beyond the OBC stage a more detailed environmental impact assessment (EIA) of that scheme would be undertaken.

The information presented here has been used in appraising the options for the scheme after the Strategic Outline Business Case was approved by the GCP Board. The results of the options appraisals have been reported in three Options Assessment Reports published by GCP:

- OAR1 : Considered the on and off-road options consulted in 2017, concluding with a recommended on-road Route and a recommended off-road route. (Appendix A to the OBC)
- OAR2 : considered the recommended on and off road routes identified by OAR 1, combined with the Scotland Farm and Waterworks Park and Ride sites between Madingley Mulch roundabout and Grange Road (Phase 1), concluding with a recommended option for Phase 1. (Appendix B to the OBC)
- OAR3 : considered a short list of options between Cambourne and Madingley Mulch roundabout (Phase 2) (Appendix C to the OBC)

The report presents the assessments undertaken on the key environmental disciplines as required by the Department for Transport's appraisal guidance, specifically as set out in WebTAG Unit A3. This guidance focuses on the following environmental topics;

- Air quality (*)
- Biodiversity
- Greenhouse gases (*)
- Historic environment
- Landscape
- Noise (*)
- Water

Topics with an asterics (*) have been used to develop a Net Present Value of the level of impact which is included in the Benefit Cost Ratio reported in the Economic Case, where there is sufficient change in traffic levels to justify this calculation.

1.2 Overview of the Scheme

1.2.1 Introduction and Scheme Location

The C2C scheme is being delivered by the Greater Cambridge Partnership (GCP) with specific objectives to improve public transport, ease congestion, offer sustainable travel choices, connect communities and support growth.

The project lies to the west of Cambridge, running between the town of Cambourne and Cambridge City Centre along the A428/A1303 corridor and terminating on Grange Road in the western outskirts of Cambridge. The project will service existing and growing settlements and development areas along the route, including:

- Cambourne,
- Hardwick,
- Highfields Caldecote,
- Maddingley,
- West Cambridge development and;
- Future developments at Bourn Airfield and Cambourne West.

As the C2C project covers a wide area the planning of the project has been split into two phases, with a new travel hub facility being developed in parallel.

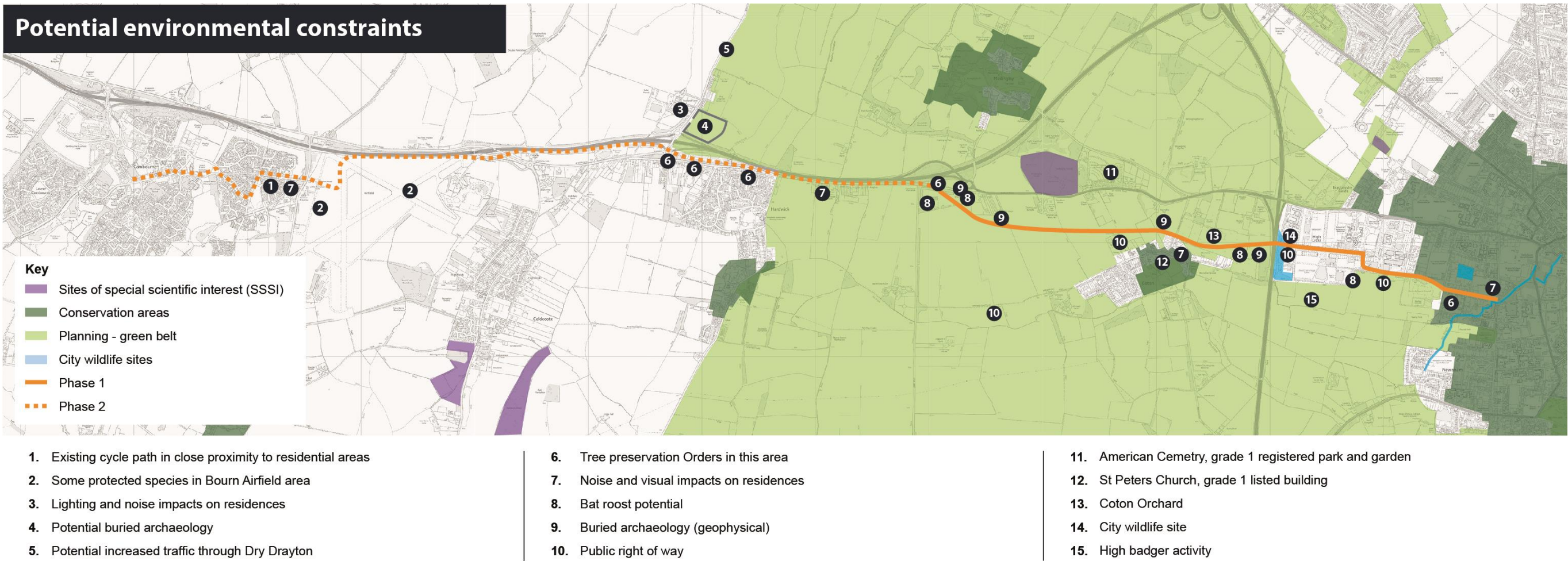
The Phase 1 section is between the Maddingley Mulch roundabout into Cambridge, connecting into the existing bus network on Grange Road.

Phase 2 is from Maddingley Mulch roundabout out to Cambourne, through the proposed development at Bourn Airfield. Phase 1 and 2 together provide the complete end-to-end High Quality Public Transport (HQPT) scheme between Cambourne and Cambridge.

The Summary Report published alongside the OBC provides an overview of the scheme components in more detail, and the Options Assessment Reports also include discussion on the various scheme elements.

Figure 1.1 shows the scheme alignment of the preferred route and the various environmental constraints that exist along the scheme (note the environmental constraints are presented as high level comments, there is more detailed information used in the WebTAG appraisal discussed in the relevant technical chapters of this report).

Figure 1.1: Environmental Constraints along the potential route corridor



Source: Mott MacDonald, 2019

1.3 Scheme Options

Three route options were assessed for Phase 1 of the C2C scheme and three route options were assessed for Phase 2. An illustrative comparator which included both off-road Phase 1 and 2 options was also assessed as part of the Phase 1 options appraisal, but the Phase 2 options supersede this option. Two travel hub locations were assessed along with each route option. A summary of the scheme options for both phases are presented in Table 1.1 below and these are depicted on Figure 1.2: Scheme Options.

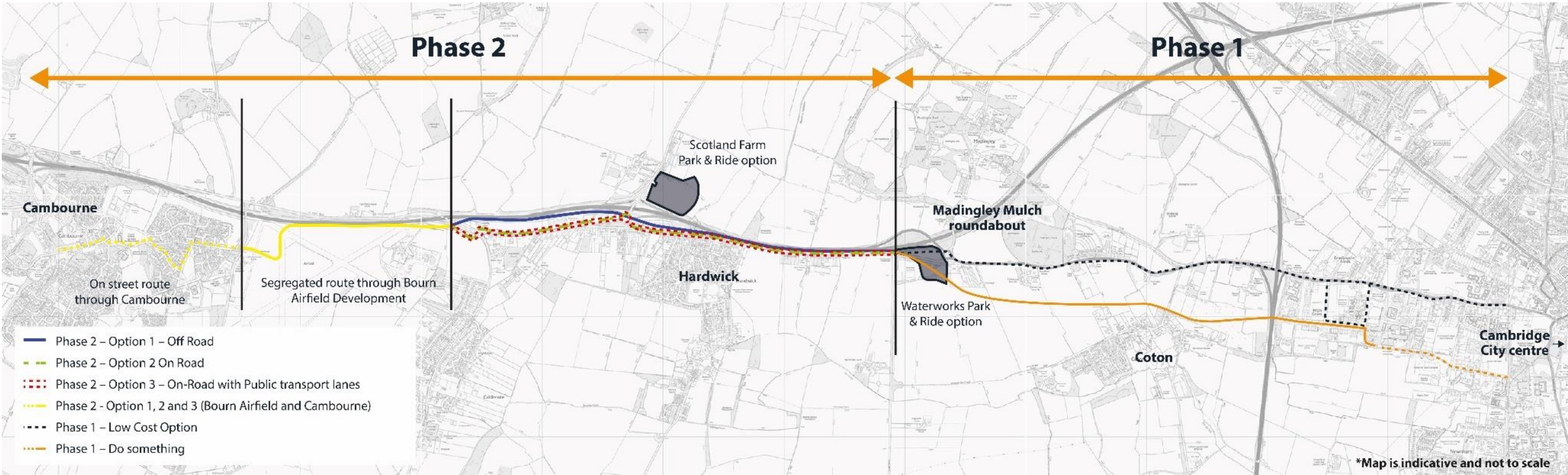
Table 1.1: Summary Description of Route Options

Option	Travel Hub Location	Description
Phase 1		
Do minimum		Committed Schemes
Low Cost A	Waterworks	An on-road scheme with a travel hub at the Waterworks site, near to Madingley Mulch roundabout. Provides Eastbound public transport lane along the existing A1303 between Madingley Mulch roundabout and High Cross along with short sections of Westbound public transport lanes where appropriate. Changes at M11 Junction 13 to provide an additional lane of traffic on the A1303 and a new pedestrian / cycle bridge over the M11. Changes to the Northbound M11 off-slip to allow both traffic lanes to turn right towards Cambridge.
Low Cost B	Scotland Farm	As Low Cost a but with a travel hub positioned at the Scotland Farm site, just off Scotland Road to the north of the A428.
Do Something 1a	Waterworks	An off-road scheme between Madingley Mulch roundabout and Grange Road with a travel hub at the Waterworks site. From this point this scheme provides a new, fully segregated public transport route to Grange Road where journeys will continue to the city centre and other destinations. Provides a new bridge over the M11 where the public transport route passes through the West Cambridge site and joins to Grange Road using Adams Road.
Do Something 1b	Scotland Farm	Off-road from Madingley Mulch Roundabout to Grange Road. As Do Something 1a but with a travel hub positioned at the Scotland Farm site, just off Scotland Road to the north of the A428.
Phase 2		
Option 1a (Off Road)	Waterworks	An off-road scheme with a travel hub at the Waterworks site. Provides new fully segregated public transport route from Cambourne to Long road. Proposed new junction with St Neots Road near Bourn roundabout and alterations to the roundabout at A428 Hardwick interchange.
Option 1b (Off Road)	Scotland Farm	As Option 1a but with a travel hub positioned at Scotland Farm and alterations to the roundabouts at the A428 Hardwick Interchange.
Option 2a (Junction Improvements)	Waterworks	An on-road scheme with a travel hub at Waterworks site. Provides minor junction alterations at A428 Hardwick interchange and Bourn roundabout. Off-road though Bourn airfield to Cambourne.
Option 2b (Junction Improvements)	Scotland Farm	As Option 2 but with a travel hub at Scotland Farm.
Option 3a (Public transport lanes)	Waterworks	An on-road scheme with a travel hub at Waterworks site. Provides inbound and outbound public transport priority lanes from Bourn roundabout to Long Road and minor junction alterations at A428 Hardwick interchange and Bourn roundabout.

Option	Travel Hub Location	Description
		Off-road through Bourn airfield to Cambourne.
Option 3b (Public transport lanes)	Scotland Farm	As option 3 but with travel hub at Scotland Farm

Source: Mott MacDonald, 2019

Figure 1.2: Scheme Options



Source: Mott MacDonald. 2019

2 Appraisal Methodology

2.1 Introduction

For each environmental topic specific approaches to impact assessment are undertaken through the appraisal process.

The assessment generally follows **TAG Unit A3** and documented in the TAG environmental impacts worksheets. However, it is important that the assessments are proportional to the stage of the process (i.e. options appraisal) and based on the availability of the data and the potential scale of the impacts.

Some topics may require a more detailed assessment (depending on the scale of change proposed from a specific development) and in such cases the assessment will follow that set out in DRMB Volume 11 (e.g. traffic related topics require output from the traffic modelling to inform the appraisal and may justify detailed modelling following the methodology set out in DRMB Volume 11 for that topic).

Each topic section in this report sets out the scale of the potential impact and the approach taken to assessing the impacts for that specific topic area.

2.2 Scoping and Proportionality

A key element of the WebTAG appraisal process is that the process should not try and replicate an EIA process at all stages of options definition and selection. The level of detail and scope should be based on the stage of the options appraisals leading to a preferred scheme being identified.

Where limited data is available then it is a requirement that the limitations are noted in the appraisal process, particularly if this could affect the conclusions being drawn. Assumptions need to be clearly stated as well and if appropriate, a precautionary approach taken in the appraisal.

The impacts assessed following the WebTAG process either arise as a direct result of changes in traffic (air quality, noise and greenhouse gases) and those that arise in the surrounding area from the new development (landscape and townscape, biodiversity, heritage and the water environment).

In completing WebTAG appraisals it is not usual to require the impacts from construction to be taken into account. The construction effects are more appropriately assessed in the EIA of the preferred scheme.

2.3 General Assessment Assumptions and Limitations

The majority of the WebTAG assessment was based on publicly available data, but original field data was collected from surveys on ecology, heritage and landscape in particular. The purchase of Cambridgeshire & Peterborough Environmental Records Centre biological records and Cambridgeshire Historic Environment Record also provided additional information. Details on the methodology followed by each of the environmental disciplines is described in the relevant sections of the report.

The landscape appraisal has also drawn on works completed by LDA Consultations who completed a Green Belt Assessment in 2017 for the C2C project.

The level of design information has been limited to an outline design of options setting out the probable footprint of each option (i.e. largely limited to a horizontal alignment of each option with a standard design of the scheme assumed along that option). Details such as vertical alignment and local variations in design required to meet locally specific constraints have not been available for the options appraised. The potential travel hub designs used in the appraisal have been developed to what might be considered concept design stage.

2.4 Mitigation and Enhancement Measures

While mitigation and enhancement measures are expected to be developed at a later stage for the preferred option only, early design concept includes the use of planting to reduce the potential impact of a new travel hub and the Scheme on the landscape. Standard design measures that would be required to meet normal design practice (e.g. drainage designed to avoid creating flood risks on or off site) are assumed to be included in all options.

As the design progresses mitigation and enhancement measures to avoid or minimise specific environmental effects will be incorporated with the design, through the detailed EIA process. However, where such measures are not confirmed for any option, then these are not allowed for in the appraisal at this stage of scheme assessment.

3 Air Quality

3.1 Introduction

This section presents the applicable legislation, the methodology, study area, existing baseline and results of the economic assessment that has been undertaken with regards to air quality.

3.2 Legislation and Policy Context

3.2.1 International Legislation and Policy

Directive 2008/50/EC¹ on ambient air quality and cleaner air for Europe was adopted in May 2008. This Directive defines limit values, and dates by which they are to be achieved, for the purpose of protecting human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants.

Directive 2008/50/EC sets out that the limit values apply everywhere with the exception of:

- Any locations situated within areas where members of the public do not have access and there is no fixed habitation
- In accordance with Article 2(1), on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply
- On the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access to the central reservation

3.2.2 National Legislation

The Air Quality Standards Regulations 2010 and the Air Quality Standards Regulations (Amendment) Regulations 2016 implement the EU's Directive 2008/50/EC on ambient air quality for the UK.

Part IV of the Environment Act 1995² requires that every Local Authority shall periodically carry out a review of air quality within its area, including predictions of likely future air quality scenarios. As part of this review, the local authority must assess whether air quality objectives are being achieved, or likely to be achieved within the relevant periods. Any parts of a local authority's area where the objectives are not being achieved or are not likely to be achieved within the relevant period must be identified and declared as an Air Quality Management Area (AQMA). Once such a declaration has been made, Authorities are under a duty to prepare an Action Plan which sets out measures to pursue the achievement of the air quality objectives within the AQMA.

The air quality objectives specifically for use by local authorities in carrying out their air quality management duties are set out in the Air Quality (England) Regulations 2000³ and the Air Quality (England) (Amendment) Regulations 2002⁴. In most cases, the air quality objectives are

¹ European Union (April 2008) Directive on Ambient Air Quality and cleaner Air for Europe, Directive 2008/50/EC Official Journal, vol. 152, pp. 0001-0044

² Defra (2003). Part IV of the Environment Act 1995 Local Air Quality Management.

³ Statutory Instrument (2000). Air Quality (England) Regulations, No. 928.

⁴ Statutory Instrument (2002). Air Quality (England) (Amendment) Regulations, No. 3043.

set at the same pollutant concentrations as the limit values specified in the EU Directives although compliance dates differ.

3.2.3 Air Quality Standards

Applicable air quality standards are summarised in Table 3.1.

Table 3.1: Air quality objectives and limit values

Pollutant	Averaging Period	Concentration	Allowance	Attainment Date	
				Air Quality Objectives	EU Limit Values
Nitrogen dioxide (NO ₂)	Annual	40 µg/m ³	-	31 December 2005 ^(a)	1 January 2010 ^(c)
	1 Hour	200 µg/m ³	18	31 December 2005 ^(a)	1 January 2010 ^(c)
Particulates (PM ₁₀)	Annual	40 µg/m ³	-	31 December 2004 ^(a)	1 January 2005 ^(c)
	24 Hour	50 µg/m ³	35	31 December 2004 ^(a)	1 January 2005 ^(c)
Fine particulates (PM _{2.5})	Annual	25 µg/m ³	-	2020 ^(b)	2015 ^(c)

Notes: ^(a) Air Quality (England) Regulations 2000 as amended in 2002

^(b) Air Quality Strategy 2007

^(c) EU Directive 2008/50/EEC on ambient air quality and cleaner air for Europe and The Air Quality Standards Regulations 2010. Derogations (time extensions) have been agreed by the EU for meeting the NO₂ limit values in some zones/agglomerations;

3.3 Assessment methodology

3.3.1 Qualitative Methodology (OAR 2 & OAR 3)

A qualitative air quality assessment of the options assessed for Phase 1 and Phase 2 was undertaken for OAR 2 and OAR 3. At the time of assessment detailed traffic information was not available, as such it was not feasible to undertake an assessment based on the air quality methodology set out in TAG Unit A3. The qualitative assessment considered the likely changes in traffic flows and the number and location of the sensitive receptors with respect the scheme option. Appendix C shows the results from the respective OARs.

3.3.2 Quantitative Methodology (preferred route)

The preferred route option has been assessed quantitatively. The air quality effects of the scheme options were assessed using TAG Unit A.5.4 Marginal External Costs (MEC) and the Net Present Values (NPVs) have been calculated based upon this approach. This requires a four step process which is detailed below.

- Step 1 - estimate the change in car kilometres
 - This will be for both the opening year and for at least one other forecast year. This will be through the implementation of diversion factors, diversion factors for busses can be calculated through table A.5.4.6 in the TAG data book this is broken down into geographical area and journey types.
- Step 2 - analyse the characteristics of the car journeys
 - The proportions of traffic can be assigned from the TAG data book using table A5.4.1. Traffic for the opening year can be worked out of linear interpolation off the 2010 and five year intervals to 2035.
- Step 3 – Marginal external cost results
 - The previous steps will provide the change in car kilometres by road type, area type and congestion level for the opening year and, usually, at least one other forecast year. These

can then be used with the marginal external costs given in the TAG data book table A5.4.2, disaggregated in the same way, to estimate the decongestion benefits in the opening and forecast year

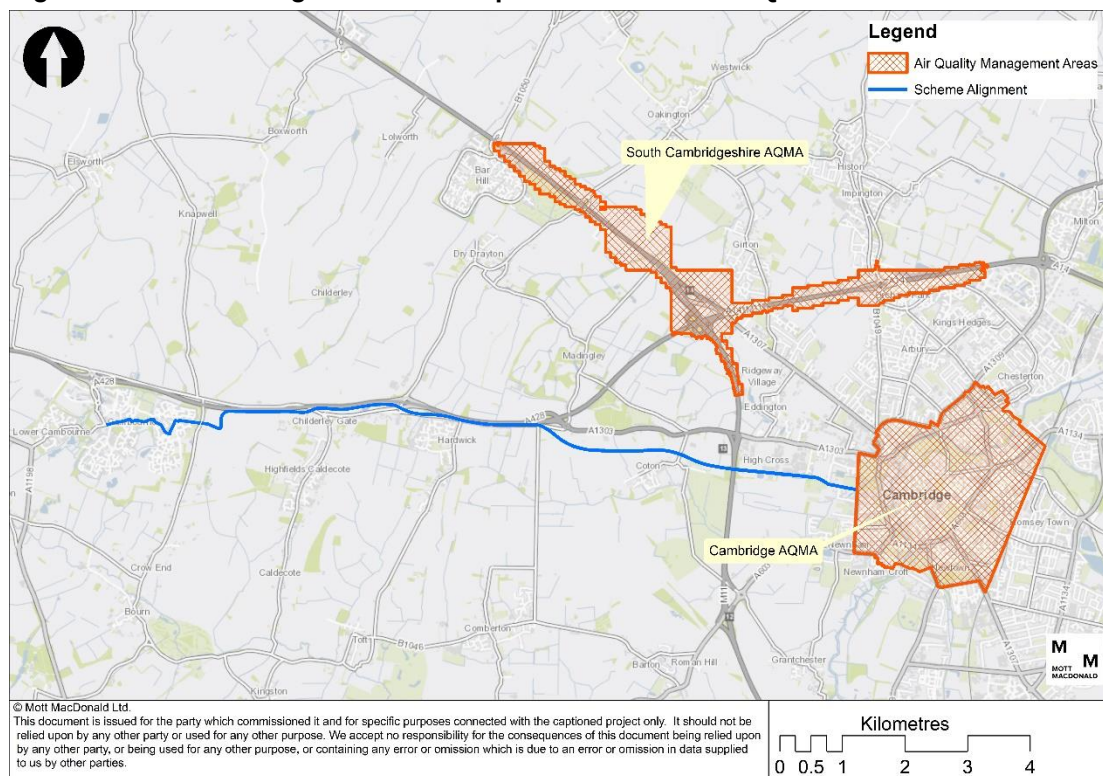
- Step 4 – Calculation of discounted external costs of car use for whole appraisal period
 - The previous steps will provide the total undiscounted external costs of changes in car use. Interpolation and extrapolation is used to derive individual values for all future years. This should take into consideration TAG Unit A1.1.

3.4 Study area

A description of the scheme options are presented in Section 1. The study areas for the options outlined for Phase 1 and Phase 2 have not been determined using traffic data. The qualitative assessments undertaken for OAR 2 and OAR 3 concluded that the scheme is not expected to cause widespread changes to traffic flows on the surrounding road network that meet the criteria for assessment as set out in TAG Unit A3.

A quantitative assessment has been done of the preferred route (phase 1 option 1b and phase 2 option 1b) following TAG Unit A.5.4 which does require the defining of a study area based on changes in traffic flows. Nevertheless, Figure 3.1 presents the route alignment and the closest AQMAs to the scheme.

Figure 3.1: Scheme alignment with respect to the nearest AQMAs



Source: Mott MacDonald, 2019

3.5 Baseline Information

3.5.1 Overview

Baseline air quality information is obtained from a variety of sources including local authorities, national networks monitoring sites and other published sources. For the purpose of this EAR, data was obtained from Defra's Air Information Resource website⁵, Cambridge City Council (CCC) and South Cambridgeshire District Council (SCDC). The most recent year of monitoring data available for both CCC and SCDC is for 2018. This data was sourced from the CCC Annual Status Report 2019⁶ and the SCDC Annual Status Reports 2018⁷ as well as through consultation with the SCDC Environmental Health officer.

3.5.2 Local Authority Review and Assessment

The Cambridge Air Quality Management Area (AQMA) was designated in 2004 for exceeding the annual mean NO₂ objective. The study area is located outside of the south Cambridgeshire AQMA, but part of the scheme for both the Core and Extra scenario extend into the Cambridge

AQMA running along West Road. The extra scenario also extends south on the A1134 between the junction of West road and the junction with Sidgwick Avenue.

The South Cambridgeshire AQMA is located 1.2km north of the proposed scheme and was designated in 2008 for exceeding the daily mean PM₁₀ objective and the NO₂ annual mean objective. Figure 3.1 shows the proximity of the proposed scheme in relation to the AQMAs.

3.5.2.1 Local Authority Automatic Monitoring

CCC undertakes automatic monitoring for NO₂ and PM₁₀ at five locations, these sites are all located within the city centre and are not considered representative of existing air quality at the scheme location.

SCDC undertakes automatic monitoring at three sites. One of these sites is the 'Girton' roadside monitor located on Huntingdon road (A1307), which is located approximately 1.8km north of the scheme and monitors NO₂, PM₁₀ and PM_{2.5}. This site is considered broadly representative of the baseline conditions for where the scheme runs adjacent to St Neots Road but is likely to be monitor higher concentrations than where the scheme runs through areas away from the busy road network. The results from this monitor are presented below.

The remaining two SCDC automatic monitors are classified as a roadside location adjacent to the A14 and urban background set back from the A14 on the edge of Orchard park. These are not considered representative of baseline conditions for the scheme study area and are not considered further.

Nitrogen Dioxide

The monitoring results from the 'Girton' monitoring station show that NO₂ concentrations did not exceed the annual and one hour mean objectives between 2015 and 2018.

⁵ Department for Environment Food and Rural Affairs. Air Quality Information Resource (Air) Website, available at: <http://uk-air.defra.gov.uk>

⁶ Cambridge City Council (2018). 2018 Air Quality Annual Status Report (ASR), June 2019.

⁷ South Cambridgeshire District Council (2018). 2018 Air Quality Annual Status Report (ASR), June 2018.

Table 3.2: Automatic monitoring data for annual mean and 1-hour NO₂ objectives

Site name	Site classification	Within AQMA	National grid reference		NO ₂ concentration (µg/m ³)			
			X	Y	2015	2016	2017	2018 ^(a)
Girton	Roadside	No	542676	260667	24 (0)	23 (0)	23 (0)	18 (0)

Source: South Cambridgeshire District Council Annual Status Report 2018 and communication with the South Cambridgeshire District Council EHO.

Note: ^(a) Annual Data Capture for 2018 is 94%
Values in brackets show the number of hours above 200 µg/m³

Particulate Matter (PM₁₀)

The monitoring results from the 'Girton' monitoring station show that PM₁₀ concentrations did not exceed the annual and daily mean objectives between 2015 and 2018.

Table 3.3: Automatic monitoring data for annual mean PM₁₀ objective

Site name	Site classification	Within AQMA	National grid reference		Annual mean NO ₂ concentration (µg/m ³) (number of days above 50µg/m ³)			
			X	Y	2015	2016	2017	2018 ^(a)
Girton	Roadside	No	542676	260667	11 (1)	17 (1)	17 (1)	17(0)

Source: South Cambridgeshire District Council Annual Status Report 2018 and communication with the South Cambridgeshire District Council EHO

Note: ^(a) Annual Data Capture for 2018 is 92%
Values in brackets show the number of days above 50µg/m³

Particulate Matter (PM_{2.5})

The monitoring results from the 'Girton' monitoring station show that PM_{2.5} concentrations did not exceed the annual mean objective between 2015 and 2018.

Table 3.4: Automatic monitoring data for annual mean PM_{2.5} objective

Site name	Site classification	Within AQMA	National grid reference		Annual mean PM _{2.5} concentration (µg/m ³)			
			X	Y	2015	2016	2017	2018 ^(a)
Girton	Roadside	No	542676	260667	11	13	11	11

Source: South Cambridgeshire District Council Annual Status Report 2018 and communication with the South Cambridgeshire District Council EHO

Note: ^(a) Annual Data Capture for 2018 is 92%
Bold indicates an exceedance of the annual mean PM_{2.5} objective (Annual Mean: 25µg/m³).

3.5.3 Local Authority Diffusion Tube Monitoring

SCDC undertakes diffusion tube monitoring at 27 sites and CCC undertook diffusion tube monitoring at 64 sites 2018. There are no SCDC diffusion tubes located within 3km of the scheme, there is one diffusion tube that is owned by CCC.

The closest monitoring station to the study area is an NO₂ diffusion tube located on Madingley Road (A1303) between Wilberforce Road and Storey's Way 0.6km north of the scheme. This site is located within the Cambridge urban area and is very close to Madingley Road.

Table 3.5 shows that at this location annual mean NO₂ concentrations are below the national objectives.

Table 3.5: Representative non-automatic monitoring

Site name	Site classification	Within AQMA	National grid reference		Annual mean PM _{2.5} concentration (µg/m ³)			
			X	Y	2015	2016	2017	2018 ^(a)
Madingley Road	Kerbside	No	543784	259093	38	37	33	30

^(a)Diffusion tube has been bias corrected by CCC

3.5.4 Scheme Specific Monitoring

A scheme specific NO₂ diffusion tube monitoring survey commenced in July 2019. The results of this survey are not yet available, however they will be used to inform baseline conditions in the preferred scheme's Environmental Impact Assessment.

3.5.5 Defra Projected Background Concentrations

Defra provides estimates of background pollution concentrations for NO_x, NO₂, PM₁₀ and PM_{2.5} across the UK for each one-kilometre grid square for every year from 2017 to 2030. Future year projections have been developed from the base year of the background maps, which is currently 2017. The maps include a breakdown of background concentrations by emission source, including road and industrial sources which have been calibrated against 2017 UK monitoring data.

The highest background concentrations for the 1km grid squares that contain the scheme in 2019 and 2026 (opening year) are presented in Table 3.6 below. The data shows background concentrations are all below the relevant objectives. The highest concentrations of NO₂, NO_x and PM_{2.5} are located in grid square '542_259' and the highest PM₁₀ concentration is located in grid square '542_258'.

Table 3.6: Defra projected background concentrations of NO_x, NO₂, PM₁₀ and PM_{2.5} for proposed scheme site in 2019 and 2026 (µg/m³)

Grid Square	2019 Defra background				2026 Defra background			
	NO ₂	NO _x	PM ₁₀	PM _{2.5}	NO ₂	NO _x	PM ₁₀	PM _{2.5}
542_259	12.9	17.8	16.8	10.5	9.5	12.6	15.9	9.7
542_258	11.4	15.5	17.0	10.3	8.5	11.3	16.0	9.4

Source: <https://uk-air.defra.gov.uk/data/laqm-background-maps>

3.5.6 Pollution Climate Mapping (PCM) Model

Defra's Pollution Climate Mapping (PCM) model is used to report UK compliance with the Air Quality Directive. The current published version of the PCM model is developed using a base year of 2017.

The scheme from the preferred route does not overlap with the PCM model and therefore this has not been considered further as the Scheme is not predicted to affected compliance with the Air Quality Directive.

3.6 Sensitive Resources and Receptors

In accordance with TAG Unit 3 receptors included within the appraisal were those where the annual mean air quality objectives are applicable for the protection of human health and are within 200m of the ARN.

The human receptors were determined from Ordnance Survey AddressBase dataset which details the classification of receptors⁸. Receptors included residential properties, educational facilities, hospitals and prisons.

3.6.1.1 Results of Assessment Qualitative Methodology (OAR 2 & OAR 3)

The initial qualitative assessment presented in OAR 2 and OAR3 (presented in Appendix C) concluded that the proposed route alignments would not be expected to cause substantial changes to traffic flows on the surrounding road network. Overall, the changes in air quality from any of the scheme options was judged to be small at affected receptors and therefore changes on the NPV would not be significant compared to the other elements of the appraisal. It was considered that increases in public transport numbers along the route options would be offset by a reduction in car numbers on the A428 and other local roads due to the expected modal shift towards public transport. In the INSERT tables it was concluded that air quality would have neutral effect for each option and therefore not influence the decision making process at the OAR phase.

3.6.1.2 Quantitative Methodology (preferred route)

The net present value (NPV) of the preferred scheme has been calculated by the marginal external costs (MEC) method, the results of which are presented in the economic business case.

⁸ Ordnance Survey (2013). Address Base Products Classification Scheme. October 2013.

4 Biodiversity

4.1 Introduction

This section presents the findings of the WebTAG appraisal completed for the proposed options for the Scheme with regards to biodiversity. The appraisal followed guidance presented in WebTAG Unit A3⁹ and also draws on guidance on ecological assessments Chartered Institute for Ecology and Environmental Management (CIEEM, 2018). The purpose of the appraisal is to identify ecological features, identify their significance and the impacts of options, using the appraisal worksheets set out in WebTAG Unit A3, so that a summary of the potential effects of each option on biodiversity is reached.

4.2 Legislation and Policy Context

WebTAG Unit A3 states that environmental practitioners/ topics specialists should refer to current European and UK legislation, regulations and policy and best practice when undertaking the assessment.

The following legislation, policy and local Biodiversity Action Plans (BAPs) are considered relevant for this assessment.

4.2.1 National Legislation and Policy

The key legislation relating to ecology and the environment is The Conservation of Habitats and Species Regulations (2017) and Wildlife and Countryside Act (WCA) (1981, as amended). Together, these form the precedent for species and habitat protection in England. Badgers are protected under the Protection of Badgers Act 1992.

Under the Natural Environment and Rural Communities (NERC) Act 2006, all public bodies are required to have regard to biodiversity conservation when carrying out their function. Under this act a list of habitats and species that are of principal importance for the conservation of biodiversity in England are published under Section 41 (S41). These include those former UK Biodiversity Action Plan (UK BAP) priority habitats and species that occur in England. The Cambridgeshire and Peterborough Biodiversity Group provide Biodiversity Action Plans (BAPs)¹⁰ for the habitats and species within Cambridgeshire.

4.2.2 Local plans

A number of policies are relevant to biodiversity within the Cambridge Local Plan (2018) as detailed below:

- **Policy 69: Protection of sites of biodiversity and geodiversity importance** - *In determining any planning application affecting a site of biodiversity or geodiversity importance, development will be permitted if it will not have an adverse impact on, or lead to the loss of, part or all of a site.*

⁹ Department for Transport (2019) TAG UNIT A3 Environmental Impact Appraisal (Accessed Online: <https://www.gov.uk/transport-analysis-guidance-webtag>)

¹⁰ Cambridgeshire and Peterborough Biodiversity Group (2019) Habitat Action Plans (Accessed Online: <http://www.cpbiodiversity.org.uk/biodiversity-action-plans>)

- **Policy 70: Protection of priority species and habitats** - *Development will be permitted which protects priority species and habitats and enhances habitats and populations of priority species. Developments should also minimise any ecological harm.*
- **Policy 71: Trees** - *Development will not be permitted which involves felling, significant surgery (either now or in the foreseeable future) and potential root damage to trees of amenity or other value, unless there are demonstrable public benefits accruing from the proposal which clearly outweigh the current and future amenity value of the trees.*

Furthermore, the South Cambridgeshire Local Plan (2018) detailed the following policies which are relevant to biodiversity:

- Policy NH/4: Biodiversity; and
- Policy NH/5: Sites of Biodiversity or Geological Importance.

These policies detail that development proposals where the primary objective is to conserve or enhance biodiversity will be permitted and new developments must aim to maintain, enhance, restore or add to biodiversity.

4.3 Assessment Methodology

The ecological baseline for this appraisal has been provided through information collected to inform the ongoing biodiversity assessment for the scheme including:

- Desk based data search (information collated using Multi-Agency Geographic Information for the Countryside, Joint Nature Conservation Committee, Cambridgeshire and Peterborough Biodiversity Group and Natural England National Character Area Profile 88 Bedfordshire and Cambridgeshire Claylands);
- Reptile Survey Report (Cambridge Ecology, 2018a);
- Water Vole Survey Report (Cambridge Ecology, 2018b);
- Breeding Bird Survey Report (Cambridge Ecology, 2018c);
- Great Crested Newt Survey Report (Cambridge Ecology, 2018d);
- Badger Survey Report (Cambridge Ecology, 2018d);
- Phase 1 Habitat Survey Report (Cambridge Ecology, 2018e);
- eDNA Great Crested Newt Report (and associated updated report) (Cambridge Ecology, 2018f); and
- Protected Species Constraints Survey Report (Cambridge Ecology, 2017).

Third party data used includes Bourn Airfield, Volume One, Two and Three – Environmental Statement (Turley, 2018).

4.4 Study Area

As discussed in Section 1, the C2C project covers a wide area. The planning of the project has been split into two phases with a new travel hub facility being developed in parallel.

The Phase 1 section is between the Madingley Mulch roundabout into Cambridge, connecting into the existing bus network on Grange Road. Phase 2 is from Madingley Mulch roundabout out to Cambourne, through the proposed development at Bourn Airfield. The scheme options for Phase 1 and Phase 2 are discussed in detail in Section 1.

Table 4.1 below details the extent of land required to inform this appraisal (hereafter referred to as the 'study area'). The study area comprises the land covered by the scheme options and additional areas of search. The search areas were defined to ensure that the

Ecological Zone of Influence (EZol) relevant to each ecological feature was used to inform this appraisal. The relevant EZol was influenced by the extent and nature of the proposed works and based on accepted best practice guidance.

Table 4.1: Zone of Influence for this assessment

Ecological Feature	Relevant Survey Guidance	Zone of Influence
Designated Sites	CIEEM (2018) <i>Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal</i> .	2.0km surrounding the scheme options
Designated Sites for Bats	Design Manual for Roads and Bridges (DMRB) (2009) <i>Environmental Assessment: Assessment of Implications on European Sites</i> . Volume 11, Section 4 [HD 44/09].	30.0km surrounding the scheme options
Protected Species / Habitat Surveys		
Phase 1 habitat and hedgerows	Joint Nature Conservation Committee (2010) Phase 1 Habitat Survey Handbook Department for Environment Food and Rural Affairs (2007) Hedgerow Survey Handbook (2 nd edition)	250m buffer around Option 3a
Botany	N/A	50m beyond the red line boundary of the Cambridge better Public transport Scheme
Breeding Birds	Common Bird Census (1983) British Trust for Ornithology.	250m buffer around Option 3a
Wintering Birds	Bibby <i>et al.</i> , (2000) Bird Census Techniques (2 nd Edition)	250m beyond the red line boundary of the Cambridge better Public transport Scheme
Barn Owl	Shawyer (2011) Barn Owl <i>Tyto alba</i> Survey Methodology and Techniques for use in Ecological Assessment. The Barn owl Trust. Survey Techniques, Leaflet no. 8. Gilbert <i>et al.</i> , (1998) Bird Monitoring Methods. A Manual of techniques for Key UK Species.	Initially 50m beyond the red line boundary of the Cambridge better Public transport Scheme For EIA wider survey area being considered.
Badger	Harris <i>et al.</i> , (1989) Surveying Badgers	50m buffer around Option 3a
Water vole	Strachen & Moorhouse (2006) Water Vole Conservation Handbook Dean, et al., (2016). The Water Vole Mitigation Handbook	50m buffer around Option 3a
Bats	Bat Conservation Trust (2016). Good Practice Guidelines: Bat Surveys for Professional Ecologists	50m beyond the red line boundary of the Cambridge better Public transport Scheme (for trees)
Brown Hare	Wiltshire Mammal Group (2015) Brown hare Surveys 2015-2016 British Trust for Ornithology (1999) Developing a mammal monitoring programme for the UK	50m beyond the red line boundary of the Cambridge better Public transport Scheme
Reptiles	Froglife (1999) Advice Sheet 9: Reptile Survey	50m buffer around Option 3a
Great crested newts	English Nature (2001) Great crested newt mitigation guidelines	250m buffer around Option 3a
Invertebrates	Drake et al., (2007) Surveying terrestrial and freshwater invertebrates for conservation evaluation	50m buffer around Option 3a

4.5 Baseline Information and Receptors

4.5.1.1 Designated Sites

There are four statutory designated sites within 2km of the proposed scheme option. These include:

- Eversden and Wimpole Woods Special Area of Conservation (SAC) is located approximately 6.5km to the south
- Madingley Wood Site of Special Scientific Interest (SSSI) 0.9km to the east,
- Caldecote Meadows SSSI is 1.6km to the south
- Hardwick Wood SSSI is 1.7km to the south.

Three non-statutory sites lie within 1.0 km of the proposed scheme options including:

- Madingley Slip Road RSV County Wildlife Site (CWS) to the north of the Phase 2 route opposite the Long Road/St Neots Road junction – separated from the proposed scheme by the existing carriageway of A428;
- Bucket Hill Plantation Grassland CWS - 0.9km to the south on Bourn Airfield; and
- Scrubland east of the M11 CWS – within the footprint of Phase 1 of the scheme.

4.5.1.2 Habitats

The dominant habitat across all the route options are; arable fields, amenity grasslands, improved grassland, tall ruderal vegetation, dense/scattered scrub and ephemeral/short perennial. Habitats of greater ecological importance included; semi-improved grassland, broad-leaved lowland deciduous woodland (including plantation woodland), traditional orchards, hedgerows, wet and dry ditches, waterbodies and a brook.

Madingley Wood SSSI, located between the A428 and A1303, is an ancient woodland (as described in Section 7. It is a relatively small ash (*Fraxinus excelsior*) / field maple (*Acer campestre*) woodland which is characteristic of clayland landscapes in eastern England. Species present include pedunculate oak (*Quercus robur*), ash, field maple, hazel (*Corylus avellana*) coppice, hawthorn (*Crataegus monogyna*), dog's mercury (*Mercurialis perennis*) and bluebell (*Hyacinthoides non-scripta*).

4.5.1.3 Species

The following protected¹¹ and notable species¹² have been included in this assessment as they are considered relevant the scheme:

- Foraging and commuting bats along hedgerows, scrub, trees, woodland features and over waterbodies including the Annex II species barbastelle (*Barbastella barbastellus*);
- Roosting bats (within trees);
- Badger including setts as well as foraging and commuting areas in hedgerows, woodland, field edges and scrub;
- Great crested newts in waterbodies, woodland, hedgerow, and scrub;
- Widespread reptiles in semi-improved grassland, hedgerows, scrub and tall ruderal;
- Breeding birds;

¹¹ Species protected under current environmental legislation such the Conservation of Habitats and Species Regulations (2017), Wildlife and Countryside Act (WCA) (1981, as amended) and the Badger Act (1992).

¹² Those species listed under S41 of the NERC Act (2006).

- Wintering birds;
- Barn owl; and
- Brown hare foraging, commuting and breeding in arable and field margins.

4.6 Results of Assessment

A summary of the appraisal is presented here. More details on the appraisal of the potential effects of each scheme option can be found in the Biodiversity WebTAG worksheets provided in Appendix D.

4.6.1 Phase 1 Assessment

4.6.1.1 Designated Sites

Low Cost A and Low Cost B options of Phase 1 of the scheme would directly impact on the Madingley Wood SSSI due to the extra lane required, thus removing buffer zone vegetation to the woodland and could impact root zones and the canopy of some of the trees on the SSSI boundary. This could lead to impacts on the quality of the woodland (the qualifying feature of the SSSI). Therefore, a major adverse effect on Madingley Wood SSSI is anticipated for these options of Phase 1 of the scheme. Neutral impacts are expected for Do Something 1a and 1b options as these are not close to the SSSI.

Minor adverse effects are anticipated on the scrubland east of the M11 CWS due to the loss of habitat expected through the site for Do Something 1a and 1b options. Neutral impacts are expected for Low Cost A and Low Cost B options.

No significant effects on the integrity of Hardwick Wood SSSI, Caldecote Meadows SSSI or Bucket Hill Plantation Grassland CWS are anticipated as the sites are over 1.0km away from all the proposed route options for Phase 1 of the scheme.

Do Something 1a and 1b options down Adams Road have neutral impacts on the Bin Brook CWS as the CWS is culverted under Adams Road.

4.6.1.2 Habitats

The ecological importance of the habitats present has been appraised against their presence on Section 41 of the NERC Act (2006), Local BAPs and their potential to support protected or notable species. Reference to Natural England's Natural Area profiles has also been considered to ensure the appraisal can be set in the context of the biodiversity of the area as a whole.

Low Cost A and Low Cost B options would impact Madingley Wood SSSI due to the additional lane requirement which would remove broad-leaved woodland (a Habitat of Principal Importance (HPI) under S41 of the NERC Act (2006)). Madingley Wood SSSI is also an ancient woodland which is considered irreplaceable habitat. Furthermore, the use of the waterworks site in Low Cost A is considered to negatively impact biodiversity due to the habitats present including; tall ruderal, broad leaved semi-natural woodland, broad leaved plantation woodland and poor semi improved grassland. Low Cost A and Low Cost B options could also result in the loss of hedgerows and broad-leaved trees down Madingley road. Hedgerows are listed as a HPI under S41 of the NERC Act (2006). The LBAP also details that attention should be directed at all of the hedgerow stock as important habitat in contrast to the national focus on ancient and species rich hedgerow due to a post-war reduction in hedgerow stock.

Do Something 1a and 1b options would results in the loss of hedgerows, arable fields, plantation woodland and limited areas of broad-leaved trees. Moderate adverse impacts are

expected for hedgerows for these options due to their loss and severance along the route. Arable field margins are listed as a HPI under S41 of the NERC Act (2006) and are listed within the LBAP for Cambridgeshire due to the habitats they provide for species such as brown hare, great crested newt and grey partridge (*Perdix perdix*).

No direct impacts are anticipated on waterbodies.

4.6.1.3 Species

Low Cost A and Low Cost B options have the potential to affect badger, birds, great crested newts, invertebrates, reptiles and other Species of Principal Importance (SPI) through loss of habitats for the additional lane on the A1303. However, these options are largely on-road using the existing corridor.

Do Something 1a and 1b options have the potential to affect badger, birds, great crested newts, invertebrates, reptiles and other Species of Principal Importance (SPI) through loss of habitats. However, the habitats lost for these options are largely arable land with hedgerows. Minor adverse impacts are expected for badger, birds, bats, invertebrates and reptiles with neutral impacts expected for great crested newts as they have not been recorded as present since 2017.

4.6.2 Phase 2 Assessment

4.6.2.1 Designated Sites

Minor adverse effects are anticipated for Eversden and Wimpole Woods SAC SSSI. Third party data has identified barbastelle activity (including roosts) within Bourn Airfield (Turley, 2018). The surveys found that the barbastelle bats present may be associated with the SAC, but no clear link was established. Habitat within Bourne Airfield provides suitable foraging and commuting habitat for this species and therefore is considered to be functioning habitat of the SAC. None of the proposed Options would result in direct habitat loss of the SAC and no known barbastelle roosts would be lost. However, the data available indicates that some of the options for Phase 2 would require the removal of habitats along known bat flight lines used by barbastelles which may be part of the SAC population. As part of the Environmental Impact Assessment (EIA), a Habitats Regulation Assessment (HRA) will be produced and any mitigation will be developed in addition to the mitigation proposed for the separate airfield development.

No significant effects on the integrity of Madingley Wood SSSI or Madingley Slip Road RSV CWS are anticipated due to the distance from all options of Phase 2 of the scheme and the general mitigation measures that would be implemented during construction.

4.6.2.2 Habitats

The proposed works for all options would potentially result in permanent loss of habitats. Several of the habitats would be directly impacted by all options. Affected habitats would include; broad-leaved plantation woodland, hedgerows, semi-improved grasslands and improved grasslands. Options 2a, 2b, 3a and 3b may result in the loss of hedgerows along St Neots Road between Bourne airfield and Scotland Farm, whereas Options 1a and 1b have limited impact in this area as it largely passes through improved grassland. Options 1a and 1b is likely to result in the loss of broad-leaved trees around Hardwick between St Neots Road and the A428. As options 2a, 2b, 3a and 3b are largely on-road solutions, habitat loss is limited in the Hardwick area. As Option 2b is an on-road scheme with minor junction alterations at A428 Hardwick and Scotland Farm travel hub, the extent of broad-leaved plantation woodland removal is reduced, reducing the overall impact to minor adverse. All scheme options will

include an off-road section within Bourne airfield which may result in the loss of arable land, hedgerows and scattered trees.

No direct impacts are anticipated on waterbodies.

4.6.2.3 Species

All the proposed options for Phase 2 of the scheme have the potential to affect badger, birds, great crested newts, invertebrates, reptiles and other Species of Principal Importance (SPI) through loss of habitats. Important flight lines for bats were identified on plans within third party data which would be crossed by Phase 2 of the scheme (Turley, 2018). However, in the absence of the assessment as to how these flight lines have been identified as 'key' for bat species within the reporting of third-party data, these flight paths are not considered as significant within this assessment. Furthermore, the off-road options through Bourne Airfield will not be a major road and the hours of operation are unlikely to overlap with activity times for bats which will reduce light spill for sensitive species such as barbastelle. All options have therefore been assessed as minor adverse for bats species.

The habitats within the scheme footprint are largely arable land with hedgerows. In the absence of mitigation there is a risk of road collisions for species such as badger.

4.6.2.4 Overall Appraisal Score

The table below details the overall appraisal scores for each of the options.

Table 4.2: Overall appraisal scores for each option

Option	Overall Appraisal Score
Phase 1	
Do minimum	Neutral
Low Cost A	Major Adverse
Low Cost B	Major Adverse
Do Something 1a	Moderate Adverse
Do Something 1b	Moderate Adverse
Phase 2	
Option 1a	Moderate Adverse
Option 1b	Moderate Adverse
Option 2a	Moderate Adverse
Option 2b	Minor Adverse
Option 3a	Moderate Adverse
Option 3b	Moderate Adverse

5 Greenhouse Gases

5.1 Introduction

This section presents the applicable legislation, the methodology, study area, existing baseline, and results of the assessments that have been undertaken with regards to Greenhouse Gas (GHG)¹³ emissions associated specifically with the operational phase of the scheme. The DFT's WebTAG Unit A3 Environmental Impact Appraisal outlines the need to determine the impacts of proposed transport schemes on GHG emissions - whether emissions increase or decrease. The term of GHG emissions will also be known as carbon emissions throughout this report.

5.2 Legislation and Policy Context

5.2.1 European Union

5.2.1.1 The Commission Implementing Regulation (2014/749/EU)

Article 17 states that Member States shall report approximated GHG inventories as referred to in Article 8(1) of Regulation (EU) No 525/2013 at a level of disaggregation of source categories reflecting the activity data and methods available for the preparation of estimates for the year X-1. An explanation for the main drivers for the trends in emissions should also be reported¹⁴.

5.2.2 National Legislation and Policy

5.2.2.1 Legislation

National Policy Statement for National Networks

The National Policy Statement for National Networks (NPSNN)¹⁵ contains a section on carbon emissions, particularly paragraph 5.17, which sets out how the impact of carbon will be assessed as part of the EIA process in order to meet the overarching national carbon reduction strategy as set out in the Carbon Plan (2011). Mitigation measures in both the design and construction should be presented as part of the assessment. The NPSNN is applicable to a public transport scheme as private vehicles will be using the national network first in order to reach the travel hub.

Climate Change Act 2008

The Climate Change Act 2008 forms part of the UK government's plan to reduce GHG emissions, committing the government to a reduction of GHG by at least 80% of 1990 levels by 2050. With recent legally binding climate commitments the UK is set to change this emissions reduction target: net UK GHG emissions for the year 2050 must be 100% lower than the 1990 baseline¹⁶.

¹³ A greenhouse gas is a gas that absorbs and emits radiant energy within the thermal infrared range. Greenhouse gases cause the greenhouse effect. The primary greenhouse gases in Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide and ozone.

¹⁴ Official Journal of the European Union (2014) Commission Implementing Regulation (2014/249/EU) [online] available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0749> (last accessed September 2019)

¹⁵ Department for Transport (2014) National Policy Statement for National Networks (NPSNN) [online] available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/387223/npsnn-web.pdf (last accessed March 2019).

¹⁶ The Climate Change Act 2008 (2050 Target Amendment) Order 2019 [online] available at: <https://www.legislation.gov.uk/uksi/2019/1056/contents/made> (last accessed September 2019)

The Climate Change Act created a new approach to managing and responding to climate change in the UK, by:

- Setting ambitious, legally binding emission reduction targets;
- Taking powers to help meet those targets;
- Strengthening the institutional framework;
- Enhancing the UK's ability to adapt to the impact of climate change; and
- Establishing clear and regular accountability to the UK Parliament and to the devolved legislatures¹⁷.

Key provisions of the Act in respect of climate change mitigation include the requirement for the government to set legally binding carbon budgets capping the amount of GHG emitted in the UK over a 5-year period, as set out in Table 5.1.

Table 5.1: UK carbon reduction targets

Carbon Budget	Carbon Budget Level	Reduction Below 1990 Levels
3rd carbon budget (2018- 2022)	2,544MtCO ₂ e	37% by 2020
4th carbon budget (2023- 2027)	1,950MtCO ₂ e	51% by 2025
5th carbon budget (2028- 2032)	1,725MtCO ₂ e	57% by 2030

Key provisions of the Act in respect of climate change adaptation include:

- A requirement for the government to report, at least every 6 years, on the risks to the UK of climate change, and to publish a programme setting out how these will be addressed. This Act also introduces powers for government to require public bodies and statutory undertakers to carry out their own risk assessment and make plans to address those risks.
- The Adaptation Sub-Committee of the Committee on Climate Change, will provide advice to, and scrutiny of, the government's adaptation work.

5.2.2.2 National Policy

The Carbon Plan 2011

The Carbon Plan was presented to UK Parliament pursuant to Sections 12 and 14 of the Climate Change Act 2008. The plan sets out how the UK will achieve decarbonisation within the framework of the energy policy. UK local authorities and regional level authorities must report on their carbon dioxide (CO₂) emissions. However, all emissions from the motorways sector have been removed and are not factored into the annual CO₂ emissions.

Infrastructure Carbon Review

The Infrastructure Carbon Review¹⁸ sets out carbon reduction actions required by infrastructure organisations. In terms of the scheme, this means that emission reduction actions should be taken into account when developing scheme specific mitigation measures, where relevant.

PAS2080:2016

PAS2080¹⁹ sets out a common approach and understanding of whole life carbon management in the provision of economic infrastructure as a result of the Infrastructure Carbon Review. It

¹⁷ DECC (2012) Climate Change Act 2008

¹⁸ HM Treasury (2013) Infrastructure Carbon Review [online] available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/260710/infrastructure_carbon_review_251113.pdf (last accessed March 2019)

¹⁹ BSI (2016) PAS 2080: Carbon management in infrastructure [online] available at: <https://shop.bsigroup.com/ProductDetail?pid=000000000030323493> (last accessed March 2019)

promotes reduced carbon, reduced cost infrastructure delivery, more collaborative ways of working and a culture of challenge in the infrastructure value chain.

5.2.3 Local Policy

Cambridge Local Plan 2018

Cambridge County Council (CCC) adopted their Cambridge Local Plan²⁰ in 2018. GHG policies within the Local Plan include Policy 28: Carbon reduction, community energy networks, sustainable design and construction, and water use which states that *“all developments should take the available opportunities to integrate the principles of sustainable design and construction into the design of proposals[...] including carbon reduction.”*

South Cambridgeshire Local Plan 2018

South Cambridgeshire District Council adopted their Local Plan in 2018²¹. GHG policies within the Local Plan include Policy CC/3: Mitigation and Adaptation to Climate Change, which states that proposals should *“embed the principles of climate change mitigation and adaptation into the development”*. Policy CC/: Renewable and Low Carbon Energy in New Developments requires developments for new dwellings or other buildings to reduce carbon emissions.

5.3 Assessment Methodology

5.3.1 Qualitative Methodology (OAR 2 & OAR 3)

Using the route information and maps, a qualitative assessment has been undertaken using professional judgement on the impact the options will have on traffic flows and GHG emissions.

A scoring on the likely impacts was applied for the assessment at OAR2, 0 being no impact, neutral impact or as existing to 3 with the greatest impact on GHG emissions out of the options being assessed.

However, as the likely changes in traffic as a result of the different options are not considered likely to differ significantly, due to the scheme options running down similar routes using either Scotland Farm travel hub or Waterworks travel hub at OAR3, the scoring of options was not carried through. On this basis and remaining in line with air quality and noise assessments, the quantification of economic value (positive or negative) is not considered to have a material effect on the overall economic benefit of the scheme and would not have a material effect on the schemes overall Benefit Cost Ratio (BCR). Additionally, the expected changes in GHG emissions as a result of the scheme (for all options assessed) are not predicted to be significant and therefore has only been calculated for the preferred route.

5.3.2 Quantitative Methodology (Preferred route)

The preferred route option has been assessed quantitatively. The greenhouse gas effects of the scheme options were assessed using TAG Unit A.5.4 Marginal External Costs (MEC) the Net Present Values (NPVs) have been calculated based upon this approach. The full details of the methodology can be found in the Air Quality chapter – Quantitative Methodology section.

²⁰ Cambridge City Council (2018) Cambridge Local Plan [online] available at: <https://www.cambridge.gov.uk/media/6890/local-plan-2018.pdf> (last accessed March 2019)

²¹ South Cambridgeshire District Council (2018) South Cambridgeshire Local Plan [online] available at: https://www.scambs.gov.uk/media/12740/south-cambridgeshire-adopted-local-plan-270918_sml.pdf (last accessed April 2019)

5.4 Study Area

The study area to be considered for this assessment specifically analyses the operational emissions that impact the ARN for road user carbon (vehicle emissions). The study areas for the options outlined for Phase 1 and Phase 2 have not been determined using traffic data. The qualitative assessments undertaken for OAR 2 and OAR 3 concluded that the scheme is not expected to cause widespread changes to traffic flows on the surrounding road network that meet the criteria for assessment as set out in TAG Unit A3.

A quantitative assessment has been done of the preferred route (phase 1 option 1b and phase 2 option 1b) following TAG Unit A.5.4 which does require the defining of a study area based on changes in traffic flows.

This study area when defined in terms of lifecycle stage, is B9 – User utilisation of infrastructure as detailed in Section 7 of PAS2080:2016.

5.5 Baseline Information

The following baseline information is based on national and county-wide data as GHG emissions do not have a local receptor, as once they are emitted, they are not limited to geographic boundaries.

From a UK perspective, national GHG emissions in 2017 decreased by 44% from 1990. In 2018, UK net CO₂ emissions were estimated at 364 million tonnes, a decrease of 2% in comparison to 2017 levels²². In 2017, 27% of UK GHG emissions were from the transport sector which is a 0% change in comparison to 2016²³.

Within South Cambridgeshire, the carbon emissions specifically from motorways in 2016 was 130.9 ktCO₂, which represents a 2% increase since 2005 and an 1% decrease in overall road transport emissions²⁴. There were 37.9 million vehicles licensed for use on roads in the UK at the end of March 2018. However, in 2018 Q1 registration of ultra-low emission vehicles were up by 11% on 2017 Q1. There has also been a sharp decline in the number of diesel cars being registered for the first time in 2018 Q1, down 33% compared to 2017 Q1²⁵.

5.6 Sensitive Resources and Receptors

GHG emissions do not have a local receptor because once they are emitted, they are not limited to geographic boundaries, and therefore the global atmosphere is the receptor. All GHG emissions contribute to climate change. It is important to note that the country which has emitted the emissions is responsible for those emissions, and the UK is legally bound to cutting emissions to meet its carbon budgets.

²² Department for Business, Energy and Industrial Strategy (2019): 2018 UK Provisional Greenhouse Gas Emissions [online] available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/790086/2018-provisional-emissions-statistics-one-page-summary.pdf (last accessed March 2019).

²³ Department for Business, Energy and Industrial Strategy (2018): 2017 UK Greenhouse Gas Emissions [online] available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/776083/2017_Final_emissions_statistics_one_page_summary.pdf (last accessed March 2019).

²⁴ Department for Business, Energy and Industrial Strategy (2018): 2005 to 2016 UK local and regional CO₂ emissions – data tables [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/720677/2005-16_UK_local_and_regional_CO2_emissions.xlsx (last accessed March 2019).

²⁵ Department for Transport (2018): Vehicle licensing statistics: January to March 2018 report [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/729581/vehicle-licensing-statistics-january-to-march-2018.pdf (last accessed March 2019).

The NPSNN states that *“It is very unlikely that the impact of a road project will, in isolation, affect the ability of Government to meet its carbon reduction plan targets.”* However, the release of GHG emissions needs to be assessed and managed to minimise emissions where possible.

5.7 Results of Assessment

5.7.1 Phase 1 Qualitative Assessment

The Do Minimum option has the least embedded carbon footprint, and the Low Cost options would probably have slightly less embedded carbon than the Do Something options. The Travel Hub options are likely to have similar embedded carbon.

Operational carbon emissions will vary depending on the impact on traffic as a result of the scheme. This impact on traffic levels is likely to be over a relatively small (ie. localised) area (as discussed in the air quality section above). All increases in carbon would be considered significant in the light of government requirements to reduce carbon across the UK. As all the options are likely to have similar scales of change on traffic it is likely that the differences in carbon between will minor between the options. As such carbon is not likely to be a differentiator between the schemes in Phase 1.

5.7.2 Phase 2 Qualitative Assessment

Option 1 (off road alignment) would have the largest embedded carbon impact, with Option 2 (on road with junction improvements) the lowest embedded carbon impact.

In terms of operational impacts Option 2 would have higher potential for idling public transport traffic than the other two options and would therefore have a marginally higher carbon footprint than Option 1 and 3 (which have segregated lanes for public transport). However, it is likely that (as with Phase 1) the differences in traffic changes due to each option will not result in significant differences in carbon emissions between the options. As such carbon is not seen as a differentiator between the options.

5.7.3 Quantitative Assessment

The net present value (NPV) has been calculated by the marginal external costs (MEC) method the results of which are presented in the economic business case.

Procurement decisions ensuring that local materials are used for the construction of the scheme will reduce emissions from the transportation of materials to site. A limitation of the assessment is that HGVs and buses are classified together, and therefore use the same emissions factors per km driven. During operation, using low carbon or electric buses on the route would reduce GHG emissions throughout the operating life time of the bus route and travel hub.

6 Historic Environment

6.1 Introduction

This section presents the applicable legislation, the methodology, study area and existing baseline and results of the qualitative WebTAG assessment that has been undertaken with regards to the historic environment.

6.2 Legislation and Policy Context

6.2.1 National Legislation and Policy

6.2.1.1 Legislation

The over-arching legislation in relation to the historic environment in England is provided by the Ancient Monuments and Archaeological Areas Act 1979; and Planning (Listed Buildings and Conservation Areas Act)1990.

6.2.1.2 National Policy

National planning policy is set out in the National Planning Policy Framework (NPPF) (2019). The NPPF addresses the conservation and enhancement of the historic of pertinence to the Scheme are paragraphs 184, 189, 190, 192, 193, 194, 195, 196, 197, 198 and 199, and footnote 63 (which is given equal weight to the paragraphs). These set out the local planning authority's responsibilities when dealing with planning proposals which have the potential to impact on cultural heritage assets. The policies emphasise the importance of balancing the need for the conservation of heritage assets with the desirability of new development. Although this Scheme will not be subject to the local authority planning process these policies represent best practice when dealing with the cultural heritage resource.

6.2.2 Local Policy

The current local planning policy and guidance relevant to the historic environment is contained in the adopted (2018) South Cambridgeshire Local Plan.

The relevant policies for South Cambridgeshire are detailed below:

- Policy NH/14: Heritage Assets

1. Development proposals will be supported when:
 - a. They sustain and enhance the special character and distinctiveness of the district's historic environment including its villages and countryside and its building traditions and details;
 - b. They create new high quality environments with a strong sense of place by responding to local heritage character including in innovative ways.
2. Development proposals will be supported when they sustain and enhance the significance of heritage assets, including their settings, as appropriate to their significance and in accordance with the National Planning Policy Framework, particularly:
 - a. Designated heritage assets, i.e. listed buildings, conservation areas, scheduled monuments, registered parks and gardens;

- b. Non-designated heritage assets including those identified in conservation area appraisals, through the development process and through further supplementary planning documents;
- c. The wider historic landscape of South Cambridgeshire including landscape and settlement patterns;
- d. Designed and other landscapes including historic parks and gardens, churchyards, village greens and public parks;
- e. Historic places;
- f. Archaeological remains of all periods from the earliest human habitation to modern times.

6.3 Assessment Methodology

The purpose of this appraisal is to identify the significance of effects of the impacts of the various proposed scheme options on the historic environment resource and highlight which if any would require further study. The appraisal study follows WebTAG environmental impact appraisal guidance. This appraisal has used the following sources:

- The National Heritage List for England (NHLE) maintained by Historic England for details of nationally designated heritage assets;
- The CHER for records pertaining to all non-designated heritage assets (both below and above ground), previous archaeological events, secondary sources;
- The Archaeology Data Service has been searched for relevant archaeological fieldwork grey literature reports and publications;
- A search was undertaken on relevant planning applications (which contained historic environment information) held by South Cambridge District Council; and
- A geophysical survey has been undertaken over the area of the Waterworks travel hub site and sections of land between the Waterworks site and Grange Road where access was provided by landowners.
- A walkover survey looking at listed structures and the Conservation Areas along the Phase 1 options.

6.4 Study Area

A study area of 250m for listed buildings and 500m for all other designated heritage assets and 250m for non-designated heritage assets from the extent of the proposed options was used to develop the baseline.

6.5 Baseline Information

6.5.1 Phase 1 Low Cost A and B

The following designated heritage assets are within the study area of the two options:

There are four Grade II* listed buildings;

- A windmill (NHLE 1163652) 40m north of the option;
- Memorial and attached walls, steps and pool surround at American Military Cemetery (NHLE 1376611) 20m north of the option;
- Schlumberger Gould Research Centre and attached perimeter wall to the north (NHLE 1438644) 120m south of the option; and
- Willow House, Conduit Head Road (NHLE 1331936) 100m north of the scheme.

There are 26 grade II Listed Buildings are situated within the study area, these include;

- White House, Conduit Head (NHLE;
- House and Brock Brothers Studio, 35 Madingley Road;
- No 31 Madingley Road;
- Linked Residential Courts south-west and south of Central Buildings, Churchill College;
- The Stone House (and associated gate-piers); and
- 3 Madingley Road.

There is one Grade I Registered Park and Garden within the study area. The American cemetery (NHLE 1001573). There is also one Grade II Registered Park and Garden within the study area, Madingley Hall (NHLE 1000627).

The option route runs adjacent to the Conduit Head Road Conservation Area, the Central Cambridge Conservation Area, and runs through the West Cambridge Conservation Area. The Coton Conservation Area is located 350m south of the option.

The following non-designated assets were identified within the 500m study area for the two online options.

A single scatter of Mesolithic/Neolithic flints (CHER Monument Pre-Ref. CB15362) was recovered during excavations at Vicar's Farm (CHER Event No. ECB1015), within the University West Cambridge Campus²⁶, outside of the area of the online options.

In addition, colluvial material containing three patinated flint flakes (MCB16813) was recorded during the A428 evaluation (ECB16813). Just to the south east of the Scotland Farm travel hub site.

There are eight Iron Age archaeological assets recorded by the CHER within the study area. These comprise;

- Late Iron Age pits (MCB17461) which indicated the presence of a possible Late Iron Age settlement recorded during excavations at St Edmunds College (ECB2370);
- A Late Iron Age/Roman settlement (MCB20377) identified during excavations at Westminster College (ECB4487);
- Shallow pits containing Iron Age pottery (CB15362) was recorded during excavations at Vicar's Farm (ECB1015);
- A shallow ditch of possible Iron Age/Roman date (MCB17225) was recorded during an evaluation at 41 Madingley Road, Cambridge (ECB1951).
- Residual sherds of Iron Age pottery (MCB17832) were from post medieval gravel pits during archaeological excavations for the Kavli Institute (ECB2609);
- A possible late prehistoric/Roman barrow (MCB17833) north of Madingley Road at the Kavli Institute;
- An Iron Age find spot (03218) is recorded at Madingley Mulch roundabout (within the online options area); and

A curvilinear enclosure and associated ditches (MCB24832), possibly of Iron Age/Roman origin, are visible as cropmarks on aerial photography to the south of Madingley mulch. The enclosure was identified during geophysical surveys of the waterworks travel hub site²⁷.

²⁶ Cambridge Archaeological Unit (2001) Excavations at Vicar's Farm West Cambridge

²⁷ WYAS Archaeological Services (2018) Cambourne 2 Cambridge; Busway Options and Park and Ride Sites, Cambridgeshire.

In addition;

- Iron Age and Roman occupation features were recorded just the east of the waterworks travel hub during archaeological fieldwork for the Coton to Bourn pipeline²⁸.
- Archaeological fieldwork (ECB2765) by Dam Brook at Scotland Farm²⁹, identified a Late Iron Age settlement enclosure (11441) to the west of the Scotland Farm travel hub site.
- A concentration of fifteen quarry pits (MCB16811) were excavated at Site 8³⁰ of the A428 archaeological investigations (ECB2935), adjacent to the Scotland Farm travel hub site.

There are 35 Roman archaeological assets identified by the CHER within the study area. These include;

- Archaeological remains associated with the Roman fort and civil settlement of Durolipons (05239);
- Inhumation and cremation burials and cemeteries (CB15361, 04928, 05049A, 04927A, 04926, 05124 and MCB16299);
- Settlement and occupation features (MCB24832, CB15361, 05243, MCB20377, and MCB16299);
- Roman pottery finds recovered from the M11 cutting (04384) in the area of the proposed cycle/foot bridge for options Low Cost a and b;
- A possible Roman Villa (MCB24832) located close to the area of the online options main compound³¹, and
- The remains of a Roman road discovered in sewage trench in Madingley Road (05123), located within the footprint of the online options, which correlates to the area where the former Roman road is marked on modern maps.

There are six Saxon/early medieval archaeological assets identified by the CHER within the study area. These comprise:

- Saxon pottery (05243B) found in an area of Late Roman occupation at Storey's Orchard (ECB4923);
- Saxon cemeteries and burials at St John's College cricket field (04926, 04927, 04927A) and 71 Grange Road (05049B), and
- Saxon pottery (05125B) found in St John's College cricket field.

The CHER identifies medieval archaeological remains across the study area including:

- The site of medieval stone building (04599) at Balliol Croft House, Madingley Road, Cambridge;
- Medieval agricultural features including ridge and furrow remains associated with the Cambridge 'West Fields' (CB15344, 09068, 05094, MCB15891, MCB18582, MCB19229, MCB15878 and MCB15886), Coton (09615, 09617 and 09618) and Madingley (03520, and 09574);
- The site of Trinity Conduit Head (04917) and the conduit which ran from conduit head to the site of Grey Friars (MCB23312) which crosses the route of the online options;

²⁸ Cambridge Archaeological Unit (2010) Coton to Bourn Booster Pipeline, Cambridgeshire An Archaeological Evaluation and Excavation

²⁹ Proceedings of the Cambridge Antiquarian Society (2008) Iron Age settlement by the Dam Brook at Scotland Farm, Dry Drayton. Vol. XCVIII

³⁰ Albion Archaeology (2006) A428 Caxton to Hardwick Improvement Scheme; Assessment of Potential and Updated Project Design

³¹ Cambridge Archaeology Unit (2010) North West Cambridge, University of Cambridge; Archaeological Evaluation Fieldwork.

- The site of Merton Hall (MCB21502), which stood in what is now the grounds of St John's College;
- Earthwork remains of enclosures for a possible copse or deer park within Madingley Wood (03243). Located on the edge of the online options area, and
- Medieval streets and roads including 'St Neots Weye' (MCB23086) which followed the route of the modern Madingley Road (within the online options area).

In addition;

- The geophysical survey of the waterworks travel hub site identified Medieval ridge and furrow; and
- Medieval ridge and furrow (09573) has been identified in the area of the Scotland Farm travel hub site.

The CHER identifies post-medieval archaeological remains across the study area including the former site of milestones (MCB20890, MCB20891 and MCB20892), which were formerly located within the online options area.

6.5.2 Phase 1 Options 1a and 1b

The following designated heritage assets are within the study area of the two offline options:

There is one Grade I Listed building. The Church of St Peter, Coton (NHLE 1127774), 230m south of the options.

There are four Grade II* listed buildings;

- A windmill (NHLE 1163652) 110m north of the option;
- Memorial and attached walls, steps and pool surround at American Military Cemetery (NHLE 1376611) 100m north of the option;
- Schlumberger Gould Research Centre and attached perimeter wall to the north (NHLE 1438644) 230m north of the option; and
- Clare Hall, Herschel Road, Cambridge (NHLE 1454213), 190m south of the options.

There are 15 Grade II listed building within the study area for the offline options. These are;

- Elmside Grange Road (NHLE 1268365)
- 57 High Street Coton (NHLE 1127772)
- 44 and 46 High Street Coton (NHLE 1162596)
- 64 High Street Coton (NHLE 1331126)
- Clay Pit Cottages, Coton (NHLE 1331127)
- 12 High Street, Coton (NHLE 1331107)
- Water pump in street north of St Peter's Church (NHLE 1331128)
- Rose Cottage, Coton (NHLE 1127771)
- Coton War Memorial (NHLE 1439976)
- The Rectory, Coton (NHLE 1127773)
- Emmanuel College Sports Pavilion (NHLE 1422595)
- 9 Wilberforce Road (NHLE 1268352)
- Whewell House (NHLE 1268367)
- Silbury House (NHLE 1268366)

- University of Cambridge Real Tennis Club (NHLE 1422000)

There is one Grade I Registered Park and Garden within the study area. The American cemetery (NHLE 1001573). There is also one Grade II Registered Park and Garden within the study area, Madingley Hall (NHLE 1000627).

The option route runs through the West Cambridge Conservation Area. The Coton Conservation Area is located 90m south of the option.

The following non-designated assets were identified within the 500m study area for the two online options.

A single Lower/Middle Palaeolithic handaxe of unknown provenance (MCB19251) is recorded by the CHER as being found in/near Coton.

Late Neolithic/ Early Bronze Age activity was identified in two trenches of the archaeological evaluation of the Coton to Bourn pipeline (ECB3036), which identified waste flint flakes in a buried soil and a sub-oval pit, to the north east of Coton covered reservoir³².

A single scatter of Mesolithic/Neolithic flints (CHER Monument Pre-Ref. CB15362) was recovered during excavations at Vicar's Farm (CHER Event No. ECB1015), within the University West Cambridge site, outside of the area of the online options.

The CHER identified that residual worked flint and Late Bronze Age pottery (13017) was recovered from late archaeological features at High Cross, West Cambridge (ECB154)³³. These finds were found within the area of the proposed offline options at West Cambridge.

In addition, colluvial material containing three patinated flint flakes (MCB16813) was recorded during the A428 evaluation (ECB16813). Just to the south east of the Scotland Farm travel hub site.

There are four Iron Age archaeological assets recorded by the CHER within the study area. These comprise:

- A ditch of Iron Age/Roman date (11962), which was recorded during an evaluation at the University library (ECB1585);
- A Mid to Late Iron Age settlement at High Cross, West Cambridge (MCB15913), identified through archaeological fieldwork (ECB154) in the area of the offline options through West Cambridge;
- An Iron Age find spot (03218) is recorded at Madingley Mulch roundabout (within the offline options area), and
- A curvilinear enclosure and associated ditches (MCB24832), possibly of Iron Age/Roman origin, are visible as cropmarks on aerial photography to the south of Madingley mulch. The enclosure was identified during geophysical surveys of the waterworks travel hub site³⁴.

In addition;

- Iron Age and Roman occupation features were recorded just the east of the waterworks travel hub during archaeological fieldwork for the Coton to Bourn pipeline³⁵.

³² Cambridge Archaeological Unit (2010) Coton to Bourn Booster Pipeline, Cambridgeshire An Archaeological Evaluation and Excavation

³³ Cambridge Archaeological Unit (2010) Excavations at High Cross, West Cambridge

³⁴ WYAS Archaeological Services (2018)

³⁵ Cambridge Archaeological Unit (2010) Coton to Bourn Booster Pipeline, Cambridgeshire An Archaeological Evaluation and Excavation

- Archaeological fieldwork (ECB2765) by Dam Brook at Scotland Farm³⁶, identified a Late Iron Age settlement enclosure (11441) to the west of the Scotland Farm travel hub site.
- A concentration of fifteen quarry pits (MCB16811) were excavated at Site 8³⁷ of the A428 archaeological investigations (ECB2935), adjacent to the Scotland Farm travel hub site.
- The geophysical survey of the route of the options through Cambridge West Fields identified an Iron Age/Roman settlement³⁸.

There are six Roman archaeological assets identified by the CHER within the study area. These include;

- The ditch (11962) identified at the University Library;
- A Roman pottery findspot (04405) at Herschel Rd, Cambridge, adjacent to the offline options route;
- An early Roman settlement (13016), recorded during archaeological fieldwork at High Cross, West Cambridge (ECB154), in the area of the offline options through West Cambridge;
- A Roman brooch and grey ware findspot (MCB17753), within the footprint of the offline options at Coton Orchard;
- A Roman field system (CB15371), recorded during archaeology fieldwork at Selwyn College (ECB1026), and
- The curvilinear enclosure and associated ditches (MCB24832), visible as cropmarks on aerial photography to the south of Madingley Mulch roundabout.

In addition, a Roman cobbled surface was recorded during trial trenching for the Coton to Bourn pipeline³⁹ to the north east of the Coton covered reservoir and the course of a Roman Road is marked on modern maps to the west of Grange Road (crossing the offline routes on Adams Road).

A single record for Saxon remains is identified by the CHER within the study area. A sub-circular Middle Saxon enclosure (MCB19989), was recorded during archaeology fieldwork at Leckhampton House, Corpus Christi College (ECB2594).

The CHER identifies medieval/post medieval/modern archaeological remains across the study area including:

- Medieval agricultural features including ridge and furrow remains associated with the Cambridge 'West Fields' (04406, 04407, 09206, MCB15891,);
- Medieval agricultural remains associated with Coton (09615, 05153 and 09618), these remains were identified by the geophysical survey within the offline route⁴⁰; and Madingley (03520, and 09574);
- A medieval/post medieval boundary ditch (MCB15915) and a late medieval/early post medieval track way/droeway at High, West Cambridge, located in the area of the offline options;
- The University Rifle Range (MCB20898) was formerly located in the area of the University Rugby grounds (near to the offline routes), and

³⁶ Proceedings of the Cambridge Antiquarian Society (2008) Iron Age settlement by the Dam Brook at Scotland Farm, Dry Drayton. Vol. XCVIII

³⁷ Albion Archaeology (2006) A428 Caxton to Hardwick Improvement Scheme; Assessment of Potential and Updated Project Design

³⁸ WYAS Archaeological Services (2018b) Cambourne to Cambridge; East of the M11, Cambridgeshire

³⁹ Cambridge Archaeological Unit (2010) Coton to Bourn Booster Pipeline, Cambridgeshire An Archaeological Evaluation and Excavation

⁴⁰ WYAS Archaeological Services (2018)

- The site of a World War II Pillbox (CB15069), was formerly just to the east of Bin Brook near the University Rugby grounds.

In addition;

- The geophysical survey of the waterworks travel hub site identified Medieval ridge and furrow;
- Medieval ridge and furrow (09573) has been identified in the area of the Scotland Farm travel hub site.
- The geophysical survey of the offline options⁴¹ identified potential former field boundaries to the north east of the Coton covered reservoir; Potential archaeological features were identified to the west of Cambridge Road, Coton and between Coton Orchard and the M11.

6.5.3 Phase 2 Options 1a, 2a and 3a

The following designated heritage assets are within 500m of the three options:

- Two Grade II Listed Buildings;
 - Pump on the south east corner of Small Green, Hardwick (NHLE 1163604), 250m south of the options.
 - Great Common Farmhouse, Broadway, Bourn (NHLE 1331374), 300m south of the options.
- A Grade II Listed 18th Century registered park and garden (Madingley Hall NHLE 1000627), situated 350m north of the option near Madingley Hill service reservoir.
- There are four Grade II listed buildings within 500m of the options.

There are 47 archaeological monument and events recorded on the CHER within 250m of the options. These include the following assets identified within footprint of the options:

- At Bourne Airfield the HER identified
 - the World War II Airfield (CB15128),
 - Iron Age/Roman remains (MCB16808), a Mesolithic pick (MCB16812), pits (MCB16335), ditches (MCB16334) and a medieval routeway (MCB16809), which were recorded during the construction of the A428; and
 - Iron Age/Roman enclosures have been identified from air photos within the airfield (MCB21977), identified as an Iron Age Roman settlement during the archaeological evaluation for the airfield⁴²;
 - The site of a former school building is located at the eastern edge of the airfield (MCB20905);
- At Childerley Gate roundabout the HER identifies Roman field system (MCB17870), the site of a former milepost (MCB20889), an Iron Age coin findspot (03304) and a post medieval moated garden feature (01099);
- Between Childerley Gate roundabout and Hardwick Junction, a Roman settlement (MCB16337), a Mid Iron Age farmstead (MCB16338), and a Roman droveway (MCB18507) were recorded during the construction of the A428;
- Between Hardwick Junction and Long Road, an Iron Age/Roman enclosure (MCB21424), undated features recorded during the construction of the A428 (MCB16813) and the site of a former milestone (MCB20890);

⁴¹ WYAS Archaeological Services (2018)

⁴² Oxford Archaeology (2018) Bourn Airfield; Archaeological Evaluation Report. Report No. 2256.

- Archaeological investigation for the Coton to Bourn pipeline (ECB3036) recorded an Iron Age/Roman settlement just to the west of the proposed waterworks travel hub site;
- Geophysical survey of the travel hub site identified enclosure features in the area of an Iron Age/Roman enclosure recorded by the CHER (MCB24832).

6.5.4 Phase 2 Options 1b, 2b and 3b

The following designated heritage assets are within 500m of the three options:

- Two Grade II Listed Buildings;
 - Pump on the south east corner of Small Green, Hardwick (NHLE 1163604), 250m south of the options.
 - Great Common Farmhouse, Broadway, Bourn (NHLE 1331374), 300m south of the options.
- A Grade II Listed 18th Century registered park and garden (Madingley Hall NHLE 1000627), situated 350m north of the option near Madingley Hill service reservoir.
- There are four Grade II listed buildings within 500m of the options.

There are 47 archaeological monument and events recorded on the CHER within 250m of the options. These include the following assets identified within footprint of the options:

- At Bourne Airfield the HER identified
 - the World War II Airfield (CB15128),
 - Iron Age/Roman remains (MCB16808), a Mesolithic pick (MCB16812), pits (MCB16335), ditches (MCB16334) and a medieval routeway (MCB16809), which were recorded during the construction of the A428; and
 - Iron Age/Roman enclosures have been identified from air photos within the airfield (MCB21977), identified as an Iron Age Roman settlement during the archaeological evaluation for the airfield⁴³;
 - The site of a former school building is located at the eastern edge of the airfield (MCB20905);
- At Childerley Gate roundabout the HER identifies Roman field system (MCB17870), the site of a former milepost (MCB20889), an Iron Age coin findspot (03304) and a post medieval moated garden feature (01099);
- Between Childerley Gate roundabout and Hardwick Junction, a Roman settlement (MCB16337), a Mid Iron Age farmstead (MCB16338), and a Roman droveway (MCB18507) were recorded during the construction of the A428;
- Between Hardwick Junction and Long Road, an Iron Age/Roman enclosure (MCB21424), undated features recorded during the construction of the A428 (MCB16813) and the site of a former milestone (MCB20890);
- Archaeological remains have been found in close proximity to the Scotland Farm travel hub site including Iron Age Enclosures at Scotland Farm (11441) and middle Iron Age quarry pits recorded during the construction of Hardwick Junction (MCB21181).

⁴³ Oxford Archaeology (2018) Bourn Airfield; Archaeological Evaluation Report. Report No. 2256

6.6 Results of Assessment

A summary of the assessment is presented here, however more details on the assessment of the potential effects of the options can be found in the Historic Environment WebTAG worksheets in Appendix F.

6.6.1 Phase 1 Low Cost a and b

6.6.1.1 Designated Assets

The construction of the online options will have a low to moderate impact on the Grade II* (listed building) Memorial and attached walls, steps and pool at the American Military Cemetery (Grade I Registered Park and Garden), assets of high value. This impact will be caused by a change to the assets setting from the proximity of the scheme to the edge of the park and garden with increased visibility of traffic and potential changes to road frontage.

The construction of the online options will have a low impact on the Grade II* Madingley Mill, an asset of high value, by the removal of the verge running adjacent to Mill Farm, which will bring traffic closer to the asset.

There will be a low impact on the following assets of moderate value from the proximity of the online construction works to the assets. The Grade II listed White House, Conduit Head; House and Brock Brothers Studio, 35 Madingley Road; No 31 Madingley Road; Linked Residential Courts south-west and south of Central Buildings, Churchill College; The Stone House (and associated gate-piers), 3 Madingley Road and the West Cambridge Conservation Area.

The construction of the online options would have a moderate adverse effect on the Grade I listed American Cemetery (Registered Park and Garden) and the Grade II* (listed building) Memorial and attached walls, the other identified impacts will cause minor adverse effects.

6.6.1.2 Buried Archaeology

The following locations along the online options have been identified as having the potential to have a major impact through the truncation/removal of archaeological remains of low to moderate value.

- Iron Age remains and previously unidentified remains around the enlarged Madingley Mulch roundabout;
- Madingley Road verge where there is potential for remains associated with the woodland enclosures (located within Madingley Wood);
- Potential for unidentified remains in the small compound located between Madingley Road and Cambridge Road, Coton;
- Potential for Roman and unidentified remains, either side of the M11 cutting, around the proposed online options cycle/footbridge, and
- (Low) Potential for unknown remains in the main compound.

The construction of Waterworks travel hub Options would have a major adverse impact on the remains associated with the Iron Age/Roman enclosure (MCB2483) and the Iron Age/Roman settlement (ECB3036).

The construction of the Scotland Farm travel hub Options would have a major adverse impact on the Iron Age Enclosures at Scotland Farm (11441) and middle Iron Age quarry pits recorded during the construction of Hardwick Junction (MCB21181).

The identified impacts to the buried archaeological remains will result in a moderate adverse effect.

6.6.2 Phase 1 Do Something 1a and 1b

6.6.2.1 Designated Assets

The construction of the offline options will have a low impact on the Grade I Church of St Peter, Coton, an asset of high value. There is potential for impacting how the asset is viewed from the public footpath that crosses the offline options.

There would potentially be a low impact on the Coton Conservation area, an asset of moderate value, through a change to its setting, and particularly changing how the asset is viewed from the public footpath to the north and from introduction of a new traffic lighted junction on Cambridge Road.

There would also be a low impact on the West Cambridge Conservation Area. The triangular field to the north of the multiuser track and the University sports playing field to the south are designated as open spaces and are character features within the Conservation Area. The construction of the scheme will reduce the area of these two open spaces, which will cause a minor impact on the context of the conservation area.

The identified impacts will cause a minor adverse effect.

6.6.2.2 Buried Archaeology

The following locations along the offline options have been identified as having the potential to have a major impact through the truncation/removal of archaeological remains of low to moderate value.

The archaeological features identified during the geophysical survey, including former field boundaries, ridge and furrow, undated features and remains associated with Iron Age/Roman settlement at West Cambridge and the Iron Age/Roman enclosure remains at the waterworks. There is also potential to impact previously unidentified archaeological remains, particularly in the areas which were not subject to the geophysical survey.

The construction of Waterworks travel hub Options would have a major adverse impact on the remains associated with the Iron Age/Roman enclosure (MCB2483) and the Iron Age/Roman settlement (ECB3036).

The construction of the Scotland Farm travel hub Options would have a major adverse impact on the Iron Age Enclosures at Scotland Farm (11441) and middle Iron Age quarry pits recorded during the construction of Hardwick Junction (MCB21181).

The identified impacts to the buried archaeological remains will result in a moderate adverse effect

6.6.3 Phase 2 options

None of the options will impact on the identified designated assets.

All six Options are largely located within the footprint of the existing (St Neots Road) carriageway or within areas located within the construction/landscape areas of the A428, where the buried archaeology potential has been removed. The exceptions are where the Options cross Bourn Airfield, the site compound/landscape mitigation areas between Hardwick Junction and Childerley Gate Roundabout, and the travel hub Options.

The construction of the common route of all the Options through Bourn Airfield would cause an adverse impact on the archaeological remains associated with the Iron Age Roman settlement (MCB21977) and the remains of the World War II airfield. In addition, previously unidentified remains may survive within the route of the Options through the airfield.

The construction of the compounds and mitigation areas have the potential to cause an adverse impact on the remains of the post medieval moated garden feature (01099), the Roman settlement (MCB16337), and the Mid Iron Age farmstead (MCB16338).

The construction of Waterworks travel hub Options would have a major adverse impact on the remains associated with the Iron Age/Roman enclosure (MCB2483) and the Iron Age/Roman settlement (ECB3036).

The construction of the Scotland Farm travel hub Options would have a major adverse impact on the Iron Age Enclosures at Scotland Farm (11441) and middle Iron Age quarry pits recorded during the construction of Hardwick Junction (MCB21181).

The identified impacts to the buried archaeological remains will result in a moderate adverse effect.

There are no predicted impacts on the identified heritage assets from the operation of the options.

6.7 Conclusion

The Low Cost options a and b are likely to change the setting of a number of designated heritage assets, with the potential for harm greatest at the Grade II* Memorial and attached walls, steps and pool at the American Military Cemetery (Grade I Registered Park and Garden). This change compromises the heritage significance of the nationally important asset, but not to a degree where the ability to appreciate the asset is lost. It is therefore predicted that this will moderate adverse effect, during construction and operation.

The online Low Cost options will only require limited land take outside of the existing road corridor. In these areas there is potential for an impact on buried archaeological remains. The identified impacts to the buried archaeological remains will result in a moderate adverse effect.

The Phase 1 do-something options will change the setting of the Grade I Coton Church and the Coton and West Cambridge Conservation Area, but these changes will not affect the ability to appreciate the assets. The identified impacts will cause a minor adverse effect.

The Phase 1 do-something options, will have large impact on below-ground archaeological remains. The identified impacts to the buried archaeological remains will result in a moderate adverse effect.

The Phase 2 options will be largely be located within the existing road corridor or in areas developed as part of the construction of the A428. In areas outside of the highway corridor and A428 construction zone the construction of the options will have large impact on below-ground archaeological remains. The identified impacts to the buried archaeological remains will result in a moderate adverse effect.

The construction of either of the travel hub options will cause a large impact to below ground archaeology, resulting in a moderate adverse effect.

7 Landscape

7.1 Introduction

This section presents the applicable legislation, methodology, study area, baseline and results of the qualitative WebTAG assessment that has been undertaken with regards to the expected landscape and visual effects of the proposed route options.

The C2C project has been split into two phases, with a new travel hub facility being developed in parallel.

- Phase 1 is the stretch of the route between the Madingley Mulch roundabout and Grange Road in Cambridge, where it will connect into the existing bus network.
- Phase 2 is the stretch of the route between the Madingley Mulch roundabout and Cambourne, through the proposed development at Bourn Airfield. Phase 1 and 2 together would provide the complete end-to-end High Quality Public Transport (HQPT) scheme between Cambourne and Cambridge.

Two travel hub locations will also be considered with the Phase 1 and Phase 2 options:

- The Waterworks site, adjacent to the Madingley Mulch roundabout.
- On Scotland Farm, on the east side of Scotland Road.

7.2 Legislation and Policy Context

7.2.1 National Legislation and Policy

7.2.1.1 National Planning Policy Framework (NPPF)

The NPPF attaches importance to the character of the environment, emphasising that developments should add to the overall quality of the area, respond to local character and history and reflect the identity of local surroundings and materials. The provisions relevant to the proposed development are included in the following sections:

- Policy 12: Achieving Well Designed Places – this states that decisions should ensure that developments are visually attractive, sympathetic to local character and history, establish or maintain a strong sense of place and with a high standard of amenity for existing and future users.
- Policy 13: Protecting Green Belt Land – emphasizes the purpose of Green Belts to check the unrestricted sprawl of large built-up areas, assist in safeguarding the countryside from encroachment and preserve the setting and special character of historic towns. 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.
- Policy 15: Conserving and Enhancing the Natural Environment – the planning system should contribute to and enhance the natural and local environment by protecting and enhancing valued landscapes and soils and recognising the intrinsic character and beauty of the countryside.
- Policy 16: Conserving and Enhancing the Historic Environment – 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.

7.2.2 Local Policy

7.2.2.1 South Cambridgeshire District Council Local Plan (2018)

- Policy NH/2: Protecting and Enhancing Landscape Character – Development must respect and aim to retain or enhance the character of the local landscape and the National Character Area in which it is located.
- Policy NH/6: Green Infrastructure – Aim to reinforce, connect, protect and create new green infrastructure where possible and promote its use by society. See Cambridgeshire Green Infrastructure Strategy.
- Policy NH/7: Ancient Woodlands and Veteran Trees – Development should avoid loss or damage to veteran trees or ancient woodland or must act to mitigate adverse effects.
- Policy NH/8: Mitigating the Impact of Development in and Adjoining the Green Belt – developments must not have detrimental impact on rurality and openness of Green Belt. Development should include careful landscaping of high-quality design. Landscaping and planting must be well-maintained.
- Policy NH/13: Important Countryside Frontage – Development must not compromise land with strong countryside character that provides important break between nearby development framework areas or acts to provide connection between urban and surrounding rural area.

7.3 Assessment Methodology

The purpose of this appraisal is to identify the significance of effects of the impacts of the proposed scheme options on landscape character. The appraisal study follows WebTAG Unit 3A guidance and was informed by the following publications:

- Cambridgeshire Green Infrastructure Strategy, LDA Design (2011);
- Cambridge Inner Green Belt Boundary Study, LDA Design (2015);
- National Character Area Profile: 88. Bedfordshire and Cambridgeshire Claylands, Natural England (2014);
- Cambridge Landscape Character Assessment, Cambridge City Council (2003);
- South Cambridgeshire District Design Guide Supplementary Planning Document (SPD), South Cambridgeshire District Council (2010); and
- Guidelines for Landscape and Visual Impact Assessment, Third Edition, Landscape Institute and The Institute of Environmental Management and Assessment (2013).

Site visits were undertaken in 2017, 2018 and 2019 during summer and winter to identify the landscape character and the potential visibility of scheme from the surrounding area.

7.4 Study Area

The study area comprises an area of 1km measured from the centre line or centre of the scheme options. This was established through discussion on the potential viewpoint locations with the landscape officer of Cambridge City Council. This distance was expanded in places where it was felt necessary to consider potential impacts such as Red Meadow Hill.

7.5 Baseline Information

7.5.1 Landscape Character

7.5.1.1 National Character Area Assessments

The study area lies within National Character Area 88: Bedfordshire and Cambridgeshire Claylands. The key characteristics of the study area in relation to this are:

- Broad, lowland plateau dissected by shallow river valleys;
- Large-scale arable farmland; and
- Majority of landscape is sparsely populated but a “feeling of urbanisation” is induced by large settlements such as Cambridge and the network of major transport routes.

7.5.1.2 Local Landscape Character Assessment

The most up to date local landscape character assessment was carried out for the South Cambridgeshire District Design Guide SPD in 2010. The study area is located within Area C – Western Claylands LCA (landscape character area). The key characteristics of the study area in relation to this are:

- The gently undulating topography is divided by broad, shallow valleys;
- It is a predominantly open and intensive arable landscape. Fields are either bounded by open ditches, or closely trimmed hedgerows, both with a variable number of hedgerow trees;
- Woodlands are scattered. Large, ancient woodlands are particularly concentrated in the north and west of the area;
- Occasional parklands and orchards add interest and variety in the landscape; and
- Each village is identified by a church spire, or tower, which enliven the skyline.

The Cambridgeshire Landscape Guidelines – A Manual for Management and Change in the Rural Landscape⁴⁴ published in 1991, remains relevant. The guidelines also place the study area in the Western Claylands LCA.

The guidelines describe the LCA as: *“a large-scale arable farmland with open fields, sparse trimmed hedgerows and watercourses often cleared of bankside vegetation. There are scattered woodlands and approximately half of these are ancient semi-natural woodlands of considerable importance in the county context. Elsewhere individual woods are of importance in visual and nature conservation terms, but they tend to be isolated incidents in an area dominated by arable farmland. The landscape of this part of Cambridgeshire has been greatly affected by modern agricultural practices. Increased mechanisation has led to the removal of hedgerows and amalgamation of fields. Many of the remaining hedges are ‘gappy’ and trimmed almost out of existence by regular cutting.”*

The South Cambridgeshire District Design Guide SPD and the Cambridgeshire Landscape Guidelines place the study area in a single character area, but the study area contains a varied landscape and consequently smaller scale local LCA have been identified for the Scheme and agreed with Cambridge City Council. The potential route options pass through the local character areas described below:

- **Grange Road LCA:** The LCA comprises Grange Road and the residential street to the west which were laid out in the 19th century. The area is identified as a character area in the West

⁴⁴ https://ccc-live.storage.googleapis.com/upload/www.cambridgeshire.gov.uk/residents/libraries-leisure-%26-culture/Landscape_document.pdf?inline=true

Cambridge Conservation Area Appraisal (Cambridge City Council, May 2011). Trees line most of the streets and these, along with the large sports fields in the LCA, give the area a verdant and in places, spacious character. Views are contained by building and gardens vegetation except in the sports fields, where longer views are possible. Important long views are from the western end of Cranmer Road over the adjoining Corpus Christi College Sports Ground, and views across the various open green spaces. The tranquillity of Grange Road is reduced during the week in the rush-hours. The streets to the west are more tranquil.

- **West Fields LCA:** The area lies between the urban edges of Cambridge and the M11 and A603 Barton Road. The area is identified as Sector 3 in the Cambridge Inner Green Belt Study (LDA Design, November 2015) and is characterised by broadly flat open fields of varying scales, sports fields and rough grassland in the east. High hedges along field boundaries restrict or frame views in places. Bin Brook runs through the area in two locations. Public rights of way (PRoW), the Harcamlow Way and Wimpole Way long distance footpaths and the Coton cycle path provide good pedestrian and cycle connectivity between the Coton Countryside Reserve, Coton, the University of Cambridge West Cambridge site and the city centre. There are distant views of the University Library tower, the West Cambridge site and Red Meadow Hill. Noise and movement generated by the M11 reduces tranquillity in the area. The area is in the Green Belt.
- **University of Cambridge West Cambridge site LCA:** The area lies between the A1303 Madingley Road, M11, Coton cycleway and Clerk Maxwell Road. The area is laid out on a rectilinear grid, with tree-lined roads and wide foot/cycleways. Laboratory and research buildings of three and four storeys have large footprints and built in an eclectic mixture of architectural styles and materials. A landscape masterplan has created a landscape framework, with trees, hedgerows, meadows and sustainable urban drainage swales and ponds. There are undeveloped plots of open grassland. The frontage to the A1303 Madingley Road is predominantly vegetated with native species vegetation, punctuated by road junctions and occasional buildings. Noise and activity generated by the A1303 Madingley Road and the site itself reduce tranquillity in the LCA.
- **Coton, Coton Orchard and Coton Countryside Reserve LCA:** The area lies between the A1303 Madingley Road, the M11 and Bin Brook. Coton is a low-lying nucleated settlement with a historic core, which forms the Coton Conservation Area. St Peter's Church dates from the twelfth century, there are timber-framed houses in the High Street dating from the mid-sixteenth century and many eighteenth and nineteenth century farmhouses, cottages and farm buildings. The village expanded to the west in the 1960s and 70s with a small estate of houses laid out on a rectilinear grid. The village has a secluded character, screened from the busy A1303 Madingley Road and the M11 by the local topography and intervening vegetation. The Bin Brook runs along the southern side of the village. One of the key characteristic of the LCA is Coton Orchard, first planted in 1922. The area also includes small agricultural fields, Rectory Farm, the M11 northbound slip road, motorway screening planting and the Coton Orchard Garden Centre. The Whitwell Way long-distance trail passes through the area and there are PRoW linking the village with the A1303 Madingley Road and the Coton Countryside Reserve to the south. Apart from Coton village, the area is in the Green Belt.
- **Coton Undulating Farmland LCA:** The area lies between Cambridge Road (in Hardwick), the A1303 Madingley Road, Coton and Bin Brook. The key characteristic of the area is the open landscape of large arable fields divided by ditches or sparse and gappy hedgerows. The landform is undulating and generally slopes down towards Bin Brook. The land varies in height from around 30m above ordnance datum (AOD) along Bin Brook to around 60m AOD the A1303 Madingley Road. The undulations in the landform means that the northern boundary of the area is frequently screened by the intervening slopes from the southern

boundary and vice-versa. The Whitwell Way national trail runs through the LCA. There are elevated panoramic views looking south from the Madingley Road and extensive views from the PRow. Properties on the Madingley Road including dwellings, Crome Lea Business Park, Madingley Mulch Garden Supplies, the communications mast and the water works which have a slightly urbanising effect on the landscape, though they are well screened by boundary vegetation. The area is in the Green Belt.

- **Madingley and the American Military Cemetery LCA:** The area includes the village of Madingley, Madingley Hall and Park and the American Military Cemetery. The area is well wooded with Madingley Wood (site of special scientific interest) and the tree belts and woodland blocks of Madingley Park. This gives the area a secluded and verdant character. The landform slopes down from the Madingley Ridge to the village of Madingley. The American Cemetery and Madingley Hall sit on higher ground and there are panoramic views from the cemetery over the farmland to the north. Noise from the A428 Madingley Road reduces tranquillity in the southern part of the LCA. The cemetery and the Madingley Hall grounds are registered parks and gardens. Madingley Hall is also listed. Apart from Madingley village, the area is in the Green Belt.
- **Hardwick and Caldecote LCA:** The area includes the settlements of Hardwick and Caldecote. Both villages were originally linear settlements but have expanded substantially in the post-war period with a more suburban layout of houses on curved feeder roads and cul-de-sacs. The historic core of Hardwick is in the Hardwick Conservation Area. The grade II* listed Parish Church of St Mary is in the centre of the conservation area. The two settlements have coalesced with a ribbon of residential development along the St Neots Road. Both settlements have schools, community facilities and recreational open space. The landscape setting is rural with farmland to the east, south and west. The landform is generally flat, sloping gently southwards. Noise from the A428 dual carriageway reduces tranquillity in the LCA. The road is largely screened from the St Neots Road in summer, but in winter, moving traffic is visible through the vegetation separating the two roads. The village is lit at night by street lighting.
- **Western Claylands LCA:** The area comprises the area north of the St Neots Road and included the A428 dual carriageway. Farmland is the dominant land use in the area, with large, arable fields separated by hedgerows and farm tracks. The hedgerows are well-maintained and hedgerows trees appear sporadically along their length. There are isolated farms and farm buildings, but the villages of Childerley and Dry Drayton to the north are screened by the undulating landform. There is a line of cottages and a small business unit in former barns on the Scotland Road. A number of PRow going north/south link the villages south of the A428 with the Pathfinder long distance walk to the north. A blue pedestrian bridge over the A428 is a local landmark. The landscape is open with long views framed by woodland blocks. Noise from the A428 dual carriageway reduces tranquillity in the LCA. The area is mostly unlit apart from the A428/Scotland Road roundabout. The area east of Scotland Road is in the Green Belt.
- **Bourne Airfield LCA:** Bourn airfield is a disused airfield between Cambourne and Caldecote. The area is flat and predominantly grassland, with the runways crossing the landscape. The area is screened from the south and east by woodland belts and the Bucket Hill Plantation. Large sheds in the north-east corner of the area house industrial and commercial uses and the hard standing on the runway is used for storage of materials associated with the businesses. Noise from the A428 dual carriageway reduces tranquillity in the LCA.
- **Cambourne LCA:** Cambourne is a new settlement comprising the villages of Great Cambourne, Lower Cambourne and Upper Cambourne. Building on the relatively flat former agricultural began around 2008. Housing is the predominant land use, with two, three and

four storey houses and four storey apartments in red and yellow brick, stone, concrete and render. The buildings are of a similar architectural style and age and consequently the different parts of Cambourne lack the distinctiveness which develops in settlements over time. The residential areas are laid out along quiet tree-lined cul-de-sacs and there is a network of open space, with formal sports pitches, amenity grassland, meadow and woodland belts throughout the settlement. Cambourne Nature Reserve is an extensive area of woodland, wetlands and meadow mainly in the south-western corner of the settlement, but also enclosing it on all sides. There are many footpaths and bridleways, partly PRow and partly permissive paths. Buses, commercial vehicles and private cars are concentrated on feeder roads linking to the A428 and A1198 and the resulting noise and movement detracts from tranquillity. Community facilities include supermarkets, public houses, cafes health centres and schools. A business park and council offices occupy much of the north-western corner of the settlement.

7.5.1.3 Registered Parks and Gardens

There are two registered parks and gardens within the study area:

- Madingley Hall, grade II - a 16th century manor house with formal gardens laid out at the beginning of the 20th century, surrounded by pleasure grounds and park designed by Lancelot Brown in 1756.
- The American Military Cemetery, grade I - the only permanent American Second World War cemetery in Britain, designed by Perry, Shaw, Hepburn and Dean, architects, and Olmsted Brothers, landscape architects, and dedicated in 1956.

7.5.1.4 Conservation Areas

The study area includes the following conservation areas:

- Hardwick, designated in 1988: the area is well vegetated and intervening trees and built development limits views into and out of the area. The conservation area boundary is a minimum of 750m from the route options;
- Madingley, designated in 1976: mature vegetation, woodland blocks and the rising topography to the south and west give the area a secluded character. There are views east over the landscape from Madingley Hall, but the perimeter woodland of Madingley Park and roadside vegetation along the A428 restrict other views to and from the conservation area;
- Coton, designated in 1978 and extended in 1988: views to and from the conservation area are mainly contained by buildings, trees and tall hedgerows. The church steeple is visible above the trees from stretches of the Whitwell Way and from the PRow between Coton and the A1303 Madingley Road; and
- West Cambridge, designated in 1972 and extended in 1984 and in 2011: the University Library (grade II listed) is a focal point in the conservation area and is visible in framed views from the PRow north of Coton. The area is well vegetated with tree-lined streets and densely planted gardens and college grounds, which restricts views in and out of the area and give it a secluded character.

7.5.2 Notable Landscape Features

7.5.2.1 Ancient Woodland

Madingley Wood Ancient and Semi-Natural Woodland is an ash-maple woodland, characteristic of clayland landscapes in eastern England. Species present include: pedunculate oak, ash, field maple, hazel coppice, hawthorn, dog's mercury and bluebell. The woodland is used by the

University of Cambridge for research and education and is designated as a SSSI by Natural England.

7.5.2.2 Traditional Orchards

There are several small traditional orchards (orchards of standard fruit trees planted at low density and contribute to landscape character and biodiversity) in the study area. Coton Orchard is the largest.

7.5.2.3 Topography

The A428 and A1303 road corridors pass partly along an east/west ridgeline which starts to descend into Cambridge east of the American Cemetery. The land slopes down towards to the north and the south. Traffic on the elevated roads is visible in long views, especially from the open landscape of the Bin Brook valley and a high point on Red Meadow Hill, where moving vehicles on the A1303 Madingley Road can be seen on the horizon.

7.5.3 Visual Context

Visual receptors potentially affected by the proposed scheme include:

- People in residential properties;
- Walkers and visitors using PRoW, national trails and paths through a high-quality landscape;
- Visitors to heritage assets; and
- People walking along footways in residential areas.

The following visual receptors may experience views of the proposed scheme options:

7.5.3.1 Phase 1

- Residents in Cambridge on Adams Road and Charles Babbage Road – clear views of the Phase 1 off-road options;
- Residents on the A1303 Madingley Road – clear or filtered views of the Phase 1 on-road options, the Phase 1 off-road option to the south and the travel hub on the Waterworks site (options low cost A and do something 1a);
- Visitors to the American Military Cemetery – filtered views of the Phase 1 on-road options;
- Residents on Cambridge Road, High Street and Whitwell Way in Coton – clear, filtered or partly screened views of the Phase 1 off-road option and the travel hub on the Waterworks site (options low cost A and do something 1a);
- Walkers on the PRoW 55/2 north of Coton and the 20/1 and 52/3 Whitwell Way west of Coton – clear views of the Phase 1 off-road options and the travel hub on the Waterworks site (options low cost A and do something 1a); and
- Walkers on PRoW 20/4, 55/7 and on Red Meadow Hill in the Coton Countryside Reserve - distant views of the Phase 1 off-road option and the travel hub on the Waterworks site (options low cost A and do something 1a).

7.5.3.2 Phase 2

- Residents on St Neots Road, Hardwick – close, clear or partially screened views of all Phase 2 options;
- Residents on Scotland Road – oblique views of the travel hub on Scotland Farm;

- People in residential properties on Cambridge Road, Hardwick - oblique views of all Phase 2 options;
- People in residential properties and pedestrians on the northern edge of Highfields Caldecote - oblique views of Phase 2 options 2 and 3;
- Residents on Sterling Way, Lancaster Gate and High Street, Cambourne – clear views of all Phase 2 options.
- Walkers on PRow 52/1, by Common Farm - clear, filtered or partly screened views of all Phase 2 options and the travel hub on the Waterworks site (option 1a, 2a and 3a);
- Walkers on PRow 38/1, west of Highfield Farm - views of all Phase 2 options;
- Walkers on PRow 66/17 east of Scotland Road will have filtered views the travel hub at Scotland Farm (options 1b, 2b and 3b); and
- Walkers on PRow 279/3 will have views of all the Phase 2 options.

7.5.3.3 Views of the Cambridge Skyline

The Cambridge Skyline Guidance (Guidance for the application of Policy 3/13 (Tall Buildings and the Skyline) of the Cambridge Local Plan (2006)) is a material consideration in the review of planning applications submitted to the Council.

The generally level topography of the city and its environs results in few vantage points from where the whole city skyline is visible. The guidance identifies 13 strategic viewpoints of which three are relevant to this study area. The planning context for these strategic viewpoints attaches some weight in relation to buildings, landscapes and settings with an emphasis on listed buildings, their settings and conservation areas. The relevant viewpoints are listed below:

- **The view from Castle Hill Mound, Castle Hill** - Viewpoint 1 in the Cambridge Skyline Guidance. The focus of this view is towards the city centre in the east and south-east. There are views from the Mound, looking towards the study area (in the west) which only occupies a small part of the background of the view.
- **The view from public footpath 55/2 on Madingley Rise (running from the American Cemetery south to Coton)**- Viewpoint 2 in the Cambridge Skyline Guidance. This is the first point at which the Cambridge skyline is visible from the west. The view opens up part-way down the path, beyond a tall field hedgerow, and extends to Cambridge, and the rising ground in the background. The University Library Tower and the spires of King's College Chapel are visible from here.
- **The view from Red Meadow Hill in Coton Countryside Reserve** -Viewpoint 3 in the Cambridge Skyline Guidance. The view looks north-eastwards towards the urban edge of Cambridge across intervening farmland with the M11 (and associated traffic) in the middle distance. To the north, moving traffic on the A1303 Madingley Road on Madingley Rise is visible in the distance in a narrow band of the panoramic view.

A summary of the assessment is presented here, however more details on the assessment of the potential effects of the options can be found in the Landscape WebTAG worksheets in Appendix G.

7.6 Results of Assessment

7.6.1 Phase 1

7.6.1.1 All Options

All options would result in adverse effects on landscape character and views due to the introduction of a busway into the landscape between the Madingley Mulch roundabout and Grange Road, Cambridge and a travel hub on Scotland Farm or the waterworks site.

7.6.1.2 Do Minimum – Low Cost 1a and 1b

The widening of the existing A1303 Madingley Road between the Madingley Mulch roundabout and the M11 in both options would result in the loss of woodland from the edge of the Madingley Wood (ancient and semi-natural woodland) and trees and vegetation along the road corridor, changing the existing wooded, rural character of the two-lane road to one that is more open and urbanised, with increased road infrastructure such as road markings, pedestrian barriers and signage. The widening would also affect setting of and access to the American Military Cemetery (registered park and garden grade I) which sits at a lower level than the A1303 Madingley Road. Loss of vegetation would open up views from the PRoW 55/2 (north of Coton), PRoW 20/1 and 52/3 (Whitwell Way, west of Coton) and distant views from PRoW 20/4, 55/7 and Red Meadow Hill (in or near the Coton Countryside Reserve) of traffic on the A1303.

Low Cost 1a

The waterworks site travel hub would include the waterworks site itself and part of the field immediately to the south. It is on elevated land at 60m AOD and is about 30m above the Bin Brook valley to the south. The travel hub would be visible from the open landscape to the south with middle-distance views from stretches of PRoW 55/2, 20/1 and 52/3 and distant views from PRoW 20/4, 55/7 and Red Meadow Hill. Views from ground level in Coton would be screened by the intervening landform and vegetation, but there might be views from upper floor windows. The travel hub would be an incongruous element within the pattern of the landscape and views. Mitigation planting incorporated into the scheme proposals would, in time, screen much of the travel hub from views to the south.

The overall impact of the busway and travel hub would be moderate adverse.

Low Cost 1b

There would be oblique views of the Scotland Farm travel hub from dwellings on Scotland Road and PRoW 66/17 (east of the field) but wider landscape effects would be contained by the local topography and existing vegetation. The travel hub would be an incongruous element within the pattern of the landscape and views, but it would be seen in the context of the A428/Scotland Road junction which is a prominent feature in the existing landscape. Similarly, the noise, activity and additional street lighting generated by the travel hub would be experienced in the context of the busy A428 corridor. Though it would reduce tranquillity immediately around the site, it would not affect tranquillity in the wider landscape. Mitigation planting would integrate the travel hub into the landscape and screen it from Scotland Road and the nearby dwellings.

The overall impact busway and travel hub would be moderate adverse.

7.6.1.3 Do Something - Low Cost 1a and 1b

Mature trees would be lost from the woodland belt that surrounds much of the waterworks site where the busway crosses the site, diminishing the wooded character of the St Neots Road.

Between the waterworks site and the Cambridge Road, Coton, the busway would be a new, linear infrastructure feature, uncharacteristic of the open, rural landscape. It would be partly screened by undulations in the landform and intervening vegetation, but the moving buses would be apparent in much of the area. The route would alter the pattern of the landscape, cutting across fields and effectively creating new field boundaries. Mitigation, using landscape earthworks and tree and hedgerow planting would help to integrate the busway into the landscape, but due to the need to retain the openness of the landscape, planting would not screen the moving buses. They would be visible from dwellings in Coton, PRoW 55/2 (north of Coton), PRoW 20/1 and 52/3 (Whitwell Way, west of Coton) and in distant views from PRoW 20/4, 55/7 and Red Meadow Hill (in or near the Coton Countryside Reserve).

Between Coton Orchard and the M11, woodland, hedgerow and fruit trees (a key feature of the landscape) would be lost along the busway corridor, adversely affecting landscape character. The busway and buses would be largely screened by intervening vegetation from dwellings along the Footpath, the adjacent allotments, PRoW 55/5 and Rectory Farm, but moving buses would be visible in filtered and partly screened views from these locations.

Between the M11 and Grange Road, vegetation from the western boundary of the West Cambridge site and the woodland and ponds north of the University of Cambridge Sports Ground would be lost along the busway route. The existing tree-lined character of the Cambridge/Coton cycleway and PRoW 39/31 would become more open. The eastern end of the route along Adams Road would pass through the West Cambridge Conservation Area. No trees would be lost from this stretch of the busway: the only change would be the removal of on-street parking and additional road markings and signage. The removal of parked cars along both sides of the road would enhance the setting of the conservation area and would slightly increase tranquillity, with a reduction in cars driving along the road, searching for a parking space.

Do Something 1a

The waterworks site travel hub would include the waterworks site itself and part of the field immediately to the south. It is on elevated land at 60m AOD above the Bin Brook valley. The travel hub would be visible from the open landscape to the south with middle-distance views from stretches of PRoW 55/2, 20/1 and 52/3 and distant views from PRoW 20/4, 55/7 and Red Meadow Hill. Views from ground level in Coton would be screened by the intervening landform and vegetation, but there might be views from upper floor windows. The travel hub would be an incongruous element within the pattern of the landscape and views. Mitigation planting incorporated into the scheme proposals would, in time, screen much of the travel hub from views to the south.

The overall impact of the busway and travel hub would be moderate adverse.

Do Something 1b

There would be oblique views of the Scotland Farm travel hub from dwellings on Scotland Road and PRoW 66/17 (east of the field) but wider landscape effects would be contained by the local topography and existing vegetation. The travel hub would be an incongruous element within the pattern of the landscape and views, but it would be seen in the context of the A428/Scotland Road junction which is a prominent feature in the existing landscape. Similarly, the noise, activity and additional street lighting generated by the travel hub would be experienced in the context of the busy A428 corridor. Though it would reduce tranquillity immediately around the site, it would not affect tranquillity in the wider landscape. Mitigation planting would integrate the travel hub into the landscape and screen it from Scotland Road and the nearby dwellings.

The overall impact of the busway and travel hub would be moderate adverse.

7.6.2 Phase 2

7.6.2.1 All Options

All options would result in adverse effects on landscape character and views due to the introduction of a new travel hub and busway into the landscape between Cambourne and the Madingley Mulch roundabout and the travel hub either on Scotland Farm or the waterworks site. Impacts would be the same for all options between Cambourne and the Highfields/St Neots Road roundabout. On this stretch of the route, the proposed scheme would be mainly on existing roads or will pass through arable farmland or grassland on Bourne Airfield. A small amount of vegetation would be removed during construction.

7.6.2.2 Option 1a

The removal of vegetation from the northern side of St Neots Road would open up views of moving traffic on the A428 and change the existing rural and wooded character of the St Neots Road. Retention of existing trees and new planting incorporated into the scheme proposals, would in time partly reinstate screening vegetation between the A428 and St Neots Road. The busway would remain visible from much of the St Neots Road, but it would be separated from the road by a landscape strip.

The waterworks site travel hub on elevated land and including part of the field immediately to the south of the site would be clearly visible from the open landscape to the south with middle-distance views from stretches of PRoW 55/2, 20/1 and 52/3 and distant views from PRoW 20/4, 55/7 and Red Meadow Hill. Views from ground level in Coton would be screened by the intervening landform and vegetation, but there might be views from upper floor windows. The travel hub would be an incongruous element within the pattern of the landscape and views. Mitigation planting incorporated into the scheme proposals would, in time, screen much of the travel hub from views to the south.

Tranquillity would be reduced with the addition of buses on the busway, new views of the traffic on the A428 and noise, activity and additional street lighting generated by the travel hub.

The overall impact will be moderate adverse.

7.6.2.3 Option 1b

The removal of vegetation from the northern side of St Neots Road would open up views of moving traffic on the A428 and change the existing rural and wooded character of the St Neots Road. The Scotland Farm travel hub would be visible in oblique views from a row of houses on Scotland Road. Tranquillity would be reduced with the addition of buses on the busway and new views of the traffic on the A428. The noise, activity and additional street lighting generated by the travel hub would be experienced in the context of the A428 corridor travel and though it would reduce tranquillity around the site, it would not affect tranquillity in the wider landscape. Mitigation planting, incorporated into the scheme proposals would, in time, screen the travel hub from Scotland Road and nearby dwellings. The busway would remain visible from much of the St Neots Road, but it would be separated from the road by a landscape strip.

The overall impact would be minor adverse.

7.6.2.4 Option 2a

The waterworks site travel hub would be clearly visible from the open landscape to the south of the site and mature trees lining St Neots Road would be felled to create access to the travel hub. Mitigation planting, incorporated into the scheme proposals, would restore much of the existing screening vegetation and integrate the busway and travel hub into the landscape. Tranquillity would be reduced with the additional buses on the St Neots Road and the noise, activity and additional lighting generated by the travel hub.

The overall impact would be minor adverse.

7.6.2.5 Option 2b

There would be oblique views of the Scotland Farm travel hub from dwellings on Scotland Road but wider landscape effects would be contained by the local topography and existing vegetation. Mitigation planting would integrate the travel hub into the landscape and screen it from Scotland Road and the nearby dwellings. Tranquillity would be reduced with the additional buses on St Neots Road. The noise, activity and additional street lighting generated by the travel hub would be experienced in the context of the A428 corridor and though it would reduce tranquillity immediately around the site, it would not affect tranquillity in the wider landscape.

The overall impact would be minor adverse.

7.6.2.6 Option 3a

The removal of vegetation from the northern side of St Neots Road would open up views of moving traffic on the A428 and change the existing rural and wooded character of the St Neots Road. Mature trees would be removed to construct the travel hub at the waterworks site and the car park would be clearly visible from the open landscape to the south. Mitigation planting would partly restore the existing screening vegetation and integrate the busway and travel hub into the landscape. Tranquillity would be reduced with the addition of buses on the busway, new views of the traffic on the A428 and noise, activity and additional street lighting generated by the travel hub.

The overall impact would be moderate adverse.

7.6.2.7 Option 3b

The removal of vegetation from the northern side of St Neots Road would open up views of moving traffic on the A428 and change the existing rural and wooded character of the St Neots Road. There would be oblique views of the Scotland Farm travel hub from dwellings on Scotland Road, but wider landscape effects would be contained by the local topography and existing vegetation. The noise, activity and additional street lighting generated by the travel hub would be experienced in the context of the A428 corridor and though it would reduce tranquillity immediately around the site, it would not affect tranquillity in the wider landscape. Mitigation planting would partly restore the existing screening vegetation and integrate the busway and travel hub into the landscape.

The overall impact would be moderate adverse.

8 Noise

8.1 Introduction

This section presents the applicable legislation, the methodology, study area and existing baseline and results of the WebTAG assessment that has been undertaken with regards to noise.

This appraisal considers noise impacts due to health effects of the scheme during the operational phase only. The impacts of noise from construction are not considered within the scope of this appraisal.

8.2 Legislation and Policy Context

8.2.1 National Legislation and Policy

8.2.1.1 The Land Compensation Act 1973 Part 1

The Land Compensation Act 1973 Part 1⁴⁵ includes provision for compensation for loss in property value resulting from physical agents, including noise and vibration, resulting from the use of public works, such as new or improved roads.

8.2.1.2 The Noise Insulation Regulations 1975 (amended 1988)

The Noise Insulation Regulations 1975 (amended 1988)⁴⁶ were made under Part 2 of the Land Compensation Act for the obligatory and discretionary provision of noise mitigation measures for dwellings adjacent to new highways. Among the criteria for a property to qualify for insulation in living rooms and bedrooms is the façade noise level is at least 68dB L_{A10,18hr}, and that noise from the new or altered highway increases by at least 1dB.

8.2.2 National Policy

8.2.2.1 The Environmental Noise (England) Regulations 2006

The Environmental Noise (England) Regulations⁴⁷ implement European legislation requiring noise action plans to be developed on a five-year rolling programme. Action plans have to be developed for the major noise sources and areas for which maps have been produced. The action plans seek to manage noise issues and effects including noise reduction, if necessary, based on the results obtained through the mapping process. As a result of the process, the “Noise Action Plan: Roads (Including Major Roads)”⁴⁸ was published, which identified ‘Important Areas’ for future mitigation.

8.2.2.2 The National Planning Policy Framework 2018

The National Planning Policy Framework (NPPF)⁴⁹ was revised in July 2018. Paragraph 170 of the NPPF states that: “Planning policies and decisions should contribute to and enhance the

⁴⁵ HMSO, (1973). “Land Compensation Act.

⁴⁶ HMSO, (1975). “Noise Insulation Regulations. Statutory Instruments No. 1763. Building and Buildings.

⁴⁷ Environmental Noise Regulations available online at http://www.legislation.gov.uk/uksi/2006/2238/pdfs/ukxi_20062238_en.pdf

⁴⁸ Noise Action Plan: Roads (Including Major Roads) Environmental Noise (England) Regulations 2006, as amended January 2014

⁴⁹ NPPF. Available online at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/728643/Revised_NPPF_2018.pdf

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 soil, air, water or noise pollution or land instability”.

Paragraph 180 of the NPPF states that planning policy and decisions should aim to:

- 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;
- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

The Noise Policy Statement for England 2010

The Noise Policy Statement for England (NPSE)⁵⁰ was issued by the Department for Environment, Food and Rural Affairs (Defra) in 2010. Its purpose is to promote, “good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development”. The three main aims are to:

- Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

Within the aims stated above there are several key phrases that lead to additional concepts now considered in the assessment of noise impact; these and their definitions are detailed below:

- Lowest Observed Adverse Effect Level (LOAEL): this is the level above which adverse effects on health and quality of life can be detected.
- Significant Observed Adverse Effect Level (SOAEL): this is the level above which significant adverse effects on health and quality of life occur.

There are no pre-defined levels for these effect levels as it is acknowledged that they will be different for different sources, different receptors and at different times.

8.2.2.3 Planning Practice Guidance

Planning Practice Guidance (PPG)⁵¹ is a Government web-based resource which provides guidance on how the policy set out in NPPF may be interpreted in practice for a wide range of issues. There is a subsection of PPG relating specifically to noise:

“Local planning authorities’ plan-making and decision taking should take account of the acoustic environment and in doing so consider:

- Whether or not a significant adverse effect is occurring or likely to occur.
- Whether or not an adverse effect is occurring or likely to occur.

⁵⁰ Defra (2010). “The Noise Policy Statement for England”

⁵¹ Department for Communities and Local Government (2014) Planning Practice Guidance.

- Whether or not a good standard of amenity can 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 (including the impact during construction wherever applicable) is, or would be, above or below the significant observed adverse effect level...”

Among the specific factors to consider where relevant the guidance states: “In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur”.

PPG provides a noise exposure hierarchy which describes the perception and outcomes associated with increasing effect levels as shown in Table 8.1.

Table 8.1: PPG noise exposure hierarchy

Perception	Examples of outcomes	Increasing effect level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an 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.	Unacceptable Adverse Effect	Prevent

Source: Planning Practice Guidance

8.2.3 Local Policy

The current local planning policy and guidance relevant to noise and vibration is contained in the adopted (2018) South Cambridgeshire and the City of Cambridge Local Plans.

The relevant policies for South Cambridgeshire are detailed below:

- Policy SC/10: Noise Pollution

1. Planning permission will not be granted for development which:
 - a. Has an unacceptable adverse impact on the indoor and outdoor acoustic environment of existing or planned development;
 - b. Has an unacceptable adverse impact on countryside areas of tranquillity which are important for wildlife and countryside recreation;
 - c. Would be subject to unacceptable noise levels from existing noise sources, both ambient levels and having regard to noise characteristics such as impulses whether irregular or tonal.
 2. Conditions may be attached to any planning permission to ensure adequate attenuation of noise emissions or to control the noise at source. Consideration will be given to the increase in road traffic that may arise due to development and conditions or Section 106 agreements may be used to minimise such noise.
 3. Where a planning application for residential development is near an existing noise source, the applicant will be required to demonstrate that the proposal would not be subject to unacceptable noise levels both internally and externally.
 4. The Council will seek to ensure that noise from proposed commercial, industrial, recreational or transport use does not cause any significant increase in the background noise level at nearby existing noise sensitive premises which includes dwellings, hospitals, residential institutions, nursing homes, hotels, guesthouses, and schools and other educational establishments.
- Policy TI/2: Planning for Sustainable Travel
 1. Developers will be required to demonstrate they will make adequate provision to mitigate the likely impacts (including cumulative impacts) of their proposal including environmental impacts (such as noise and pollution) and impact on amenity and health...
 - Policy SC/10 supporting text also refers to Noise Action Plans and Noise Important Areas which would be potentially impacted due to development. The policy notes that with respect to the Noise Action Plans existing management and control measures can be implemented to mitigate against increases in noise exposure due to development.

The relevant policies for the City of Cambridge are detailed below:

- Policy 35: Protection of human health and quality of life from noise and vibration

Development will be permitted where it is demonstrated that:

 - a. it will not lead to significant adverse effects and impacts, including cumulative effects and construction phase impacts wherever applicable, on health and quality of life/amenity from noise and vibration; and
 - b. adverse noise effects/impacts can be minimised by appropriate reduction and/or mitigation measures secured through the use of conditions or planning obligations, as appropriate (prevention through high quality acoustic design is preferable to mitigation).

This appraisal of noise does not consider mitigation measures and therefore cannot determine the significance of effects which would be assessed during detailed design within an EIA. The determination of potential significant effects is considered within this assessment however are subject to further assessment following detailed design of any necessary mitigation measures.

8.2.4 Guidance

8.2.4.1 DMRB Volume 11, Section 3, Part 7 'Noise and Vibration 2011

The DMRB Volume 11, Section 3, Part 7, HD213/1152 'Noise and Vibration' describes a methodology for the assessment of road projects in the UK and best reflects Environmental Impact Assessment (EIA) methodology as applied to highways. It includes a method of the classification of magnitude of impact and assessment of both long and short-term effects.

8.2.4.2 WHO Environmental Noise Guidelines for the European Region 2018

The World Health Organisation (WHO) Environmental Noise Guidelines for the European Region⁵³ provide evidence-based recommendations on the health effects of noise. The guidelines complement the expert-based recommendations of the WHO 'Night Noise Guidelines' (2009) (NNG).

The new guidelines provide source specific recommendations road traffic, railway, aircraft and wind turbine noise, and indoor as well as outdoor exposure levels for leisure noise.

Specific recommendations are made with regards to road traffic noise as follows:

- "For average noise exposure, the Guideline Development Group (GDG) strongly recommends reducing noise levels produced by road traffic below 53 decibels (dB) L_{den} , as road traffic noise above this level is associated with adverse health effects.
- For night noise exposure, the GDG strongly recommends reducing noise levels produced by road traffic during night time below 45 dB L_{night} , as night-time road traffic noise above this level is associated with adverse effects on sleep.
- To reduce health effects, the GDG strongly recommends that policymakers implement suitable measures to reduce noise exposure from road traffic in the population exposed to levels above the guideline values for average and night noise exposure. For specific interventions, the GDG recommends reducing noise both at the source and on the route between the source and the affected population by changes in infrastructure."

The Guidelines clarify that " L_{den} and L_{night} refer to a measurement or calculation of noise exposure at the most exposed façade, outdoors, reflecting the long-term average exposure."

8.2.4.3 WHO Night Noise Guidelines for Europe

The WHO Night Noise Guidelines for Europe (NNG)⁵⁴ suggest on a very precautionary basis, that the population should not be exposed to a NNG value greater than 40dB of $L_{night, outside}$ (defined as the night noise level outside in free field conditions) during the part of the night when most people are sleeping. However, the precautionary nature of this target is fully appreciated by the WHO and a noise level of 55dB $L_{night, outside}$ is therefore recommended relating to the onset of heart disease.

⁵² Design Manual for Roads and Bridges, HD213/11 Revision 1, 2011.

⁵³ WORLD HEALTH ORGANISATION, 2018. Environmental Noise Guidelines for the European Region. ISBN 978 92 890 5356 3. URL available: <http://www.euro.who.int/en/health-topics/environment-and-health/noise/publications/2018/environmental-noise-guidelines-for-the-european-region-2018> (Last accessed January 2019)

⁵⁴ World Health Organization, (2009). Night Noise Guidelines for Europe.

8.2.4.4 British Standard (BS) 8233 2014

BS 8233 2014⁵⁵ provides guidance relating to noise levels in external amenity areas which states that it is desirable noise levels do not exceed 50 dB $L_{Aeq,T}$ with an upper guidance value of 55 dB $L_{Aeq,T}$. The upper guidance value is relevant in noisier environments.

Guidance states “however, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.”

8.2.4.5 Calculation of Road Traffic Noise 1988

Calculation of Road Traffic Noise (CRTN)⁵⁶ provides procedures for predicting noise levels for a given flow of road traffic at sensitive receptors. These methodologies are used in the determination of entitlement under the Noise Insulation Regulations and for traffic noise change assessments undertaken in accordance with the DMRB assessment methodology.

8.2.4.6 Noise Advisory Council 1978

Noise Advisory Council (NAC) guidance⁵⁷ provides a method to predict noise levels from road traffic sources given flow, speed and percentage heavy goods vehicles using a Sound Exposure Level (SEL) based approach. This methodology provides a means to approximate noise levels for roads which fall below the CRTN lower bound flow value.

8.3 Assessment Methodology

8.3.1.1 Option Appraisal (Phase 1 and Phase 2)

At the time of appraisal detailed forecast traffic data was not available to complete a quantitative assessment for all scheme options (Phase 1 and Phase 2). Qualitative appraisal for OAR purposes has been undertaken for scheme options to understand potential noise effects. Full WebTAG worksheets were therefore not completed for each scheme option. This approach is considered proportionate for preliminary assessment.

Qualitative assessment reviewed the following aspects to appraise noise effects due to implementation of each scheme option:

- Likely changes in vehicle flows, percentage of heavy goods vehicles or speeds which have the potential to result in beneficial or adverse noise effects
- Review of the horizontal scheme alignments and nearby noise sensitive receptors
- Review of the park and ride site locations and proximity to nearby noise sensitive receptors
- Consideration of the existing ambient noise environment and potential ambient noise level increases due to the introduction of new road traffic and park and ride site noise sources.

⁵⁵ BSI 2014, BS 8233, Guidance on sound insulation and noise reduction for buildings.

⁵⁶ Department of Transport (1988). “Calculation of Road Traffic Noise”.

⁵⁷ The Noise Advisory Council (1978). “A Guide to Measurement and Prediction of the Equivalent Continuous Sound Level L_{eq} ”

8.3.1.2 Preferred Route Option Appraisal

The preferred route option has been assessed quantitatively. The noise effects of the scheme were assessed using TAG Unit A.5.4 Marginal External Costs (MEC) and the Net Present Values (NPVs) have been calculated based upon this approach.

8.4 Study Area

DMRB Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration (2011) requires that the study area for operational noise is identified as an area within 1 kilometre of the physical works associated with the scheme.

The study area for quantitative appraisal of the preferred routes has been determined in accordance with TAG Unit A.5.4 guidance.

8.5 Baseline Information

Baseline noise surveys have not been undertaken at this stage of the scheme assessment. Existing baseline conditions have therefore been reviewed through desktop study using the Extrium (available online at: <http://extrium.co.uk/>) noise map. Existing ambient noise levels for properties within approximately 200m of the A428 in the study area are typically between 55 - 60 dB $L_{Aeq,16hr}$ (that is, between LOAEL and SOAEL).

Baseline noise levels in the immediate vicinity of the proposed scheme area are characterised by road traffic noise using the A428 and surrounding road network. As distance increases from the road traffic noise sources, noise levels reduce but traffic remains audible within the study area.

8.6 Sensitive Resources and Receptors

There are five noise important areas (NIA) located within 1km of the scheme route parallel with the A428. The Important Areas are :

- ID 5132, ID 5133 (two sites north of Cambourne and north of the A428),
- ID 5135, ID 5136 and ID 5137 (three sites along St Neots Road between Highfields Road and Hardwick Road)

NIAs are viewable online at: <http://extrium.co.uk/noiseviewer.html>

The surrounding areas from the preferred scheme option include noise sensitive residential dwellings in Cambridge, Cambourne and villages along the scheme route including Hardwick, Coton and Highfields. The preferred scheme terminates at Adams Road in a noise sensitive residential area.

8.7 Results of Assessment

8.7.1 Qualitative Appraisal of all Options

Results from qualitative options appraisals are provided in the appended qualitative assessment documents (see Appendix H).

In general, appraisal outcomes indicate that scheme options would result in neutral or minor adverse impacts. Minor adverse impacts are anticipated for off-line options due to the introduction of a new noise sources; however, all scheme options are not expected to result in substantial changes to traffic flows on the surrounding road network and therefore impacts would be localised to areas around the scheme route which are in general sparsely populated.

These relatively small increases in public transport numbers might be offset by the expected reduction in car numbers on the A428 and local road network resulting from a shift towards increased use of public transport. The scale of reduction resulting from the options are subject to the scale of other development in the surrounding areas and resultant increases in overall traffic flows.

The scheme options are very similar in horizontal alignment, and the variance in the number of receptors affected by the different options is minimal.

8.7.2 Quantitative assessment (Preferred route)

The net present value (NPV) has been calculated by the TAG Unit A.5.4 Marginal External Costs (MEC) and the Net Present Values (NPVs) have been calculated based upon this approach. The results are presented in the economic business case.

9 Water

9.1 Introduction

This section presents the applicable legislation, the methodology, study area and existing baseline and results of the qualitative WebTAG assessment that has been undertaken with regards to water.

9.2 Legislation and Policy Context

9.2.1 European legislation

9.2.1.1 Water Framework Directive 2000

The key EU legislation covering the water environment which has a bearing on this scheme is the Water Framework Directive (WFD), which establishes a framework for the management of water resources throughout the European Union. The WFD is translated into UK law through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

The key objectives of the WFD are to:

- Prevent deterioration, enhance and restore bodies of surface water, achieve good chemical and ecological status of such water and reduce pollution from discharges and emissions of hazardous substances.
- Protect, enhance and restore all bodies of groundwater, achieve good chemical and quantitative status of groundwater, prevent the pollution and deterioration of groundwater, and ensure a balance between groundwater abstraction and replenishment.
- Preserve protected areas.

9.2.1.2 Groundwater Directive 2006

The Groundwater Directive 2006/118/EEC is aimed at the protection of groundwater from pollution and deterioration. The main requirements of the directive in relation to transport projects is the requirement to limit or avoid the discharge of hazardous substances to groundwater.

9.2.2 National legislation

9.2.2.1 Environmental Permitting Regulations 2010

The Environmental Permitting Regulations (EPR) 2010 aim to protect groundwater and surface waters from pollution by controlling the inputs of potentially harmful and polluting substances. The Regulations implement the WFD and the Groundwater Daughter Directive 2006. The EPR replace those parts of the Water Resources Act (WRA) 1991 that relate to the regulation of discharges to controlled waters (including groundwater).

9.2.2.2 Water Resources Act 1991

Section 93 of the WRA 1991 provides for the establishment of groundwater protection zones. The requirements of Section 93 are implemented and set out in the Environment Agency's Groundwater Protection Guides covering: requirements, permissions, risk assessments and

controls (previously covered in GP3⁵⁸). Source Protection Zones (SPZs) are defined for groundwater supplies used for human consumption. The Environment Agency's position statement relating to the use of sustainable drainage systems can be found within these guides.

9.2.2.3 Land Drainage Act 1991

The Land Drainage Act 1991 is also relevant to manage flood risk for any works within eight metres of ordinary watercourses. In these cases, land drainage consent is required for development to proceed which has to be addressed for the final scheme design.

9.2.3 National policy

9.2.3.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) 2019⁵⁹ applies to this scheme under Chapter 14 ("Meeting the challenge of climate change, flooding and coastal change") and the supporting technical guidance, in relation to flood risk. A site-specific flood risk assessment may be required for the preferred option because the proposed site for the preferred scheme is located is larger than 1 hectare in size.

9.2.4 Local Policy

The current local planning policy and guidance relevant to the water environment is contained in the adopted (2018) South Cambridgeshire and the City of Cambridge Local Plans.

The South Cambridgeshire Local Plan⁶⁰ contains three policies relevant to this scheme. "Policy CC/7: Water Quality" mentions the need for proposals to have adequate water supply, sewerage and land drainage systems for the whole development. The proposal also needs to demonstrate that the quality of the ground, surface water and waterbodies will not be harmed, and that sources of pollution and Sustainable Drainage Systems (SuDS) measures are considered. "Policy CC/8: Sustainable Drainage Systems" also refers to the need for proposals to incorporate appropriate SuDS. "Policy CC/9: Managing Flood Risk" describes the need to minimise flood risk associated with the proposed development by incorporating suitable flood protection / mitigation measures to the level and nature of the flood risk and by ensuring there is no increase in flood risk. The policy also refers to the need to undertake a site-specific flood risk assessment depending on the size of the proposed development and the flood zone it is located in.

Two policies from the Cambridge Local Plan⁶¹ are relevant to the water environment for this scheme. "Policy 31: Integrated water management and the water cycle" suggests that surface water management features are multi-functional wherever possible in their land use and measures need to be implemented to contain the run-off from all hard surfaces. It also refers to the need for all hard surfaces to be permeable surfaces where reasonably practicable, and

⁵⁸ Environment Agency (2013). Groundwater protection: Principles and practice (GP3). August 2013 Version 1.1. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/598799/LIT_7660.pdf (last accessed April 2019).

⁵⁹ National Planning Policy Framework [online] available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf (last accessed April 2019).

⁶⁰ South Cambridgeshire District Council (2018). South Cambridgeshire Local Plan, Adopted September 2018. Available online at: https://www.scambs.gov.uk/media/12740/south-cambridgeshire-adopted-local-plan-270918_sml.pdf (last accessed April 2019).

⁶¹ Cambridge City Council (2018). Cambridge Local Plan. October 2018. Available online at: <https://www.cambridge.gov.uk/media/6890/local-plan-2018.pdf> (last accessed April 2019).

having regard to groundwater protection. “Policy 32: Flood Risk” describes the need for proposals to address the potential flood risk following the principles of the NPPF.

9.3 Assessment Methodology

The water resources assessment has followed the process set out in WebTAG Unit 3A.

The WebTAG methodology allows the assessment of the value of water resource features that occur in the study area, based on their quality (physical condition of the feature), scale (local, regional, national), rarity (how common the feature is in the area) and substitutability (how easily can the feature be replaced in the area). However, the WebTAG method requires a scoping of the risks to water resources to be carried out, if there is not likely to be a significant risk to water resources the full assessment is not required.

9.4 Baseline Information

The study area covers an area that is up to 1km wide on either side of the route alignments of each option and the potential two travel hub sites. The routes of all options are on existing roads in Camborne and then within a relatively narrow corridor across the Bourn Airfield, before running parallel to the A428 up to the Waterworks travel hub site. The Scotland Farm site is just north of the A428. The two site options are at:

- Scotland Farm around NGR TL369600
- Waterworks site around NGR TL391591

Beyond the Waterworks site the study area encompassed the A1303 and land down to Coton, across West Cambridge Development, the West Fields and along Adams Road to Grange Road.

9.4.1 Surface water features

The scheme options are all located on the interfluvium between the Bin Brook (to the south) and the River Great Ouse to the north. The low, flat ridge on which Camborne, the A428 and the A1303 are located runs east west and drainage features run north and south from this ridge. A number of field drainage features are shown on OS maps which also follow this north / south flow pattern linked to the interfluvium.

As a result, there are no natural surface water features in the potential Scotland Road travel hub site although the headwater of the Callow Brook is located to the east of the proposed site. This small feature drains north.

There is no surface water feature on the potential Waterworks site. Drainage off this location would flow south downhill to the Bin Brook.

None of the route options for the scheme cross a perennial surface water feature, and no flood zones are intersected by any of the route options, except one of the options that considered a scheme down the Rifle Range Road which would have had to cross the Bin Brook at NGR TL4660 5830. This was option was discounted at a late stage of the optioneering process. However, if the route did cross the brook the design would have not impacted the stream itself and appropriate flood compensation would have been included in the design so any impact was likely to be neutral.

9.4.2 Groundwater

The majority of the scheme, from the Cambridge Road cross road on the A1303 at Coton, westwards beyond Cambourne, is underlain by the Secondary (Undifferentiated) Aquifer made up of the Diamicton Till. This is called the Oadby Member which is a low permeability formation that has limited groundwater present within it. East of the Cambridge Road junction on the A1303 towards Grange Road there are no superficial deposits overlying bedrock.

Within the study area there are only two Principal Aquifer units present. Beneath Bourn Airfield are sandstones of the Woburn Sands Formation. From Madingley Mulch to the Coton Orchard the area has the West Melbury Marl Chalk Formation present. Both aquifers are identified as having low groundwater vulnerability by the Environment Agency.

Where the chalk is absent between Childerley Gate and Grange Road the scheme is underlain by Gault Formation (low permeability mudstone).

Kimmeridge Clay and undifferentiated West Walton and Ampthill Clay Formations are beneath the scheme in Cambourne. None of these clay formations are designated as aquifers (i.e. they have no significant groundwater present within them).

Both travel hub sites are entirely on the low permeability Oadby Member. This will provide protection to the underlying West Melbury Marly Chalk Formation at the Waterworks site. At the Scotland Farm site, the underlying geology is the Gault Formation.

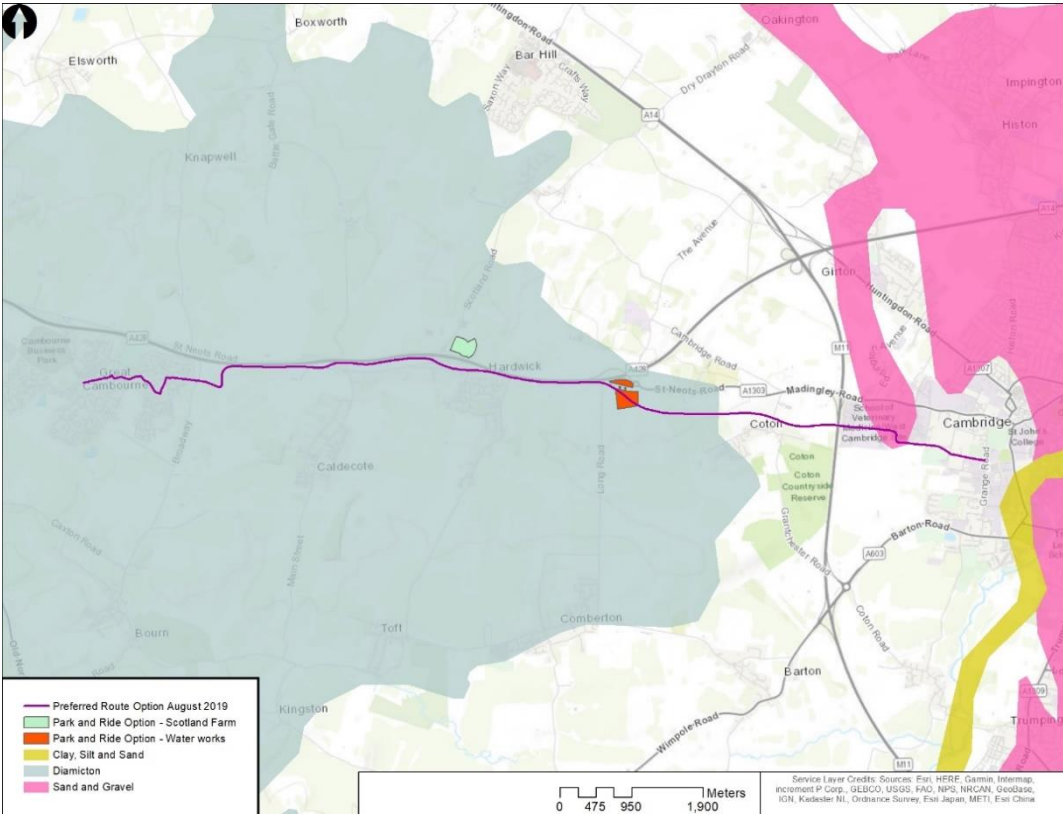
The chalk formation present is an isolated section that is on the north western limit of outcropping chalk in East Anglia. As such it is likely to be relative thin over the underlying Gault Formation.

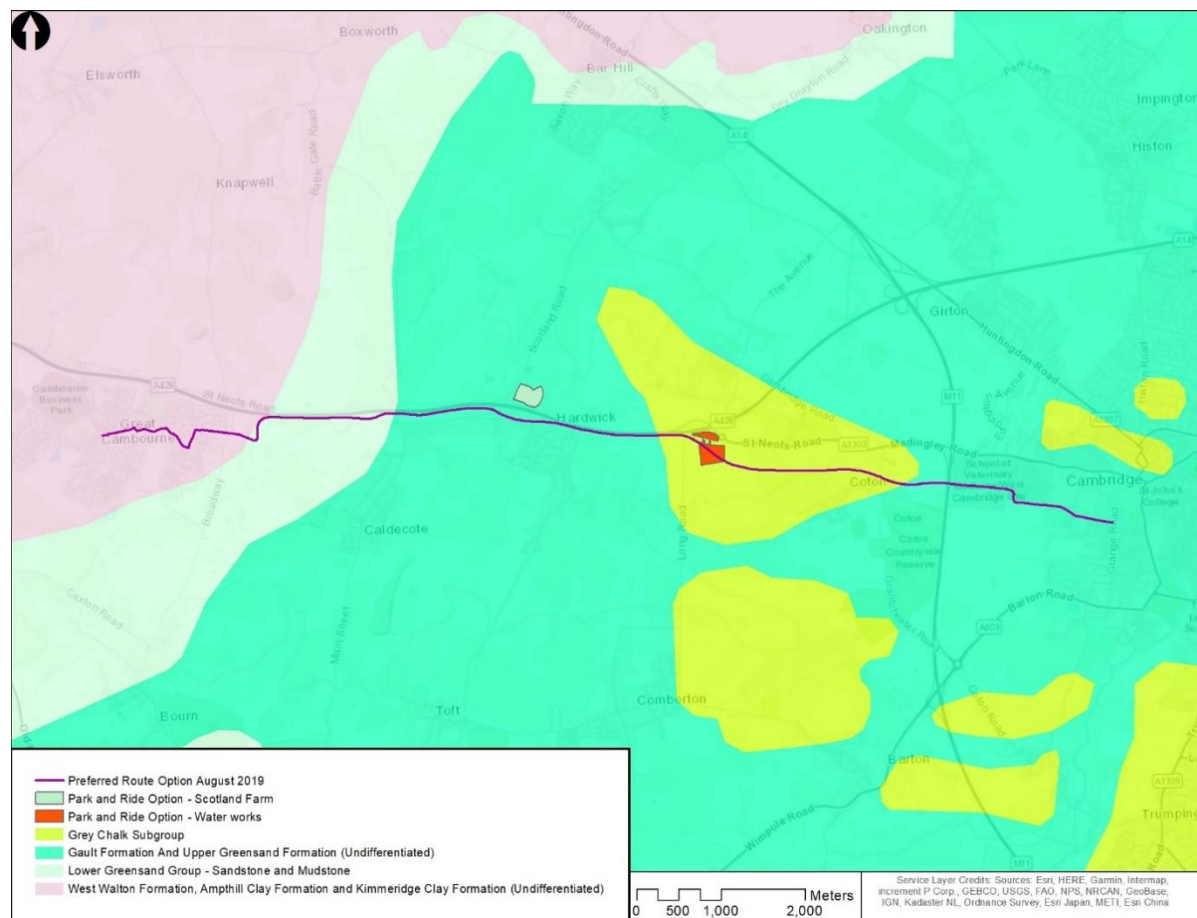
There are no springs visible in the area around the edge of the chalk formation which indicates the chalk is likely to have limited water within it.

The geology described above is shown in Figure 9.1.

Figure 9.1: Geology of the Study Area

Superficial Geology





Source: Mott MacDonald, 2019

9.5 Results of Assessment

9.5.1 Surface Water

There would be no surface water courses crossed by the route of Low Cost Option a/b, and there are no flood zones identified on the government Flood Mapping for Planning website along this route. The scheme would increase the hard surfacing which would increase runoff, but drainage for the scheme would have to accommodate this to ensure not increase in flood risk from the scheme. As such the risks to surface water are considered neutral and not deemed to justify further assessment.

Option 1a/1b route is the same for either option and does not cross any flood plain or main river. It crosses some field drains in places between Coton and Madingley. All drainage off this route would have to meet the requirements of the Environment Agency in relation to flood risk and water quality. As there is no direct effect on surface water these options would be neutral in relation to surface water, and do not justify further assessment.

None of the Phase 2 options cross any surface water features, and drainage will be neutral in terms of affecting surface water flows or quality. Therefore, there is no reason to assess surface water effects further.

The travel hub sites are both located away from any surface water features. Scotland Farm is about 115m from the nearest water course (Callow Brook). The Waterworks site is over 1km from the Bin Brook. Drainage of either site would comply with Environment Agency requirements to be neutral in terms of flood risk and impacts on water quality. This will require appropriate storage and attenuation for runoff, and sediment traps to meet the Environment Agency requirements, which would be included in the drainage design for the selected travel hub. As it is anticipated each site has good potential to be neutral in relation to surface water there is no reason to assess these sites in relation to surface water any further.

9.5.2 Groundwater

The low cost option 1a/b route has no direct effect on groundwater as the new road surface and associated infrastructure would have no significant below ground elements, and would not be likely to intersect the groundwater table in any Principal Aquifer. If there is groundwater present in the Oadby Formation it is likely to be isolated and shallow perched groundwater above the main chalk water table. Any elements of construction of a scheme encountering groundwater in this formation would not have anything more than a very local impact, unlikely to be significant.

Drainage from any of the Option 1a/1b and Phase 2 route options for the segregated public transport could include discharge to infiltration ponds in the ground – although this is likely to be very limited in extent given the low permeability formations that the routes cross. If infiltration to ground is practical the volume of traffic on the public transport route would be negligible in terms of generating contaminant loads that could affect groundwater and does not warrant detailed appraisal of the options in this regard.

The low permeability surface geology at the travel hub sites indicates that drainage of the sites would likely discharge to surface water features. There are unlikely to be any significant below ground features at these sites so impacts on groundwater at either site are likely to be neutral.

9.5.3 Spillage Risk

The segregated public transport routes would have very low levels of traffic relative the traffic volumes that require spillage risk to be appraised. None of the routes are anticipated to create changes in junction arrangements with the A428 at Scotland Farm and the A428/A1303 at Madingley so there is no change to existing spillage risk from any of the scheme options.

9.6 Conclusion

All the options have neutral impacts on water resources and do not warrant appraising using the WebTAG worksheets for water resources. As a result, the water resources impacts have not been included in the INSET scoring of the various options.

A. Appraisal Summary Table (AST)

This section presents a summary of the WebTAG worksheets for each option (Tables A.1 to A.11) which include a short description of the overall impact, an assessment of the magnitude of the potential impact and a rating. Table A.12 and A.13 present a comparisons of the different options for Phase 1 and Phase 2 respectively based on their magnitude and rating.

Table A.1. Summary of the WebTAG worksheets for Phase 1 Do Minimum			
Disciplines	Overall potential impact	Magnitude of potential impact	Rating
Air quality	No Impact.	Neutral/negligible	4
Biodiversity	Madingley Wood SSSI has High value and will be impacted adversely by continuing high, or increasing levels of traffic emissions. Do Min will not change current scale of effect - neutral effect.	Neutral/negligible	4
Greenhouse gases	No Impact.	Neutral/negligible	4
Historic environment	No Impact.	Neutral/negligible	4
Townscape	(The route corridor between Grange Road and the M11 are assessed in this discipline.) There will be no impacts on townscape features in the Do Minimum option.	Neutral/negligible	4
Landscape	Neutral impact on landscape character because the cycle lane between High Cross Junction and Lady Margaret Road will pass through an urbanised environment within the existing road corridor.	Neutral/negligible	4
Noise	No Impact.	Neutral/negligible	4

Table A.2. Summary of the WebTAG worksheets for Phase 1 Low Cost A

Disciplines	Overall potential impact	Magnitude of potential impact	Rating
Air quality	<p>There are 605 receptors within 200 metres of Low Cost A.</p> <p>The Scheme as a whole is likely to reduce congestion along Madingley Road and therefore has the potential to improve air quality. This improvement could be offset by the additional bus lane on certain parts of Madingley Road (A1303), however as an additional lane would be used by buses only, which would operate a low frequency, and would meet Euro VI standards this would have no significant effect on air quality at nearby receptors.</p> <p>The Scheme may lead to an improvement in air quality in the AQMA due to a model shift through the provision of increased bus capacity and reducing the number of private vehicles in the AQMA.</p> <p>All changes in air quality are predicted to be small and considering the small number of receptors within 200 meters would not significantly affect the Net Present Value if a full WebTag assessment based on traffic data was to be undertaken.</p>	Neutral/negligible	4
Biodiversity	<p>Madingley Wood SSSI has High value and will be impacted adversely by continuing high, or increasing levels of traffic emissions. Large adverse potential impact on this SSSI from</p> <p>Scheme until traffic emissions impact is assessed for full OBC.</p> <p>Waterworks area has High biodiversity value for habitat and protected species, and intermediate impact through loss of wooded area from P&R resulting in decrease in biodiversity which will be mitigated by sensitive design and planting for the P&R.</p> <p>Works will have minor impacts on remainder of A1303 corridor and the route from Hardwick to Madingley Mulch.</p>	Major adverse	1
Greenhouse gases	Operational P&R Carbon deemed similar between Waterworks and Scotland Farm sites. Operational deemed neutral (on basis of current technology - in reality technology / fuel changes likely to see drop in operational carbon). Scheme has higher carbon than Do Minimum but less than Do Something 1a/1b/illustrative comparator.	Neutral/negligible	4
Historic environment	<p>It is considered a low to moderate impact on the form and context of the Memorial and attached walls, steps and pool at the American Military Cemetery from the proximity of the scheme to the edge of the park and garden with increased visibility of traffic and potential changes to road frontage of the asset cause a low to moderate adverse effect overall.</p> <p>A number of listed buildings adjacent to Madingley Road east of M11 could have slight adverse effect due to proximity of scheme.</p>	Moderate adverse	2
Townscape	(The route corridor between Grange Road and the M11 are assessed in this discipline.) There will be no impacts on townscape features in the Low Cost A option.	Neutral/negligible	4
Landscape	Waterworks travel hub conflicts with existing landscape pattern, would result in loss of mature trees and would affect the setting of the open landscape to the south. Widening of A1303 Madingley Road and loss of vegetation along the road corridor conflicts with some local policies protecting landscape character. It would affect Madingley Wood ancient and semi-natural woodland, existing views across the open landscape and the setting of the American Military Cemetery. Likely to have minor to moderate adverse effects along the route, with the main impacts around the American Military Cemetery/Madingley Wood.	Moderate adverse	2
Noise	Since this Option is an online scheme, changes in traffic flow or composition that would result in significant changes in noise are unlikely. Although Waterworks Park and Ride is new and there are residential receptors in the vicinity, it is considered that standard good design can be applied such that noise changes at these receptors is minimal.	Neutral/negligible	4

Table A.3. Summary of the WebTAG worksheets for Phase 1 Low Cost B

Disciplines	Overall potential impact	Magnitude of potential impact	Rating
Air quality	There are 662 receptors within 200 metres of Low Cost B. The impact of this scheme do not differ significantly from Low Cost a, the impacts will be as described in Low Cost a.	Neutral/negligible	4
Biodiversity	Madingley Wood SSSI has High value and will be impacted adversely by continuing high, or increasing levels of traffic emissions. Large adverse potential impact on this SSSI from Scheme from Scheme until traffic emissions impact is assessed for full OBC. Works will have minor impacts on remainder of A1303 corridor and the route from Hardwick to Madingley Mulch.	Major adverse	1
Greenhouse gases	Operational P&R Carbon deemed similar between Waterworks and Scotland Farm sites. Operational deemed neutral (on basis of current technology - in reality technology / fuel changes likely to see drop in operational carbon). Scheme has higher carbon than Do Minimum but less than Do Something 1a/1b/illustrative comparator.	Neutral/negligible	4
Historic environment	It is considered a low to moderate impact on the form and context of the Memorial and attached walls, steps and pool at the American Military Cemetery from the proximity of the scheme to the edge of the park and garden with increased visibility of traffic and potential changes to road frontage of the asset cause a low to moderate adverse effect overall. A number of listed buildings adjacent to Madingley Road east of M11 could have slight adverse effect due to proximity of scheme.	Moderate adverse	2
Townscape	(The route corridor between Grange Road and the M11 are assessed in this discipline.) There will be no impacts on townscape features in the Low Cost B option.	Neutral/negligible	4
Landscape	Widening of A1303 Madingley Road and loss of vegetation along the road corridor conflicts with some local policies protecting landscape character. It would affect Madingly Wood ancient and semi-natural woodland, existing views across the open landscape and the setting of the American Military Cemetery. Likely to have minor to moderate adverse effects along the route, with the main impacts around the American Military Cemetery/Madingley Wood. Scotland Farm Travel Hub conflicts slightly with existing landscape pattern and may affect the setting of the landscape directly north but this is tempered by its proximity to an existing junction. The travel hub would increase traffic movements, lighting and visual intrusion adjacent to the A428-Scotland Road junction and Scotland road.	Moderate adverse	2
Noise	Since this Option is an online scheme, changes in traffic flow or composition that would result in significant changes in noise are unlikely. Although Scotland Farm Park and Ride is new and there are residential receptors adjacent to the site, it is considered that standard good design can be applied such that noise changes at these receptors is minimal.	Neutral/negligible	4

Table A.4. Summary of the WebTAG worksheets for Phase 1 Do Something 1a

Disciplines	Overall potential impact	Magnitude of potential impact	Rating
Air quality	There are 413 receptors within 200 metres of Do Something 1a. This route introduces vehicles to areas where no vehicles operate now (from Madingley Mulch to Grange Road). However, as the off road route would be used by public transport vehicles only, which would operate a low frequency, and would meet Euro VI standards this is unlikely to have a significant effect on air quality at nearby receptors. The remaining impacts are described for Madingley Road under Low Cost a/b and would be similar for this Option.	Neutral/negligible	4
Biodiversity	Madingley Wood SSSI could see some benefit by reducing traffic, but assessed as neutral until traffic emissions impact is assessed for full OBC. Waterworks area has High biodiversity value for habitat and protected species, and intermediate impact through loss of wooded area from P&R resulting in decrease in biodiversity which will be mitigated by sensitive design and planting for the P&R. Coton Orchard to M11 area (UK BAP habitat and potential for protected species) will have intermediate impact similar to Waterworks P&R site. Otherwise route has minor impacts on Grange Fields (GCN protected species and locally important habitats), Coton Path Hedgerow CWS.	Moderate adverse	2
Greenhouse gases	Operational P&R Carbon deemed similar between Waterworks and Scotland Farm sites. Operational deemed neutral (on basis of current technology - in reality technology / fuel changes likely to see drop in operational carbon). Scheme has higher carbon than Do Minimum and Low Cost A / B but less than the illustrative comparator.	Neutral/negligible	4
Historic environment	Proximity of numerous HER Assets and features on aerial photographs and geophysical surveys of the Waterworks P&R indicates high likelihood of some historic environment assets on this route. Major impact likely resulting in moderate adverse effect on low/moderate value assets. Coton Village Conservation Area and Church of St Peter in Coton - potential minor adverse (Slight) due to proximity of route to setting of the church West Cambridge Conservation Area - slight adverse effect due to changes in road layout along Grange Road. Setting of heritage assets (backing onto scheme at 5a/5b Herschel Road - locally listed) and Nr 49 Grange Road (Grade II) - minor adverse effect.	Moderate adverse	2
Townscape	(The route corridor between Grange Road and the M11 are assessed in this discipline.) There would be a loss of vegetation east of the M11 and north of the Cambridge University Sports Ground. The busway would pass through the West Cambridge Conservation Area along Adams Road. The removal of on-street parking would enhance the setting of the conservation area. Cycle and pedestrian routes between Cambridge and the Coton would be improved.	Minor beneficial	5
Landscape	Waterworks Travel Hub conflicts with existing landscape pattern and may affect the setting of the landscape directly south. Trees (some protected by TPO) and vegetation would be lost from the Waterworks site, from north of the Coton Conservation area and Coton Orchard. Route crosses open countryside between Madingley Mulch roundabout and Coton affecting field patterns and introducing a hard-surfaced, linear feature through agricultural land. Tranquillity would be reduced by moving buses on the busway and vehicle movement and lighting in the travel hub. Visual intrusion due to new features in views over the open landscape. The proposal would also affect the setting of Coton Conservation Area as well as Coton Orchard.	Moderate adverse	2
Noise	Traffic, hence noise level at adjacent properties is unlikely to change so much that noise levels will alter significantly, so are judged to remain unchanged on the A1303 and A428. Noise changes will depend on existing background noise levels, and for the majority of this option these are likely to be dominated by distant (A1303, A428, M11) and localised (Cambridge Road, Grange Road, M11) road traffic. Given that the number of buses proposed is relatively low, the majority of impacts will be negligible, however there will be some minor adverse impacts to the rear of some properties. There will be opportunities for mitigation such as acoustic barriers which will reduce these impacts further. The Waterworks Park and Ride would be at Madingley Mulch Interchange. Although the Park and Ride is new and there are residential receptors in the vicinity, it is considered that mitigation can be applied such that noise changes at these receptors is minimal.	Minor adverse	3

Table A.5. Summary of the WebTAG worksheets for Phase 1 Do Something 1b

Disciplines	Overall potential impact	Magnitude of potential impact	Rating
Air quality	There are 419 receptors within 200 metres of Do Something 1b due to the increased distance from Scotland Farm P&R site to Grange Road. However, otherwise the impacts would be largely as for Do Something 1a with 6 additional properties experiencing potentially a marginal change in air quality.	Neutral/negligible	4
Biodiversity	Madingley Wood SSSI could see some benefit by reducing traffic, but assessed as neutral until traffic emissions impact is assessed for full OBC. Waterworks area has High biodiversity value for habitat and protected species, and intermediate impact through loss of wooded area from route corridor resulting in decrease in biodiversity which will be mitigated by sensitive design and planting for the P&R. Coton Orchard to M11 area (UK BAP habitat and potential for protected species) will have intermediate impact similar to Waterworks P&R site. Otherwise route has minor impacts on Grange Fields (GCN protected species and locally important habitats), Coton Path Hedgerow CWS.	Moderate adverse	2
Greenhouse gases	Operational P&R Carbon deemed similar between Waterworks and Scotland Farm sites. Operational deemed neutral (on basis of current technology - in reality technology / fuel changes likely to see drop in operational carbon). Scheme has higher carbon than Do Minimum and Low Cost A / B but less than the illustrative comparator.	Neutral/negligible effect	4
Historic environment	Proximity of numerous HER Assets to Scotland Farm P&R and the route indicates high likelihood of some historic environment assets on this route. Major impact likely resulting in moderate effect on low/moderate value assets Coton Village Conservation Area and Church of St Peter in Coton - potential minor adverse (Slight) due to proximity of route to setting of the church West Cambridge Conservation Area - slight adverse effect due to changes in road layout along Grange Road. Setting of heritage assets (backing onto scheme at 5a/5b Herschel Road - locally listed) and Nr 49 Grange Road (Grade II) - minor adverse effect.	Moderate adverse	2
Townscape	(The route corridor between Grange Road and the M11 are assessed in this discipline.) There would be a loss of vegetation east of the M11 and north of the Cambridge University Sports Ground. The busway would pass through the West Cambridge Conservation Area along Adams Road. The removal of on-street parking would enhance the setting of the conservation area. Cycle and pedestrian routes between Cambridge and the Coton would be improved.	Minor beneficial	5
Landscape	Scotland Farm Travel Hub conflicts slightly with existing landscape pattern and may affect the setting of the landscape directly north but this is tempered by its proximity to an existing junction. The travel hub would increase traffic movements, lighting and visual intrusion adjacent to the A428-Scotland Road junction and Scotland road. Reduction in the tranquillity of the landscape to the north and east of the facility. Trees (some protected by TPO) and vegetation would be lost from the Waterworks site, from north of the Coton Conservation area and Coton Orchard. Route crosses open countryside between Madingley Mulch roundabout and Coton affecting field patterns and introducing a hard-surfaced, linear feature through agricultural land. Tranquillity reduced by moving buses on the busway. Visual intrusion due to new features in views over the open landscape. The proposal would also affect the setting of Coton Conservation Area as well as Coton Orchard.	Moderate adverse	2
Noise	Option 1b follows the same alignment as Option 1a and similar comments apply, with the difference being the location of the Scotland Farm Park and Ride further west along the A428. Although the Park and Ride is new and there are residential receptors in the vicinity, it is considered that mitigation can be applied such that noise changes at these receptors is minimal.	Minor adverse	3

Table A.6. Summary of the WebTAG worksheets for Phase 2 Option 1a

Disciplines	Overall potential impact	Magnitude of potential impact	Rating
Air quality	<p>Traffic changes for each of the scheme options are likely to be similar, therefore changes in air quality at these receptors would be consistent.</p> <p>The changes in traffic would likely lead to a small deterioration in air quality in this area as there would be the additional emissions from the buses. However, due to the frequency of the bus movements any changes are expected to be de minimis, would not cause significant changes in concentrations, and would not significantly alter the net present value of the scheme.</p> <p>Option one, the off-road segregated route affects slightly fewer receptors than the on-road options due to the section that would be located north of St Neots Road, and therefore fewer receptors are affected in the Hardwick and Highfields Court areas.</p> <p>It is likely that all three scheme options would contribute to an improvement in air quality along the A428 and within CCC through the promotion of modal shift and reduction of cars within the city.</p> <p>Scotland Farm Park and Ride slightly increases the number of receptors affected compared to the Waterworks Park and Ride for each of the route options and these receptors would likely receive a small deterioration in air quality as a result of the increased traffic accessed the site which is within 200m of the receptors along Scotland Road. Nevertheless, the changes at these properties would be small, would not result in significant effects and would not have a material benefit on the net present value.</p>	Neutral/negligible	4
Biodiversity	<p>Minor adverse effects are anticipated for Eversden and Wimpole Woods SAC SSSI due to the third party data provided on barbastelle bats. Barbastelle bats have been recorded within the Zol and these may be a part of the larger population within the SAC, of which they are a qualifying feature. Waterworks park and ride site would cause the loss of tall ruderal, grassland, plantation which has high invertebrate interest, trees with high bat potential and reptile likely present. Waterworks park and ride also contains semi-natural broad-leaved woodland which would be lost as part of the development. Option 1a will result in a large area of plantation woodland being removed, with arable, scrub, grassland and hedgerows also lost.</p> <p>The proposed works, without appropriate mitigation, have the potential to adversely affect bats, reptiles, badgers, great crested newts, invertebrates and nesting birds through the loss, fragmentation and isolation of habitats.</p>	Moderate adverse	2
Greenhouse gases	<p>During the construction period, minor impact on other road users due to construction taking place off-road, with only construction vehicles using the local network to get to site affecting the flow of traffic marginally. During the operation of the scheme minor queuing may occur at junctions when the buses merge with the local traffic, which will lower the flows of traffic resulting in a slight increase of GHG emissions.</p> <p>As the Waterworks P&R is located closer to Cambridge along the A428, private vehicles will be required to travel 2 miles further than the Scotland Farm P&R options adding to operational GHG emissions. With vehicles using the park and ride and bus when heading into Cambridge from Camborne a reduction in overall GHGs may be achieved as less members of the public use their private vehicle. The journey time by bus is projected to be considerably reduced with Option 1a, which indicates better flow of journey and therefore reduced bus journey emissions.</p> <p>However, without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change resulting from the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions - this will be assessed for the preferred route option within the Environmental Assessment Report when a full WebTAG assessment is undertaken.</p>	Minor adverse	3
Historic environment	A moderate adverse impact is predicted to unknown archaeological remains within the proposed option area through the construction of the option. Where remains are present they will be removed by necessary excavations. Although the form, nature and extent of potential remains is unknown there is regionally significant archaeology within the vicinity of the proposed option and the area is considered to have a moderate to high archaeological potential in areas outside of the existing road corridor and the A428 construction corridor. This assessment is subject to change following proper assessment and investigation of archaeological potential and finalisation of construction methodology.	Moderate adverse	2
Landscape	Option 1a would result in adverse impacts due to the introduction of a new travel hub on the waterworks site and busway between Cambourne and the A1303/St Neots Road roundabout. The scheme would reduce tranquillity and would alter the pattern of the open rural landscape south of the waterworks site and the wooded road corridor along the St Neots Road. There would be a loss of mature trees and screening vegetation on the boundaries of the waterworks site and along the St Neots Road. Visual intrusion due to new features in views over the open landscape.	Moderate Adverse Effect	2
Noise	<p>This Option is unlikely to result in significant changes in traffic (hence noise) on the existing road network. Where this Option is adjacent to an existing road such as A428, noise from the latter is likely to predominate and significant impacts are unlikely to result.</p> <p>Where this Option is adjacent to, or on more lightly-trafficked roads, such as those on its route within Upper Camborne and Great Camborne, noise from public transport is likely to be audible at nearest properties.</p> <p>Noise from traffic within the Waterworks Park and Ride has the potential to be audible at the rear of nearest properties, although this can be reduced with mitigation.</p>	Minor adverse	3

Table A.7. Summary of the WebTAG worksheets for Phase 2 Option 1b

Disciplines	Overall potential impact	Magnitude of potential impact	Rating
Air quality	<p>Traffic changes for each of the scheme options are likely to be similar, therefore changes in air quality at these receptors would be consistent.</p> <p>The changes in traffic would likely lead to a small deterioration in air quality in this area as there would be the additional emissions from the buses. However, due to the frequency of the bus movements any changes are expected to be de minimis, would not cause significant changes in concentrations, and would not significantly alter the net present value of the scheme.</p> <p>Option one, the off-road segregated route affects slightly fewer receptors than the on-road options due to the section that would be located north of St Neots Road, and therefore fewer receptors are affected in the Hardwick and Highfields Court areas.</p> <p>It is likely that all three scheme options would contribute to an improvement in air quality along the A428 and within CCC through the promotion of modal shift and reduction of cars within the city.</p> <p>Scotland Farm Park and Ride slightly increases the number of receptors affected compared to the Waterworks Park and Ride for each of the route options and these receptors would likely receive a small deterioration in air quality as a result of the increased traffic accessed the site which is within 200m of the receptors along Scotland Road. Nevertheless, the changes at these properties would be small, would not result in significant effects and would not have a material benefit on the net present value.</p>	Neutral/negligible	4
Biodiversity	<p>Minor adverse effects are anticipated for Eversden and Wimpole Woods SAC SSSI due to the third party data provided on barbastelle bats. Barbastelle bats have been recorded within the Zol and these may be a part of the larger population within the SAC, of which they are a qualifying feature. Option 1b will result in a large area of plantation woodland being removed, with arable, scrub, grassland and hedgerows also lost. Scotland Farm site for the park and ride site is on an arable site, which has not been accessed to survey.</p> <p>The proposed works, without appropriate mitigation, have the potential to adversely affect bats, reptiles, badgers, great crested newts, invertebrates and nesting birds through the loss, fragmentation and isolation of habitats.</p>	Moderate adverse	2
Greenhouse gases	<p>During the construction period, minor impact on other road users due to construction taking place off-road with only construction vehicles using the local network to get to site affecting the flow of traffic marginally. During the operation of the scheme minor queuing may occur at junctions when the buses merge with the local traffic, which will lower the flows of traffic resulting in a slight increase of GHG emissions.</p> <p>Additional GHG emissions will result from the buses crossing the A428 using Scotland Road overbridge along with the 2 roundabouts either end of the bridge to enter the P&R followed by crossing a second time to re-join the buses designated route upon exiting. With vehicles using the park and ride and bus when heading into Cambridge from Camborne a reduction in overall GHGs may be achieved as less members of the public use their private vehicle. The journey time by bus is projected to be considerably reduced with Option 1b, which indicates better flow of journey and therefore reduced bus journey emissions.</p> <p>However, without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change resulting from the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions - this will be assessed for the preferred route option within the Environmental Assessment Report when a full WebTAG assessment is undertaken.</p>	Minor adverse	3
Historic environment	<p>A moderate adverse impact is predicted to unknown archaeological remains within the proposed option area through the construction of the option. Where remains are present they will be removed by necessary excavations. Although the form, nature and extent of potential remains is unknown there is regionally significant archaeology within the vicinity of the proposed option and the area is considered to have a moderate to high archaeological potential in areas outside of the existing road corridor and the A428 construction corridor.</p>	Moderate adverse	2
Landscape	<p>Option 1b would result in adverse impacts due to the introduction of a new park and ride site and busway between Cambourne and the A1303/St Neots Roundabout. The scheme would reduce tranquillity and would alter the pattern of the landscape along the wooded road corridor of the St Neots Road. There would be a loss of mature trees and screening vegetation along the St Neots Road. Scotland Farm Travel Hub conflicts slightly with existing landscape pattern and may affect the setting of the landscape directly north but this is tempered by its proximity to an existing junction. The travel hub would increase traffic movements, lighting and visual intrusion adjacent to the A428-Scotland Road junction and Scotland road.</p>	Moderate adverse	2
Noise	<p>This Option is unlikely to result in significant changes in traffic (hence noise) on the existing road network. Where this Option is adjacent to an existing road such as A428, noise from the latter is likely to predominate and significant impacts are unlikely to result.</p> <p>Where this Option is adjacent to, or on more lightly-trafficked roads, such as those on its route within Upper Camborne and Great Camborne, noise from public transport is likely to be audible at nearest properties.</p> <p>Noise from traffic within the Scotland Farm Park and Ride has the potential to be audible at the rear of nearest properties fronting Scotland Road, although this can be reduced with mitigation.</p>	Minor adverse	3

Table A.8. Summary of the WebTAG worksheets for **Phase 2 Option 2a**

Disciplines	Overall potential impact	Magnitude of potential impact	Rating
Air quality	<p>Traffic changes for each of the scheme options are likely to be similar, therefore changes in air quality at these receptors would be consistent.</p> <p>The changes in traffic would likely lead to a small deterioration in air quality in this area as there would be the additional emissions from the buses. However, due to the frequency of the bus movements any changes are expected to be de minimis, would not cause significant changes in concentrations, and would not significantly alter the net present value of the scheme.</p> <p>Receptors to the south of St Neots Road may experience a slight reduction in air quality with options two and three in comparison to option one, due to the buses operating in closer proximity to them on St Neots Road, rather than north of St Neots Road as in option one. However, considering the number of buses using the busway and the distances to the receptors any air quality deteriorations may be off-set by an overall reduction in traffic due to a modal shift.</p> <p>It is likely that all three scheme options would contribute to an improvement in air quality along the A428 and within CCC through the promotion of modal shift and reduction of cars within the city.</p> <p>The impacts of Scotland Farm Park and Ride site in comparison to Water Works Park and Ride are described in Option 1a and 1b.</p>	Neutral/negligible	4
Biodiversity	<p>Minor adverse effects are anticipated for Eversden and Wimpole Woods SAC SSSI due to the third party data provided on barbastelle bats. Barbastelle bats have been recorded within the ZOI and these may be a part of the larger population within the SAC, of which they are a qualifying feature. Option 2a is largely on-road, but would result in habitat loss of areas of grassland, arable and hedgerow. Waterworks park and ride site would cause the loss of tall ruderal, grassland, plantation which has high invertebrate interest, trees with high bat potential and reptile likely present. Waterworks park and ride also contains semi-natural broad-leaved woodland which would be lost as part of the development.</p> <p>The proposed works, without appropriate mitigation, have the potential to adversely affect bats, reptiles, badgers, great crested newts, invertebrates and nesting birds through the loss, fragmentation and isolation of habitats.</p>	Moderate adverse	2
Greenhouse gases	<p>During the construction period, diversions may be required as this option consists of minor junction and pavement improvements which will have a minor impact on other road users. During the operational phase of the scheme, the buses are running on-road with the traffic on St Neots Road which would result in a reduction in traffic flows and speeds as the buses stop at the bus stops and may be travelling at slower speeds than general traffic. With the minor junction improvements it would be expected to better the flows of traffic which may result in a reduction of GHG emissions.</p> <p>As the Waterworks P&R is located closer to Cambridge along the A428, private vehicles will be required to travel 2 miles further than the Scotland Farm P&R b options adding to operational GHG emissions. With vehicles using the park and ride and bus when heading into Cambridge from Camborne a reduction in overall GHGs may be achieved as less members of the public use their private vehicle, and an estimated reduction in bus journey time.</p> <p>However, without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change resulting from the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions - this will be assessed for the preferred route option within the Environmental Assessment Report when a full WebTAG assessment is undertaken.</p>	Minor adverse	3
Historic environment	<p>A moderate adverse impact is predicted to unknown archaeological remains within the proposed option area through the construction of the option. Where remains are present they will be removed by necessary excavations. Although the form, nature and extent of potential remains is unknown there is regionally significant archaeology within the vicinity of the proposed option and the area is considered to have a moderate to high archaeological potential in areas outside of the existing road corridor and the A428 construction corridor.</p>	Moderate adverse	2
Landscape	<p>Option 2a would result in adverse impacts due to the introduction of a new travel hub on the Waterworks site and busway between Camborne and the A1303/St Neots Road roundabout. The Waterworks travel hub conflicts with existing landscape pattern. It would also reduce tranquillity due to movement of vehicles and lighting and would alter the pattern of the open rural landscape south of the waterworks site. There would be a loss of mature trees and screening vegetation on the boundaries of the waterworks site.</p>	Minor adverse	3
Noise	<p>This Option is unlikely to result in significant changes in traffic (hence noise) on the existing road network. Where this Option is adjacent to an existing road such as A428, noise from the latter is likely to predominate and significant impacts are unlikely to result.</p> <p>Where this Option is adjacent to, or on more lightly-trafficked roads, such as those on its route within Upper Camborne and Great Camborne, noise from public transport is likely to be audible at nearest properties.</p> <p>Noise from traffic within the Waterworks Park and Ride has the potential to be audible at the rear of nearest properties, although this can be reduced with mitigation.</p>	Minor adverse	3

Table A.9. Summary of the WebTAG worksheets for Phase 2 Option 2b

Disciplines	Overall potential impact	Magnitude of potential impact	Rating
Air quality	<p>All scheme options follow the same route west of Wellington Way, this is the section of the scheme that is in closest proximity to the highest number of receptors in Cambourne. Traffic changes for each of the scheme options are likely to be similar, and therefore changes in air quality at these receptors would be consistent. The changes in traffic would likely lead to a small deterioration in air quality in this area as there would be additional emissions from the buses. However, due to the frequency of the bus movements any changes are expected to be de minimis, would not cause significant changes in concentrations, and would not significantly alter the net present value of the scheme.</p> <p>Option one, the off-road segregated route affects slightly fewer receptors than the on-road options due to the section that would be located north of St Neots Road, and therefore fewer receptors are affected in the Hardwick and Highfields Court areas.</p> <p>Receptors to the south of St Neots Road may experience a slight reduction in air quality with options two and three in comparison to option one, due to the buses operating in closer proximity to them on St Neots Road, rather than north of St Neots Road as in option one. However, considering the number of buses using the busway and the distances to the receptors any air quality deteriorations may be off-set by an overall reduction in traffic due to a modal shift. Any of these changes would be de minimis and not create a significant change in air quality.</p> <p>It is likely that all three scheme options would contribute to an improvement in air quality along the A428 and within CCC through the promotion of modal shift and reduction of cars within the city. The choice of Scotland Farm Park and Ride slightly increases the number of receptors affected compared to the Waterworks Park and Ride for each of the route options and these receptors would likely receive a small deterioration in air quality as a result of the increased traffic accessed the site which is within 200m of the receptors along Scotland Road. Nevertheless, the changes at these properties would be small, would not result in significant effects and would not have a material benefit on the net present value.</p>	Neutral/negligible	4
Biodiversity	<p>Minor adverse effects are anticipated for Eversden and Wimpole Woods SAC SSSI due to the third party data provided on barbastelle bats. Barbastelle bats have been recorded within the Zol and these may be a part of the larger population within the SAC, of which they are a qualifying feature. Option 2 is largely on-road, but would result in habitat loss of areas of grassland, arable and hedgerow. Scotland Farm site for the park and ride site is on an arable site, which has not been accessed to survey.</p> <p>The proposed works, without appropriate mitigation, have the potential to adversely affect bats, reptiles, badgers, great crested newts, invertebrates and nesting birds through the loss, fragmentation and isolation of habitats.</p>	Minor adverse	3
Greenhouse gases	<p>During the construction period, diversions may be required as this option consists of minor junction and pavement improvements which will have a minor impact on vehicle users. During the operational phase of the scheme, the buses are running on-road with the traffic on St Neots Road which would result in a reduction in traffic flows and speeds as the buses stop at the bus stops and may be travelling at slower speeds than general traffic. With the minor junction improvements it would be expected to better the flows of traffic which may result in a reduction of GHG emissions.</p> <p>Additional GHG emissions will result from the buses crossing the A428 using Scotland Road overbridge along with the 2 roundabouts either end of the bridge to enter the P&R followed by crossing a second time to re-join the buses designated route upon exiting. With vehicles using the park and ride and bus when heading into Cambridge from Camborne a reduction in overall GHGs may be achieved as less members of the public use their private vehicle, and an estimated reduction in bus journey time.</p> <p>However, without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change resulting from the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions - this will be assessed for the preferred route option within the Environmental Assessment Report when a full WebTAG assessment is undertaken.</p>	Minor adverse	3
Historic environment	<p>A moderate adverse impact is predicted to unknown archaeological remains within the proposed option area through the construction of the option. Where remains are present they will be removed by necessary excavations. Although the form, nature and extent of potential remains is unknown there is regionally significant archaeology within the vicinity of the proposed option and the area is considered to have a moderate to high archaeological potential in areas outside of the existing road corridor and the A428 construction corridor.</p>	Moderate adverse	2
Landscape	<p>Option 2b would result in adverse impacts due to the introduction of a new park and ride site and busway between Cambourne and the A1303/St Neots Roundabout. The scheme would reduce tranquillity and would alter the pattern of the landscape at Scotland Road where a car park would replace part of an arable field. The scheme would increase light levels in the open landscape north of the Scotland Road site.</p>	Minor adverse	3
Noise	<p>Where this Option is adjacent to, or on more lightly-trafficked roads, such as those on its route within Upper Camborne and Great Camborne, noise from public transport is likely to be audible at nearest properties.</p> <p>Noise from traffic within the Scotland Farm Park and Ride has the potential to be audible at the rear of nearest properties fronting Scotland Road, although this can be reduced with mitigation.</p>	Minor adverse	3

Table A.10. Summary of the WebTAG worksheets for Phase 2 Option 3a

Disciplines	Overall potential impact	Magnitude of potential impact	Rating
Air quality	<p>All scheme options follow the same route west of Wellington Way, this is the section of the scheme that is in closest proximity to the highest number of receptors in Cambourne. Traffic changes for each of the scheme options are likely to be similar, and therefore changes in air quality at these receptors would be consistent. The changes in traffic would likely lead to a small deterioration in air quality in this area as there would be additional emissions from the buses. However, due to the frequency of the bus movements any changes are expected to be de minimis, would not cause significant changes in concentrations, and would not significantly alter the net present value of the scheme.</p> <p>Option one, the off-road segregated route affects slightly fewer receptors than the on-road options due to the section that would be located north of St Neots Road, and therefore fewer receptors are affected in the Hardwick and Highfields Court areas.</p> <p>Receptors to the south of St Neots Road may experience a slight reduction in air quality with options two and three in comparison to option one, due to the buses operating in closer proximity to them on St Neots Road, rather than north of St Neots Road as in option one. However, considering the number of buses using the busway and the distances to the receptors any air quality deteriorations may be off-set by an overall reduction in traffic due to a model shift. Any of these changes would be de minimis and not create a significant change in air quality.</p> <p>It is likely that all three scheme options would contribute to an improvement in air quality along the A428 and within CCC through the promotion of modal shift and reduction of cars within the city.</p> <p>The choice of Scotland Farm Park and Ride slightly increases the number of receptors affected compared to the Waterworks Park and Ride for each of the route options and these receptors would likely receive a small deterioration in air quality as a result of the increased traffic accessed the site which is within 200m of the receptors along Scotland Road. Nevertheless, the changes at these properties would be small, would not result in significant effects and would not have a material benefit on the net present value.</p>	Neutral/negligible	4
Biodiversity	<p>Minor adverse effects are anticipated for Eversden and Wimpole Woods SAC SSSI due to the third party data provided on barbastelle bats. Barbastelle bats have been recorded within the Zol and these may be a part of the larger population within the SAC, of which they are a qualifying feature. Option 3a will in habitat loss of plantation woodland, arable, grassland and hedgerows. Waterworks park and ride site would cause the loss of tall ruderal, grassland, plantation which has high invertebrate interest, trees with high bat potential and reptile likely present. Waterworks park and ride also contains semi-natural broad-leaved woodland which would be lost as part of the development.</p> <p>The proposed works, without appropriate mitigation, have the potential to adversely affect bats, reptiles, badgers, great crested newts, invertebrates and nesting birds through the loss, fragmentation and isolation of habitats.</p>	Moderate adverse	2
Greenhouse gases	<p>During the construction period, diversions may be required as construction works will be taking place on-road to widen the road and improve existing junctions which will have a minor impact on traffic. During operation of the scheme the buses segregated from the main traffic this option should not impact the traffic flows and speeds with levels of GHG remaining neutral. At junctions where buses and vehicles will be required to merge it may result in flows of traffic to slow increasing the GHG emissions. As the Waterworks P&R is located closer to Cambridge along the A428, private vehicles will be required to travel 2 miles further than the Scotland Farm P&R b options adding to operational GHG emissions. With vehicles using the park and ride and bus when heading into Cambridge from Camborne a reduction in overall GHGs may be achieved as less members of the public use their private vehicle, and an estimated reduction in bus journey time.</p> <p>However, without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change resulting from the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions - this will be assessed for the preferred route option within the Environmental Assessment Report when a full WebTAG assessment is undertaken.</p>	Minor adverse	3
Historic environment	A moderate adverse impact is predicted to unknown archaeological remains within the proposed option area through the construction of the option. Where remains are present they will be removed by necessary excavations. Although the form, nature and extent of potential remains is unknown there is regionally significant archaeology within the vicinity of the proposed option and the area is considered to have a moderate to high archaeological potential in areas outside of the existing road corridor and the A428 construction corridor.	Moderate adverse	2
Landscape	Option 3a would result in adverse impacts due to the introduction of a new park and ride site and busway between Cambourne and the park and ride site. The scheme would reduce tranquillity and would alter the pattern of the open rural landscape south of the waterworks site and the wooded road corridor along the St Neots Road. There would be a loss of mature trees and screening vegetation on the boundaries of the Waterworks site and along the St Neots Road.	Moderate adverse	2
Noise	<p>Where this Option is adjacent to, or on more lightly-trafficked roads, such as those on its route within Upper Camborne and Great Camborne, noise from public transport is likely to be audible at nearest properties.</p> <p>Noise from traffic within the Waterworks Park and Ride has the potential to be audible at the rear of nearest properties, although this can be reduced with mitigation.</p>	Minor adverse	3

Table A.11. Summary of the WebTAG worksheets for Phase 2 Option 3b

Disciplines	Overall potential impact	Magnitude of potential impact	Rating
Air quality	<p>All scheme options follow the same route west of Wellington Way, this is the section of the scheme that is in closest proximity to the highest number of receptors in Cambourne. Traffic changes for each of the scheme options are likely to be similar, and therefore changes in air quality at these receptors would be consistent. The changes in traffic would likely lead to a small deterioration in air quality in this area as there would be additional emissions from the buses. However, due to the frequency of the bus movements any changes are expected to be de minimis, would not cause significant changes in concentrations, and would not significantly alter the net present value of the scheme.</p> <p>Option one, the off-road segregated route affects slightly fewer receptors than the on-road options due to the section that would be located north of St Neots Road, and therefore fewer receptors are affected in the Hardwick and Highfields Court areas.</p> <p>Receptors to the south of St Neots Road may experience a slight reduction in air quality with options two and three in comparison to option one, due to the buses operating in closer proximity to them on St Neots Road, rather than north of St Neots Road as in option one. However, considering the number of buses using the busway and the distances to the receptors any air quality deteriorations may be off-set by an overall reduction in traffic due to a model shift. Any of these changes would be de minimis and not create a significant change in air quality.</p> <p>It is likely that all three scheme options would contribute to an improvement in air quality along the A428 and within CCC through the promotion of modal shift and reduction of cars within the city.</p> <p>The choice of Scotland Farm Park and Ride slightly increases the number of receptors affected compared to the Waterworks Park and Ride for each of the route options and these receptors would likely receive a small deterioration in air quality as a result of the increased traffic accessed the site which is within 200m of the receptors along Scotland Road. Nevertheless, the changes at these properties would be small, would not result in significant effects and would not have a material benefit on the net present value.</p>	Neutral/negligible	4
Biodiversity	<p>Minor adverse effects are anticipated for Eversden and Wimpole Woods SAC SSSI due to the third party data provided on barbastelle bats. Barbastelle bats have been recorded within the ZOI and these may be a part of the larger population within the SAC, of which they are a qualifying feature. Option 3b will in habitat loss of plantation woodland, arable, grassland and hedgerows. Scotland Farm site for the park and ride site is on an arable site, which has not been accessed to survey.</p> <p>The proposed works, without appropriate mitigation, have the potential to adversely affect bats, reptiles, badgers, great crested newts, invertebrates and nesting birds through the loss, fragmentation and isolation of habitats.</p>	Moderate adverse	2
Greenhouse gases	<p>During the construction period, diversions may be required as construction works will be taking place on-road to widen the road and improve existing junctions which will have a minor impact on traffic. During operation of the scheme the buses segregated from the main traffic this option should not impact the traffic flows and speeds with levels of GHG remaining neutral. At junctions where buses and vehicles will be required to merge it may result in flows of traffic to slow increasing the GHG emissions. Additional GHG emissions will result from the buses crossing the A428 using Scotland Road overbridge along with the 2 roundabouts either end of the bridge to enter the P&R followed by crossing a second time to re-join the buses designated route upon exiting. With vehicles using the park and ride and bus when heading into Cambridge from Camborne a reduction in overall GHGs may be achieved as less members of the public use their private vehicle, and an estimated reduction in bus journey time.</p> <p>However, without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change resulting from the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions - this will be assessed for the preferred route option within the Environmental Assessment Report when a full WebTAG assessment is undertaken.</p>	Minor adverse	3
Historic environment	<p>A moderate adverse impact is predicted to unknown archaeological remains within the proposed option area through the construction of the option. Where remains are present they will be removed by necessary excavations. Although the form, nature and extent of potential remains is unknown there is regionally significant archaeology within the vicinity of the proposed option and the area is considered to have a moderate to high archaeological potential in areas outside of the existing road corridor and the A428 construction corridor.</p>	Moderate adverse	2
Landscape	<p>Option 3b would result in adverse impacts due to the introduction of a new travel hub and busway between Cambourne and the A1303/St Neots Roundabout. The scheme would reduce tranquillity and would alter the pattern of the landscape along the wooded road corridor of the St Neots Road. There would be a loss of mature trees and screening vegetation along St Neots Road. The scheme would also alter the pattern of the landscape at Scotland Road where a car park would replace part of an arable field. The travel hub would increase traffic movements, lighting and visual intrusion adjacent to the A428-Scotland Road junction and Scotland Road.</p>	Moderate adverse	2
Noise	<p>Where this Option is adjacent to, or on more lightly-trafficked roads, such as those on its route within Upper Camborne and Great Camborne, noise from public transport is likely to be audible at nearest properties.</p> <p>Noise from traffic within the Scotland Farm Park and Ride has the potential to be audible at the rear of nearest properties fronting Scotland Road, although this can be reduced with mitigation.</p>	Minor adverse	3

Table A.12. High Level Comparison (Phase 1)					
Disciplines	Do Minumim	Low Cost A	Low Cost B	Do Something A	Do Something B
Air quality	4	4	4	4	4
Biodiversity	4	1	1	2	2
Greenhouse gases	4	4	4	4	4
Historic environment	4	2	2	2	2
Townscape	4	4	4	5	5
Landscape	4	2	2	2	2
Noise	4	4	4	3	3
<i>Total</i>	<i>28</i>	<i>21</i>	<i>21</i>	<i>22</i>	<i>22</i>

Table A.13. High Level Comparison (Phase 2)						
Disciplines	Option 1a	Option 1b	Option 2a	Option 2b	Option 3a	Option 3b
Air quality	4	4	4	4	4	4
Biodiversity	2	2	2	2	3	2
Greenhouse gases	3	3	3	3	3	3
Historic environment	2	2	2	2	2	2
Landscape	2	2	3	3	3	2
Noise	3	3	3	3	3	3
<i>Total</i>	<i>16</i>	<i>16</i>	<i>17</i>	<i>17</i>	<i>18</i>	<i>16</i>

B. Glossary

Acronym	Meaning
AADT	Annual average daily traffic
AAWT	Annual Average Weekly Traffic
AQMA	Air Quality Management Area
ARN	Affected road network
AST	Appraisal Summary Table
BAP	Biodiversity Action Plan
BCR	Benefit Cost Ratio
CAP	City Access Penalty
CCC	Cambridge City Council
CHER	Cambridgeshire Historic Environment Record
CO ₂	Carbon dioxide
CSRM2	Cambridge Sub Regional Model
CSWPR	Cambridge South West travel hub
EAR	Environmental Appraisal Report
EPR	Environmental Permitting Regulations
GCP	Greater Cambridge Partnership
GHG	Greenhouse gases
HGV	Heavy Goods Vehicles (including buses)
J10, J11, J12	Junction 10, Junction 11, Junction 12
LNR	Local Nature Reserve
NHLE	National Heritage List for England
NPPF	National Planning Policy Framework
NO ₂	Nitrogen dioxide
OBC	Outline Business Case
PCM	Pollution Climate Mapping
TRAVEL HUB	travel hub
PM _{2.5} , PM ₁₀	Particulate matter with an aerodynamic diameter of less than 2.5 (PM _{2.5}) or 10 (PM ₁₀) microns
SCDC	South Cambridgeshire District Council
SPZ	Source Protection Zone
SuDS	Sustainable Drainage Systems
WRA	Water Resources Act
ZoI	Zone of influence

C. Air Quality

Project:	Cambourne to Cambridge		
Our reference:	392438		
Prepared by:	S. Oliver	Date:	16 April 2018
Approved by:	C. Mills	Checked by:	C. Mills
Subject:	Air Quality – Environmental Appraisal Report (Phase 1)		

1 Qualitative Air Quality Assessment

1.1 Overview

A semi-quantitative air quality assessment of the six options for the Cambourne to Cambridge Busway has been undertaken. At the time of assessment detailed traffic information was not available, as such it was not feasible to undertake an assessment based on the air quality methodology set out in WebTAG Unit A3. The assessment has been undertaken considering the following key aspects:

- Existing baseline conditions – risk of exceedances of air quality objectives and EU limit values
- Number of properties affected
- Potential changes in traffic data
- Potential effects on the Cambridge City Air Quality Management Area (AQMA)

The following options have been assessed:

- Low Cost A - Completion of preferred on-road + Park & Ride (P&R) at Waterworks
- Low Cost B - Completion of preferred on-road + P&R at Scotland Farm
- Do Something 1a - Preferred off-road + P&R at Water works
- Do Something 1b - Preferred off-road + P&R at Scotland Farm
- Illustrative Comparator a - Preferred off-road Phase 1 and 2 + P&R at Water works
- Illustrative Comparator b - Preferred off-road Phase 1 and 2 + P&R at Scotland Farm

1.2 Low Cost A – Completion of preferred on-road + Park & Ride (P&R) at Waterworks

The monitoring data shows that in 2016 monitored concentrations at a kerbside site (within 1 metre of the road) along Madingley Road NO₂ concentrations remain below the air quality objectives. Defra Background maps show that background concentrations away from the busy roads are well below the air quality objectives. Appendix A provides a summary of local monitoring data.

Defra's Pollution Climate Mapping (PCM) is used to report UK compliance with the Air Quality Directive. The current published version of the PCM model is developed using a base year of 2015. Considering the current

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version, and based on the concentrations reported for 2018, there are no modelled links exceeding $40\mu\text{g}/\text{m}^3$ within 20km of the scheme.

There are 605 receptors within 200 metres of Low Cost A.

The Scheme as a whole is likely to reduce congestion along Madingley Road and therefore has the potential to improve air quality. This improvement could be offset by the additional bus lane on certain parts of Madingley Road (A1303), however as an additional lane would be used by buses only, which would operate at a low frequency, and would meet Euro VI standards this would have no significant effect on air quality at nearby receptors.

The Scheme may lead to an improvement in air quality in the AQMA due to a model shift through the provision of increased bus capacity and reducing the number of private vehicles in the AQMA.

All changes in air quality are predicted to be small and considering the small number of receptors within 200 meters would not significantly affect the Net Present Value if a full WebTag assessment based on traffic data was to be undertaken.

1.3 Low Cost b – Completion of preferred on-road + P&R at Scotland Farm

The monitoring data shows that in 2016 monitored concentrations at a kerbside site (within 1 metre of the road) along Madingley Road NO_2 concentrations remain below the air quality objectives. Defra Background maps show that background concentrations away from the busy roads are well below the air quality objectives. Appendix A provides a summary of local monitoring data.

Defra's Pollution Climate Mapping (PCM) is used to report UK compliance with the Air Quality Directive. The current published version of the PCM model is developed using a base year of 2015. Considering the current version, and based on the concentrations reported for 2018, there are no modelled links exceeding $40\mu\text{g}/\text{m}^3$ within 20km of the scheme.

There are 662 receptors within 200 metres of Low Cost B.

The Scheme as a whole is likely to reduce congestion along Madingley Road and therefore has the potential to improve air quality. This improvement could be offset by the additional bus lane on certain parts of Madingley Road (A1303), however as an additional lane would be used by buses only, which would operate at a low frequency, and would meet Euro VI standards this would have no significant effect on air quality at nearby receptors.

The Scheme may lead to an improvement in air quality in the AQMA due to a model shift through the provision of increased bus capacity and reducing the number of private vehicles in the AQMA.

All changes in air quality are predicted to be small and considering the small number of receptors within 200 meters would not significantly affect the Net Present Value if a full WebTag assessment based on traffic data was to be undertaken.

1.4 Do Something 1a – Preferred off-road + P&R at Water works

The monitoring data shows that in 2016 monitored concentrations in the study area are below the air quality objectives in 2016. Defra Background maps show that background concentrations away from the busy roads are well below the air quality objectives. Appendix A provides a summary of local monitoring data.

Defra's Pollution Climate Mapping (PCM) is used to report UK compliance with the Air Quality Directive. The current published version of the PCM model is developed using a base year of 2015. Considering the current version, and based on the concentrations reported for 2018, there are no modelled links exceeding $40\mu\text{g}/\text{m}^3$ within 20km of the scheme.

There are 413 receptors within 200 metres of Do Something 1a.

The Scheme is likely to reduce congestion along Madingley Road and therefore has the potential to improve air quality.

The option includes a new road alignment through an area with no existing roads. This would result in a deterioration in air quality for properties within 200m of this new route alignment that were previously unaffected by road emission sources. The off-road bus route is not expected to have a significant air quality effect as there are minimal properties located within 200 metres of the alignment and the bus way would be used by buses only, which would operate a low frequency, and would meet Euro VI standards. Given the existing background concentrations away from main roads there would be no exceedances of the air quality objectives.

The Scheme may lead to an improvement in air quality in the AQMA due to a model shift through the provision of increased bus capacity and reducing the number of private vehicles in the AQMA.

Therefore, all changes in air quality are predicted to be small and considering the small number of receptors within 200 meters would not significantly affect the Net Present Value if a full WebTag assessment based on traffic data was to be undertaken.

1.5 Do Something 1b – Preferred off-road + P&R at Scotland Farm

The monitoring data shows that in 2016 monitored concentrations in the study area are below the air quality objectives in 2016. Defra Background maps show that background concentrations away from the busy roads are well below the air quality objectives. Appendix A provides a summary of local monitoring data.

Defra's Pollution Climate Mapping (PCM) is used to report UK compliance with the Air Quality Directive. The current published version of the PCM model is developed using a base year of 2015. Considering the current version, and based on the concentrations reported for 2018, there are no modelled links exceeding $40\mu\text{g}/\text{m}^3$ within 20km of the scheme.

There are 419 receptors within 200 metres of Do Something 1b.

The Scheme is likely to reduce congestion along Madingley Road and therefore has the potential to improve air quality.

The option includes a new road alignment through an area with no existing roads. This would result in a deterioration in air quality for properties within 200m of this new route alignment that were previously unaffected by road emission sources. The off-road bus route is not expected to have a significant air quality effect as there are minimal properties located within 200 metres of the alignment and the bus way would be used by buses only, which would operate a low frequency, and would meet Euro VI standards. Given the existing background concentrations away from main roads there would be no exceedances of the air quality objectives.

The Scheme may lead to an improvement in air quality in the AQMA due to a model shift through the provision of increased bus capacity and reducing the number of private vehicles in the AQMA.

Therefore, all changes in air quality are predicted to be small and considering the small number of receptors within 200 meters would not significantly affect the Net Present Value if a full WebTag assessment based on traffic data was to be undertaken.

1.6 Illustrative Comparator a – Preferred off-road Phase 1 and 2 + P&R at Water works

The monitoring data shows that in 2016 monitored concentrations in the study area are below the air quality objectives in 2016. Defra Background maps show that background concentrations away from the busy roads are well below the air quality objectives. Appendix A provides a summary of local monitoring data.

Defra's Pollution Climate Mapping (PCM) is used to report UK compliance with the Air Quality Directive. The current published version of the PCM model is developed using a base year of 2015. Considering the current version, and based on the concentrations reported for 2018, there are no modelled links exceeding $40\mu\text{g}/\text{m}^3$ within 20km of the scheme.

There are 2136 receptors within 200 metres of Illustrative Comparator a.

The Scheme is likely to reduce congestion along Madingley Road and therefore has the potential to improve air quality.

The option includes a new road alignment through an area with no existing roads. This would result in a deterioration in air quality for properties within 200m of this new route alignment that were previously unaffected by road emission sources. The off-road bus route is not expected to have a significant air quality effect as there are minimal properties located within 200 metres of the alignment and the bus way would be used by buses only, which would operate a low frequency, and would meet Euro VI standards. Given the existing background concentrations away from main roads there would be no exceedances of the air quality objectives.

The Scheme may lead to an improvement in air quality in the AQMA due to a model shift through the provision of increased bus capacity and reducing the number of private vehicles in the AQMA.

Therefore, all changes in air quality are predicted to be small and considering the small number of receptors within 200 meters would not significantly affect the Net Present Value if a full WebTag assessment based on traffic data was to be undertaken.

The increase size of this option has the potential to lead to greater improvements in air quality as more receptors have the potential to be affected along existing roads.

1.7 Illustrative Comparator b – Preferred off-road Phase 1 and 2 + P&R at Scotland Farm

The monitoring data shows that in 2016 monitored concentrations in the study area are below the air quality objectives in 2016. Defra Background maps show that background concentrations away from the busy roads are well below the air quality objectives. Appendix A provides a summary of local monitoring data.

Defra's Pollution Climate Mapping (PCM) is used to report UK compliance with the Air Quality Directive. The current published version of the PCM model is developed using a base year of 2015. Considering the current version, and based on the concentrations reported for 2018, there are no modelled links exceeding $40\mu\text{g}/\text{m}^3$ within 20km of the scheme.

There are 2142 receptors within 200 metres of Illustrative Comparator b.

The Scheme is likely to reduce congestion along Madingley Road and therefore has the potential to improve air quality.

The option includes a new road alignment through an area with no existing roads. This would result in a deterioration in air quality for properties within 200m of this new route alignment that were previously unaffected by road emission sources. The off-road bus route is not expected to have a significant air quality effect as there are minimal properties located within 200 metres of the alignment and the bus way would be used by buses only, which would operate a low frequency, and would meet Euro VI standards. Given the

existing background concentrations away from main roads there would be no exceedances of the air quality objectives.

The Scheme may lead to an improvement in air quality in the AQMA due to a model shift through the provision of increased bus capacity and reducing the number of private vehicles in the AQMA.

Therefore, all changes in air quality are predicted to be small and considering the small number of receptors within 200 meters would not significantly affect the Net Present Value if a full WebTag assessment based on traffic data was to be undertaken.

The increase size of this option has the potential to lead to greater improvements in air quality as more receptors have the potential to be affected along existing roads.

1.8 Conclusion

Defra background concentrations and local authority monitoring data available from CCC and SCDC indicate that there are no air quality objectives being exceeded along the Scheme options. There is one PCM link that overlaps with the scheme, this is Madingley Road (A1303), the link has a concentration of $28.7\mu\text{g}/\text{m}^3$ in 2018 which is well below the EU Limit Value. It is considered unlikely that the scheme would result in exceedances of air quality objectives or limit values.

No detailed traffic information was available and as such no detailed quantitative assessment could be undertaken. The scheme is not expected to cause substantial changes to traffic flows on the surrounding road network and therefore changes in air quality as a result of the scheme are predicted to be small and not significantly affect the overall Net Present Value.

Scheme options Illustrative Comparator a and b affected the largest number of receptors, this is due to these options resulting in a larger scheme compared to the other options and therefore these options have the potential to lead to the greatest improvements in air quality.

A. Appendix A

A.1 Baseline Conditions

A.1.1 Overview

Information on air quality within the UK is available from a variety of sources including Local Authorities, national network monitoring sites and other published sources. The primary sources of data examined in this assessment are from Cambridge City Council (CCC), South Cambridgeshire District Council (SCDC) and Defra.

A.1.2 Local Authority Review and Assessment

SCDC has one AQMA declared within the borough, this is declared on sections of the A14 to the north west of Cambridge City Centre and was declared in 2008 for exceedances of the Nitrogen Dioxide (NO_2) Annual Mean and Particulate Matter (PM_{10}) 24-Hour Mean.

CCC has one AQMA declared, this is the Cambridge AQMA that encompasses the entirety of the City Centre. This area was designated an AQMA in 2004 for exceedances of the NO_2 annual mean. The Low Cost A and B options enter into this AQMA on Madingley Road (A1303). The Do Something 1a and 1b Illustrative Comparator a and b off-road options end on Grange Road, which is the start of this AQMA designation that then covers all of Cambridge City Centre.

A.1.3 Local Authority Automatic Monitoring

A.1.3.1 Overview

CCC undertakes automatic monitoring for NO₂ and PM₁₀ at five locations within the borough, these sites are all located within the city centre and are not considered representative of the proposed scheme option site conditions.

SCDC undertakes automatic monitoring at three sites within the district. One of these sites is Girton roadside monitor that is located on Huntingdon Road (A1307), which is located approximately 1.3km north of the Low Cost A and B options on Madingley Road and monitors NO₂, PM₁₀ and PM_{2.5}. This site is considered broadly representative of the Low Cost A and B options baseline conditions as it is situated on a road with similar proximity to Cambridge City Centre. The results from this monitor are presented below. The remaining two SCDC automatic monitors are located on the A14 and at an urban background location set back from the A14, these are not considered representative of site conditions and are not considered further.

Figure 1 presents the locations of the monitoring sites discussed below.

A.1.3.2 Nitrogen Dioxide

The monitoring results from the Girton monitoring station shows that concentrations were well below the annual and 1-hour mean objective levels in 2014, 2015 and 2016. The automatic monitoring results are presented in Table 1.

Table 1: Automatic Monitoring Data for Annual Mean NO₂ Objective

Site Name	Site Classification	Within AQMA	National Grid Reference		Annual Mean NO ₂ Concentration (µg/m ³) (Values in brackets shows number of hours above 200 µg/m ³ in line with 1-hour mean objective)		
			X	Y	2014	2015	2016 ^(a)
Girton	Roadside	No	542676	260667	25 (0)	24 (0)	23 (0)

Source: South Cambridgeshire District Council Annual Status Report 2017.

Note: ^(a) Annual Data Capture for 2016 is 86%

Bold indicates an exceedance of NO₂ objective (Annual Mean: 40µg/m³; 1-Hour: 200µg/m³ not to be exceeded for more than 18 hours per year).

A.1.3.3 Particulate Matter (PM₁₀)

There were no exceedances of the PM₁₀ annual or 24-hour mean objectives in 2014 – 2016, concentrations at the Girton automatic monitoring station were well below the objective levels. The PM₁₀ concentrations are presented below in Table 2.

Table 2: Automatic Monitoring Data for Annual Mean PM₁₀ Objective

Site Name	Site Classification	Within AQMA	National Grid Reference		Annual Mean NO ₂ Concentration (µg/m ³) (Number of days above 50µg/m ³)		
			X	Y	2014	2015	2016 ^(a)
Girton	Roadside	No	542676	260667	16 (2)	11 (1)	17 (1)

Source: South Cambridgeshire District Council Annual Status Report 2017.

Note: ^(a) Annual Data Capture for 2016 is 86%

Bold indicates an exceedance of the PM₁₀ objective (Annual Mean: 40µg/m³; 24-Hour Mean: 50µg/m³ not to be exceeded for more than 35 days per year)

A.1.3.4 Particulate Matter (PM_{2.5})

There were no exceedances of the PM_{2.5} annual mean objective in 2014 – 2016. The PM₁₀ concentrations are presented below in Table 3.

Table 3: Automatic Monitoring Data for Annual Mean PM_{2.5} Objective

Site Name	Site Classification	Within AQMA	National Grid Reference		Annual Mean NO ₂ Concentration (µg/m ³)		
			X	Y	2014	2015	2016 ^(a)
Girton	Roadside	No	542676	260667	12	11	13

Source: South Cambridgeshire District Council Annual Status Report 2017.

Note: ^(a) Annual Data Capture for 2016 is 81%

Bold indicates an exceedance of the annual mean PM_{2.5} objective (Annual Mean: 25µg/m³).

A.1.4 Local Authority Diffusion Tube Monitoring

SCDC undertakes diffusion tube monitoring at 27 sites within the district. There are no diffusion tubes within this local authority located within 2km of the proposed scheme options and these are not considered further.

CCC undertake diffusion tube monitoring at 64 sites within the district. There is one site that is located on Madingley Road along the Low Cost A and B route alignment, this is site DT22. There are also two diffusion tubes located on Huntingdon Road (A1307) approximately 800m north of the Low Cost A and B route alignments, these are sites DT19 and DT23 and are considered broadly representative of site conditions.

CCC diffusion tube DT25 is located on Barton Road, this is on the edge of the Cambridge AQMA close to Grange Road where Scheme options Do Something Option 1a and 1b and Illustrative Comparator a and b conclude and enter the AQMA. It is considered that this tube is broadly representative of the area of these Scheme options that would experience the highest NO₂ concentrations. These tubes are presented below in Table 4.

In 2016 concentrations at all the diffusion tube sites were below the NO₂ annual mean objective. The Madingley Road site that is located on the route alignment of the Low Cost A and B scheme options was in exceedance of the annual mean in 2014. The concentration was 37µg/m³ in 2016.

Table 4: Diffusion Tube Monitoring Data for NO₂

Site Name	Site Classification	Data Capture 2016 (%)	Within AQMA	National Grid Reference		Annual Mean NO ₂ Concentration (µg/m ³)		
				X	Y	2014	2015	2016
DT19 – Huntingdon Road 2	Roadside	100	No	543101	260344	23	27	23
DT22 – Madingley Road	Kerbside	83	No	543784	259093	40	38	37
DT23 – Huntingdon Road 1	Roadside	92	No	543761	259813	25	24	23
DT24 – Barton Road	Roadside	100	No	544100	257473	20	22	22

Source: Cambridge City Council Annual Status Report 2017.

Note: ^(a) All results have been bias adjusted

A.1.5 Defra Projected Background Concentrations

Defra provides estimates of background pollution concentrations for NO_x, NO₂, PM₁₀ and PM_{2.5} across the UK for each one kilometre grid square for every year from 2015 to 2030. Future year projections have been developed from the base year of the background maps, which is currently 2015. The maps include a breakdown of background concentrations by emission source, including road and industrial sources which have been calibrated against 2015 UK monitoring data.

The highest background concentrations for the 1km grid squares that contain the proposed scheme in 2018 are presented in Table 5 below. The data shows background concentrations are all below the relevant objectives. The off road scheme options have lower maximum NO_x and NO₂ concentrations in comparison to the low cost on road Options 1 and 2.

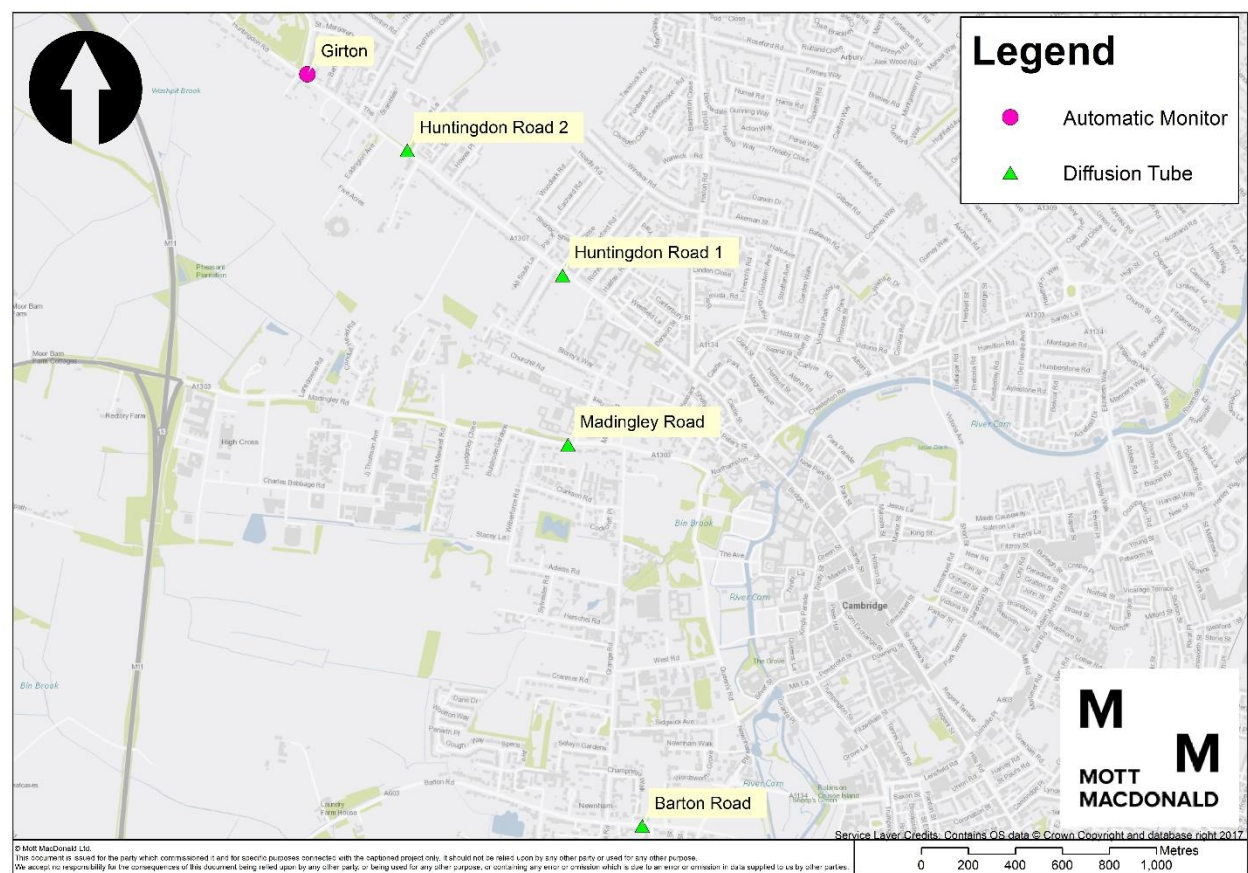
Table 5: Defra projected background concentrations of NO_x, NO₂, PM₁₀ and PM_{2.5} for proposed development site in 2017 (µg/m³)

Scheme Option	2018 Defra Background			
	NO _x	NO ₂	PM ₁₀	PM _{2.5}
Low Cost a – Completion of preferred on-road + Park & Ride (P&R) at Waterworks	20.0	14.5	15.1	9.8
Low Cost b – Completion of preferred on-road + P&R at Scotland Farm	20.0	14.5	15.1	9.8
Do Something 1a – Preferred off-road + P&R at Water works	15.1	11.3	15.2	9.9
Do Something 1b – Preferred off-road + P&R at Scotland Farm	15.1	11.3	15.2	9.9
Illustrative Comparator a – Preferred off-road Phase 1 and 2 + P&R at Water works	15.1	11.3	15.2	9.9
Illustrative Comparator b – Preferred off-road Phase 1 and 2 + P&R at Scotland Farm	15.1	11.3	15.2	9.9

Source: <https://uk-air.defra.gov.uk/data/laqm-background-maps>

Note: Low Cost A and B background squares: 544500, 259500 and 542500, 259500. Do-something 1a and 1b and Illustrative Comparator a and b background squares: 541500, 248500 and 542500, 258500.

Figure 1: Locations of relevant monitoring sites



Project: Cambourne to Cambridge

Our reference: 392438P2

Your reference:

Prepared by: S. Oliver

Date: July 2019

Approved by: C. Mills

Checked by: C. Mills

Subject: Air Quality – OAR3 Input

1 Air Quality

This section provides a semi-quantitative air quality assessment of the six options for Phase 2 of the Cambourne to Cambridge Busway. At the time of assessment detailed traffic information was not available, as such it was not feasible to undertake an assessment based on the air quality methodology set out in WebTAG Unit A3. Nevertheless, a semi-quantitative assessment of the following options has been undertaken to feed into the OAR3 appraisal:

- Option 1a – Off-road segregated route - A new public transport route adjacent to the A428 and St Neots Road. The route would be entirely off-road with minimal interaction with general traffic, except at junctions and will be linked with the proposed Waterworks Park and Ride
- Option 1b - Off-road segregated route - A new public transport route adjacent to the A428 and St Neots Road. The route would be entirely off-road with minimal interaction with general traffic, except at junctions and will be linked with the proposed Scotland Farm Park and Ride
- Option 2a – On-road route with junction improvements (low cost alternative) - Public transport vehicles would use the existing St Neots Road along with general traffic east of the Bourn roundabout. There would be basic junction improvements and it would be linked with the proposed Waterworks Park and Ride
- Option 2b - On-road route with junction improvements (low cost alternative) - Public transport vehicles would use the existing St Neots Road along with general traffic east of the Bourn roundabout. There would be basic junction improvements and it would be linked with the proposed Scotland Farm Park and Ride
- Option 3a – On-road route with public transport priority lanes - Public transport vehicles would run on-road along the St Neots Road in priority lanes running in both directions and would be linked with the proposed Waterworks Park and Ride
- Option 3b - On-road route with public transport priority lanes - Public transport vehicles would run on-road along the St Neots Road in priority lanes running in both directions and would be linked with the proposed Scotland Farm Park and Ride

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1.1 Baseline conditions

1.1.1 Overview

Information on air quality within the UK is available from a variety of sources including Local authorities, national network monitoring sites and other published sources. The primary sources of data examined in this assessment are from Cambridge City Council (CCC), South Cambridgeshire District Council (SCDC) and Defra.

1.1.2 Local authority review and assessment

SCDC has one air quality management area (AQMA) declared within the borough, this is declared on sections of the A14 to the north west of Cambridge city centre and was declared in 2008 for exceedances of the nitrogen dioxide (NO₂) annual mean and particulate matter (PM₁₀) 24-hour mean. This AQMA is approximately 2.6km north east of all three scheme options.

CCC has one AQMA declared, this is the Cambridge AQMA that encompasses the entirety of the city centre. This area was designated an AQMA in 2004 for exceedances of the NO₂ annual mean. This AQMA is located approximately 5.2km east of all three scheme options.

1.1.3 Local authority automatic monitoring

1.1.3.1 Overview

CCC undertakes automatic monitoring for NO₂ and PM₁₀ at five locations within the borough, these sites are all located within the city centre and are not considered representative of existing air quality close to the three scheme options.

SCDC undertakes automatic monitoring at three sites within the district. One of these sites is the Girton roadside monitor that is located on Huntingdon road (A1307), which is located approximately 3.9km north east of all three options, this site monitors NO₂, PM₁₀ and PM_{2.5}. This site is considered broadly representative of the baseline conditions for along St Neots Road. The results from this monitor are presented below. The remaining two SCDC automatic monitors are classified as a roadside location adjacent to the A14 and at an urban background location set back from the A14, these are not considered representative of baseline conditions for the scheme options and are not considered further.

1.1.3.2 Nitrogen dioxide

The monitoring results from the Girton monitoring station shows that NO₂ concentrations were well below the annual and 1-hour mean objectives in 2015, 2016 and 2017.

Table 1: Automatic monitoring data for annual mean and 1-hour NO₂ objectives

Site name	Site classification	Within AQMA	National grid reference		NO ₂ concentration (µg/m ³)		
			X	Y	2015	2016	2017 ^(a)
Girton	Roadside	No	542676	260667	24 (0)	23 (0)	23 (0)

Source: South Cambridgeshire District Council Annual Status Report 2018.

Note: ^(a) Annual Data Capture for 2017 is 95%

Bold indicates an exceedance of NO₂ objective (Annual Mean: 40µg/m³; 1-Hour: 200µg/m³ not to be exceeded for more than 18 hours per year).

Values in brackets shows number of hours above 200 µg/m³ in line with 1-hour mean objective

1.1.3.3 Particulate matter (PM₁₀)

There were no exceedances of the PM₁₀ annual or 24-hour mean objectives in 2015 – 2017, concentrations at the Girton automatic monitoring station were below the objectives.

Table 2: Automatic monitoring data for annual mean PM₁₀ objective

Site name	Site classification	Within AQMA	National grid reference		Annual mean NO ₂ concentration (µg/m ³) (number of days above 50µg/m ³)		
			X	Y	2015	2016	2017 ^(a)
Girton	Roadside	No	542676	260667	11 (1)	17 (1)	17 (1)

Source: South Cambridgeshire District Council Annual Status Report 2018.

Note: ^(a) Annual Data Capture for 2016 is 94%

Bold indicates an exceedance of the PM₁₀ objective (Annual Mean: 40µg/m³; 24-Hour Mean: 50µg/m³ not to be exceeded for more than 35 days per year)

1.1.3.4 Particulate matter (PM_{2.5})

There were no exceedances of the PM_{2.5} annual mean objective in 2015 – 2017, concentrations at the Girton automatic monitoring station were below the objectives.

Table 3: Automatic monitoring data for annual mean PM_{2.5} objective

Site name	Site classification	Within AQMA	National grid reference		Annual mean PM _{2.5} concentration (µg/m ³)		
			X	Y	2015	2016	2017 ^(a)
Girton	Roadside	No	542676	260667	11	13	11

Source: South Cambridgeshire District Council Annual Status Report 2018.

Note: ^(a) Annual Data Capture for 2016 is 94%

Bold indicates an exceedance of the annual mean PM_{2.5} objective (Annual Mean: 25µg/m³).

1.1.4 Local authority diffusion tube monitoring

SCDC undertakes diffusion tube monitoring at 27 sites within the district. There are no diffusion tubes located within 3km of the proposed scheme options. CCC undertook diffusion tube monitoring at 64 sites within the district in 2017, there were no diffusion tubes located within 4km of the proposed scheme options. None of these diffusion tubes are considered representative of site conditions and they are not considered further.

A NO₂ diffusion tube monitoring survey commenced in July 2019 in the immediate surroundings of the proposed scheme options. The results of this survey will be used to inform baseline conditions and will be incorporated to the schemes Environmental Statement.

1.1.5 Defra projected background concentrations

Defra provides estimates of background pollution concentrations for NO_x, NO₂, PM₁₀ and PM_{2.5} across the UK for each one kilometre grid square for every year from 2017 to 2030. Future year projections have been developed from the base year of the background maps, which is currently 2017. The maps include a breakdown of background concentrations by emission source, including road and industrial sources which have been calibrated against 2017 UK monitoring data.

The highest background concentrations for the 1km grid squares that contain the scheme options in 2019 are presented in Table 4 below. The data shows background concentrations are all below the relevant

objectives. All three scheme options are in close proximity to each other, and due to the background data being available on a 1km grid square basis, all have the same background concentrations.

Table 4: Defra projected background concentrations of NO_x, NO₂, PM₁₀ and PM_{2.5} for proposed development site in 2019 (µg/m³)

Scheme Option	2019 Defra Background			
	NO _x	NO ₂	PM ₁₀	PM _{2.5}
Option 1 – Off-road segregated route	11.6	8.7	16.4	9.8
Option 2 – On-road with junction improvements (low cost alternative)	11.6	8.7	16.4	9.8
Option 3 – On-road with public transport priority lanes	11.6	8.7	16.4	9.8

Source: <https://uk-air.defra.gov.uk/data/laqm-background-maps>

Note: All 3 options background squares: 532500, 259500 and 533500, 259500.

1.1.6 EU limit value compliance

Defra's Pollution Climate Mapping (PCM) model is used to report UK compliance with the Air Quality Directive. The current published version of the PCM model is developed using a base year of 2017. Considering the current version, and based on the concentrations reported for 2019, there are no modelled links with the PCM model exceeding 40µg/m³ within 20km of the scheme.

The nearest PCM model link to all three scheme options is located approximately 3.9km east of all options, this link is a section of Madingley Road (A1303). The NO₂ concentrations on the road for 2019 is 21.8µg/m³, which is well below the limit value. There are a number of PCM links within Cambridge City Centre, they are all well below the air quality limit value in 2019. As all PCM links in the area are below the limit values it is unlikely that any of the scheme options would cause a non-compliance with the Air Quality Directive.

1.1.7 summary

Considering the baseline review, the existing pollutant concentrations along the proposed scheme options are likely to all be below the relevant air quality objectives and EU limit values. All the scheme options are located in the same area and the effects from the scheme in traffic are also predicted to be similar and therefore the baseline for each of the options would not change.

1.2 Qualitative assessment of likely effects

1.2.1 Potential traffic changes

Detailed traffic information has not been produced for the OAR3 appraisal as it is not considered proportionate to produce the data for detailed assessments as there would be minimal differences between each of the scheme options. Nevertheless, this semi-quantitative appraisal has considered the likely changes in traffic the scheme options would result in.

The scheme options encompass the provision of a link from the west of Madingley Mulch roundabout to Bourn Airfield, and on to Cambourne and a new park and ride facility. It is not expected that these changes would alter traffic flows to lead to a significant air quality effect. Currently all three of the scheme options would have a busway with a flow of approximately six buses per hour.

The new busways and park and ride would increase the number of buses operating on local roads, but this would only likely be a small compared to existing traffic flows. In addition, the provision of the busway and park and ride is aimed at promoting a modal shift which would reduce traffic flows along the A428.

All three of the options would be expected to result in similar levels of change to traffic numbers on the local road network.

1.2.2 Receptors

A receptor count has been undertaken for each of the scheme options to identify the number of properties that could potentially be affected. The number of receptors within 200m of each of the scheme options are presented below in Table 5 and shows that the receptor numbers are broadly the same. These receptors have the potential to experience a benefit in air quality as well as a deterioration, but considering the similarities in the scheme options and the likely traffic effects the changes would be broadly similar.

Table 5: Scheme option receptor counts

Scheme Option	Receptors Within 200m
Option 1a – Off-road segregated route with Waterworks Park and Ride	1,707
Option 1b – Off-road segregated route with Scotland Farm Park and Ride	1,718
Option 2a – On-road with junction improvements (low cost alternative) Waterworks Park and Ride	1,777
Option 2b – On-road with junction improvements (low cost alternative) Scotland Farm Park and Ride	1,788
Option 3a – On-road with public transport priority lanes Waterworks Park and Ride	1,792
Option 3b – On-road with public transport priority lanes Scotland Farm Park and Ride	1,803

All scheme options follow the same route west of Wellington Way, this is the section of the scheme that is in closest proximity to the highest number of receptors in Cambourne. Traffic changes for each of the scheme options are likely to be similar, and therefore changes in air quality at these receptors would be consistent. The changes in traffic would likely lead to a small deterioration in air quality in this area as there would be additional emissions from the buses. However, due to the frequency of the bus movements any changes are expected to be de minimis, would not cause significant changes in concentrations, and would not significantly alter the net present value of the scheme.

Option one, the off-road segregated route affects slightly fewer receptors than the on-road options due to the section that would be located north of St Neots Road, and therefore fewer receptors are affected in the Hardwick and Highfields Court areas. Receptors to the south of St Neots Road may experience a slight reduction in air quality with options two and three in comparison to option one, due to the buses operating in closer proximity to them on St Neots Road, rather than north of St Neots Road as in option one. However, considering the number of buses using the busway and the distances to the receptors any air quality deteriorations may be off-set by an overall reduction in traffic due to a model shift. Any of these changes would be de minimis and not create a significant change in air quality.

It is likely that all three scheme options would contribute to an improvement in air quality along the A428 and within CCC through the promotion of modal shift and reduction of cars within the city.

The choice of Scotland Farm Park and Ride slightly increases the number of receptors affected compared to the Waterworks Park and Ride for each of the route options and these receptors would likely receive a small deterioration in air quality as a result of the increased traffic accessing the site which is within 200m of the receptors along Scotland Road. Nevertheless, the changes at these properties would be small, would not result in significant effects and would not have a material benefit on the net present value.

1.3 Conclusion

Defra background concentrations and local authority monitoring data available from CCC and SCDC indicate that there are no air quality objectives being exceeded along or close to the scheme options. There are no PCM model links that overlap with the scheme options, and the closest link on Madingley Road (A1303) 3.9km east of the scheme options has a concentration of $21.8\mu\text{g}/\text{m}^3$ in 2019 which is well below the EU limit value. It is considered unlikely that the scheme would result in exceedances of air quality objectives or limit values.

At the time of assessment, no detailed traffic information was produced as it is considered not proportionate to produce the traffic information due to the minimal changes between options and as such no detailed quantitative assessment was undertaken. The scheme is not expected to cause substantial changes to traffic flows on the surrounding road network. Options two and three would result in small increases in bus numbers on St Neots road in comparison in Option one, this is due to Option one being mainly off route. These small increases in bus numbers could be offset by the expected reduction in car numbers on the A428 and local road network expected resulting from a shift towards public transport resulting from the works.

A receptor count was undertaken to demonstrate the number of properties affected by the scheme options. The scheme options are very similar, and the variance in the number of receptors affected by the different options is minimal. All three scheme options follow the same route west of Wellington Way, resulting in no difference between the options in the number of receptors affected in the area of the highest population density on the route. Overall, the changes in air quality from any of the scheme options is judged to be de minimis and therefore changes on the net present value would not be significant compared to the other elements of the appraisal. As such air quality should not form part of the decision making process for the scheme options.

D. Biodiversity

TAG Biodiversity Impacts Worksheet

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Madingley Wood Site of Special Scientific Interest (SSSI)	SSSI reason for designation: An example of the ash-maple woodland type characteristic of the chalky boulder clay of eastern England. The western sector of the wood is of ancient origin whilst the eastern half is relatively recent, thus providing valuable opportunities for study.	National	High - SSSI	Favourable (100%)	High	Do minimum - Neutral Low cost A - Intermediate negative Low cost B - Intermediate Negative Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral	Do minimum - Neutral Low cost A - Large Adverse Low cost B - Large Adverse Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral
Coton Orchard	Orchard is comprised of broad leaved plantation woodland crossed by species poor intact hedge. Ephemeral/short perennial and scattered scrub are located within the central portion. Traditional Orchard habitat is UKBAP habitat or Habitat of Principal Importance.	Local	High - UK BAP priority habitat, likelihood of multiple protected species although not surveyed so not included in assessment.	N/A	Medium - undesignated site with BAP Priority habitat/species	Do minimum - Neutral Low cost A - N/A Low cost B - N/A Do Something 1a - Intermediate negative Do Something 1b - Intermediate negative Illustrative comparator A - Intermediate negative Illustrative comparator B - Intermediate negative	Do minimum - Neutral Low cost A - N/A Low cost B - N/A Do Something 1a - Moderate adverse Do Something 1b - Moderate adverse Illustrative comparator A - Moderate adverse Illustrative comparator B - Moderate adverse
Waterworks site	Broadly arable land with waterworks site in the far north-west corner, bordering the roads. Brown Hare present - UK BAP species. Common Lizard - protected species, Cambridgeshire and Peterborough priority species. Areas of tall ruderal, Broad leaved semi-natural woodland, broad leaved plantation woodland and poor semi improved grassland. Around 13% of wooded area lost and 33% of grassed area - mitigation for lost woodland through landscape scheme should replace much of this.	Local	High - Protected and local BAP species, broad-leaved woodland is UK BAP habitat	N/A	Medium - Protected and local BAP species, broad-leaved woodland is UK BAP habitat	Do minimum - Neutral Low cost A - Major negative Low cost B - N/A Do Something 1a - Intermediate negative Do Something 1b - Intermediate negative Illustrative comparator A - Intermediate negative Illustrative comparator B - Intermediate negative	Do minimum - Neutral Low cost A - Major negative adverse Low cost B - N/A Do Something 1a - Moderate adverse Do Something 1b - Moderate adverse Illustrative comparator A - Moderate adverse Illustrative comparator B - Moderate adverse
Scrubland east of M11 - City & County Wildlife Site	Brown Hare present - BAP species. Badger. Designated a CWS because it supports populations of Nationally Scarce vascular plant species and a vascular plant species which is rare in the county. Minor loss of southern limit of the CWS - no major loss of habitat within the CWS, but construction disturbance and operational disturbance likely.	Regional	High - hedgerows are UKBAP habitat, protected species present.	N/A	Medium	Do minimum - Neutral Low cost A - N/A Low cost B - N/A Do Something 1a - Minor Negative Do Something 1b - Minor Negative Illustrative comparator A - Minor Negative Illustrative comparator B - Minor Negative	Do minimum - Neutral Low cost A - N/A Low cost B - N/A Do Something 1a - Slight Adverse Do Something 1b - Slight Adverse Illustrative comparator A - Slight Adverse Illustrative comparator B - Slight Adverse
Coton Country Park	This area is typically arable land with species poor hedge with trees.	Regional	Low	N/A	Low	Do minimum - Neutral Low cost A - N/A Low cost B - N/A Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral	Do minimum - Neutral Low cost A - N/A Low cost B - N/A Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral
West Cambridge development	The development comprises improved amenity grassland with some minor potential for temporary bat roosts (as noted in ES for masterplan application)	Local	Bats are Protected Species - route will not impact viability of roosts or feeding commuter routes in this developed area	N/A	Low	Do minimum - Neutral Low cost A - Neutral Low cost B - Neutral Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral	Do minimum - Neutral Low cost A - Neutral Low cost B - Neutral Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral

Grange Fields (including area called West Fields)	Arable fields, bordered by species poor hedge with trees. Eastern portion includes dense scrub and standing water, with amenity grassland (area used as CURUFC as training ground). Badger. Great Crested Newts.	Regional	Medium - Habitats of local importance and protected species	N/A	High - site hosts species (Great Crested Newt) not covered by Berne Convention but in schedules 1, 5 and 8 of Wildlife and Countryside Act 1981	Do minimum - Neutral Low cost A - N/A Low cost B - N/A Do Something 1a - Minor Negative Do Something 1b - Minor Negative Illustrative comparator A - Minor Negative Illustrative comparator B - Minor Negative	Do minimum - Neutral Low cost A - N/A Low cost B - N/A Do Something 1a - Slight adverse Do Something 1b - Slight adverse Illustrative comparator A - Slight adverse Illustrative comparator B - Slight adverse
Rugby Club access track	Amenity grassland bordered by trees.	Local	Low	N/A	Low	Do minimum - Neutral Low cost A - N/A Low cost B - N/A Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral	Do minimum - Neutral Low cost A - N/A Low cost B - N/A Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral
Scotland Farm	The site is arable land bordered by species poor intact hedges. Beyond the hedge is scrub scattered.	Local	Low	N/A	Negligible	Do minimum - Neutral Low cost A - N/A Low cost B - Minor negative Do Something 1a - N/A Do Something 1b - Minor negative Illustrative comparator A - N/A Illustrative comparator B - Minor negative	Do minimum - Neutral Low cost A - N/A Low cost B - Neutral Do Something 1a - N/A Do Something 1b - Neutral Illustrative comparator A - N/A Illustrative comparator B - Neutral
Rectory Farm	Area is defined by improved grassland and broad leaved plantation woodland. Badger are present in the area.	Local	Medium - Habitats of local importance	N/A	Low	Do minimum - N/A Low cost A - N/A Low cost B - N/A Do Something 1a - Minor Negative Do Something 1b - Minor Negative Illustrative comparator A - Minor Negative Illustrative comparator B - Minor Negative	Do minimum - N/A Low cost A - N/A Low cost B - N/A Do Something 1a - Slight adverse Do Something 1b - Slight adverse Illustrative comparator A - Slight adverse Illustrative comparator B - Slight adverse
Bin Brook City Wildlife Site	Supports breeding populations of a mammal species (water vole) protected by the Wildlife and Countryside Act 1981. Also qualifies for its group of at least 5 mature pollard willows in association with other semi-natural habitat. Kingfisher noted as using the area.	Regional	High - UK BAP habitat	N/A	Medium	Do minimum - Neutral Low cost A - Neutral Low cost B - Neutral Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral	Do minimum - Neutral Low cost A - Neutral Low cost B - Neutral Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral
Grassland	Semi-improved and improved grassland have been recorded within the surveyed area.	Local	Low	Semi-improved and improved grasslands are a widespread habitat in Cambridgeshire	Low	Do minimum - Neutral Low cost A - Minor Negative Low cost B - Minor Negative Do Something 1a - Minor negative Do Something 1b - Minor negative Illustrative comparator A - Minor negative Illustrative comparator B - Minor negative	Do minimum - Neutral Low cost A - Slight adverse Low cost B - Slight adverse Do Something 1a - Slight adverse Do Something 1b - Slight adverse Illustrative comparator A - Slight adverse Illustrative comparator B - Slight adverse
Broad leaved plantation woodland	A section of plantation woodland is present along Adams Road and large areas are present to the south of Rectory Farm.	Local	Low	Cambridgeshire is one of the least wooded areas in the UK., representing 3.6% .of the county land area (according to the LBAP).	Low	Do minimum - Neutral Low cost A - Minor Negative Low cost B - Minor Negative Do Something 1a - Intermediate negative Do Something 1b - Intermediate negative Illustrative comparator A - Intermediate negative Illustrative comparator B - Intermediate negative	Do minimum - Neutral Low cost A - Slight adverse Low cost B - Slight adverse Do Something 1a - Slight adverse Do Something 1b - Slight adverse Illustrative comparator A - Slight adverse Illustrative comparator B - Slight adverse

Broad leaved semi natural woodland	A small section of broad-leaved woodland is present north of the waterworks site.	Local	Low	Cambridgeshire is one of the least wooded areas in the UK., representing 3.6% .of the county land area (according to the LBAP).	Medium	Do minimum - Neutral Low cost A - Intermediate Negative Low cost B - Intermediate Negative Do Something 1a - Intermediate negative Do Something 1b - Intermediate negative Illustrative comparator A - Intermediate negative Illustrative comparator B - Intermediate negative	Do minimum - Neutral Low cost A - Large adverse Low cost B - Large adverse Do Something 1a - Moderate adverse Do Something 1b - Moderate adverse Illustrative comparator A - Moderate adverse Illustrative comparator B - Moderate adverse
Hedgerow	Hedgerows are present which would be impacted by the scheme.	County	Medium	LBAP states all hedgerow stock is important habitat due to post-war agricultural	Medium	Do minimum - Neutral Low cost A - Intermediate Negative Low cost B - Intermediate Negative Do Something 1a - Intermediate negative Do Something 1b - Intermediate negative Illustrative comparator A - Intermediate negative Illustrative comparator B - Intermediate negative	Do minimum - Neutral Low cost A - Large adverse Low cost B - Large adverse Do Something 1a - Moderate adverse Do Something 1b - Moderate adverse Illustrative comparator A - Moderate adverse Illustrative comparator B - Moderate adverse
Water bodies	Standing water is present along Adams Road.	County	Medium	LBAP states that there are few natural remaining ponds in Cambridgeshire.	Medium	Do minimum - Neutral Low cost A - Neutral Low cost B - Neutral Do Something 1a - Intermediate negative Do Something 1b - Intermediate negative Illustrative comparator A - Intermediate negative Illustrative comparator B - Intermediate negative	Do minimum - Neutral Low cost A - Neutral Low cost B - Neutral Do Something 1a - Moderate adverse Do Something 1b - Moderate adverse Illustrative comparator A - Moderate adverse Illustrative comparator B - Moderate adverse
Botanical Interest	Notable plant species have been recorded in the survey area	County	Medium - there are locations within the survey area that were considered to be of notable botanical interest and of county importance.	England Red Data book species are nationally rare or have experienced national population range contractions or population reductions.	Medium	Do minimum - Neutral Low cost A - Neutral Low cost B - Neutral Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral	Do minimum - Neutral Low cost A - Neutral Low cost B - Neutral Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral
Badger	Evidence of badgers has been recorded within the survey area. Badgers are protected under the Protection of Badgers Act 1992.	Regional	Low	Common and widespread.	Medium	Do minimum - Neutral Low cost A - Minor negative Low cost B - Minor negative Do Something 1a - Minor negative Do Something 1b - Minor negative Illustrative comparator A - Minor negative Illustrative comparator B - Minor negative	Do minimum - Neutral Low cost A - Slight adverse Low cost B - Slight adverse Do Something 1a - Slight adverse Do Something 1b - Slight adverse Illustrative comparator A - Slight adverse Illustrative comparator B - Slight aderse
Birds	Breeding bird assemblage including several Birds of Conservation Concern Red List or Amber list species; including dunnoek, song thrush, yellowhammer and reed bunting. All wild birds are protected under the Wildlife and Countryside Act 1981.	Up to county	Medium	Generally woodland and farmland bird trends are in decline in England.	Medium	Do minimum - Neutral Low cost A - Minor negative Low cost B - Minor negative Do Something 1a - Minor negative Do Something 1b - Minor negative Illustrative comparator A - Minor negative Illustrative comparator B - Minor negative	Do minimum - Neutral Low cost A - Slight adverse Low cost B - Slight adverse Do Something 1a - Slight adverse Do Something 1b - Slight adverse Illustrative comparator A - Slight adverse Illustrative comparator B - Slight aderse
Great crested newt	eDNA sample in 2017 was positive for GCN along Adams Road but negative in 2018. GCN were considered absent in 2018. GCN are protected under the Conservation of Habitats and Species Regulations 2017 and the Wildlife and Countryside Act 1981.	Up to county	Medium	Likely to have undergone steady decline and range contraction at the national level.	Medium	Do minimum - Neutral Low cost A - Neutral Low cost B - Neutral Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral	Do minimum - Neutral Low cost A - Neutral Low cost B - Neutral Do Something 1a - Neutral Do Something 1b - Neutral Illustrative comparator A - Neutral Illustrative comparator B - Neutral

Bats	Trees with high potential to support bat roosts have been recorded in close proximity to the scheme. Barbastelles are known in the area. All bat species are protected under the Conservation of Habitat and Species Regulations 2017 and the Wildlife and Countryside Act	National	High	Barbastelle are a nationally rare species.	High	Do minimum - Neutral Low cost A - minor negative Low cost B - minor negative Do Something 1a - minor negative Do Something 1b - minor negative Illustrative comparator A - minor negative Illustrative comparator B - minor negative	Do minimum - Neutral Low cost A - Slight adverse Low cost B - Slight adverse Do Something 1a - slight adverse Do Something 1b - slight adverse Illustrative comparator A - slight adverse Illustrative comparator B - slight adverse
Invertebrates	Areas of high invertebrate interest have been identified within the survey area.	National	High	Twenty species recorded were Red Data Book or equivalent and 134 were Nationally Scarce or equivalent. Four recorded species are Priority Species under Section 41 of the NERC Act 2006 but have no other status.	High	Do minimum - Neutral Low cost A - minor negative Low cost B - minor negative Do Something 1a - Minor negative Do Something 1b - Minor negative Illustrative comparator A - Minor negative Illustrative comparator B - Minor negative	Do minimum - Neutral Low cost A - Slight adverse Low cost B - Slight adverse Do Something 1a - Slight adverse Do Something 1b - Slight adverse Illustrative comparator A - Slight adverse Illustrative comparator B - Slight aderse
Reptiles	Grass snakes have been recorded in habitat adjacent to Adams Road. All native reptile species are protected under the Wildlife and Countryside Act 1981	Local	Low	Species of Principal Importance but widespread across Cambridgeshire. Common lizard are detailed in the LBAP.	Low	Do minimum - Neutral Low cost A - Neutral Low cost B - Neutral Do Something 1a - Minor negative Do Something 1b - Minor negative Illustrative comparator A - Minor negative Illustrative comparator B - Minor negative	Do minimum - Neutral Low cost A - Neutral Low cost B - Neutral Do Something 1a - Slight adverse Do Something 1b - Slight adverse Illustrative comparator A - Slight adverse Illustrative comparator B - Slight aderse
Other Species of Principal Importance including harvest mouse, common toad and hedgehog	Woodland and grassland (hedgehog), freshwater ponds (common toad), rough grassland (harvest mouse)	Up to county	Medium	Species of Principal Importance are recognised conservation priorities in England.	Medium	Do minimum - Neutral Low cost A - minor negative Low cost B - minor negative Do Something 1a - Minor negative Do Something 1b - Minor negative Illustrative comparator A - Minor negative Illustrative comparator B - Minor negative	Do minimum - Neutral Low cost A - Slight adverse Low cost B - Slight adverse Do Something 1a - Slight adverse Do Something 1b - Slight adverse Illustrative comparator A - Slight adverse Illustrative comparator B - Slight aderse

Reference Sources

Phase 1 Habitat Survey of land associated with the catchment area for the potential transport infrastructure between Bourne Airfield and Grange Road, Cambridge , Cambridge Ecology, 2017
Protected Species Constraints Survey of land associated with the catchment area for a potential transport infrastructure between Bourne Airfield and Grange Road, Cambridge .Cambridge Ecology, 2017

Summary Assessment Score

Do minimum - Neutral Low Costs A - Major adverse Low Cost B - Major adverse Do Something 1a - Moderate adverse Do Something 1b - Moderate adverse Illustrative comparator A - Moderate adverse Illustrative comparator B - Moderate adverse

Qualitative Comments

The impacts have been assessed using the Department for Transport TAG Unit A3, Environmental Impact Appraisal guidance. The ecology reports from Cambridge Ecolgy have been used to inform the assessment of the proposed options against the habitats. The options have been assessed without the consideration of potential mitigation options.

TAG Biodiversity Impacts Worksheet - Phase 2 Option 1a (Waterworks Travel Hub and off road option)

Step 2		Step 3				Step 4		Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score	
Eversden and Wimpole Woods Special Area of Conservation (SAC) and Special Scientific Interest (SSSI)	6.5km to south. A colony of barbastelle associated with the trees in the woodland, used as summer maternity roosts.	International	High - Bats play an important role in many environments by aiding pollination and preying on insects. Some UK species are indicator species because changes to these populations can reflect changes to aspects of biodiversity.	The most recent assessment was in 2009. SSSI condition assessments classed Unit 3 (Eversden Wood) as unfavourable recovering and unit 4 (National Trust area - Wimpole) as favourable. Qualifying feature of the SAC - barbastelle bats are listed as near threatened on the IUCN Red List.	Very high	Minor negative - based on third party data, the barbastelle bats recorded within the airfield may be part of the larger population in the SAC. Changes to their foraging and commuting routes due to vegetation clearance may impact on this species. However, mitigation to be considered on impact - to ensure flight lines are maintained. Furthermore, no impacts on the habitat within the SAC.	Slight Adverse	
Madingley Wood SSSI	0.8km to the east. Madingley Wood is of special interest due to the ash-maple woodland type characteristic of the chalky boulder clay of eastern England. The western sector of the wood is of ancient origin whilst the eastern half is relatively recent, thus providing valuable opportunities for study.	National	High - The woodland holds standards of pedunculate oak, ash, field maple with old hazel and hawthorn dominating the shrub layer. The site is of particular educational and research value in view of its association with Cambridge University.	The most recent assessment was in 2012. This unit was assessed as favourable.	High	Neutral due to distance from option and mitigation during construction (general best practice during construction following CEMP)	Neutral	
Hardwick Wood SSSI	1.7km to south. Designated for broadleaved mixed and yew woodland.	National	High - The ancient core of the woodland is ash-field maple woodland containing oxlip and primrose, a woodland type which is nationally restricted in distribution to small part of Cambridgeshire, Suffolk and Essex.	The most recent assessment was in 2012. This unit was assessed as favourable.	High	Neutral due to distance from option.	Neutral	
Caldecote Meadows SSSI	1.6km to south. Designated for MG5 Cynosorus cristatus - Centaurea nigra grassland.	National	High - Meadows of this type were once widespread throughout Cambridgeshire but are now scarce in the county.	The most recent assessment was in 2012. Units 001, 002, 003, 004 were assessed as favourable.	High	Neutral due to distance from option.	Neutral	
Madingley Slip Road RSV CWS	35m to north, other side of A428. Supports frequent numbers of at least 6 strong calcareous grassland indicator species	County	Medium - no further information on the reasons designation.	No information was available to determine conservation status. Cambridgeshire County Council reported that habitats of special importance account for less than 7% of the county area.	Medium	Neutral due to mitigation during construction (general best practice during construction following CEMP) and no direct impacts on nearby site.	Neutral	
Bucket Hill Plantation Grassland CWS	0.9km to south. Supports frequent numbers of at least 3 strong neutral grassland indicator species and at least 8 neutral grassland indicator species.	County	Medium - no further information on the reasons designation.	No information was available to determine conservation status. Cambridgeshire County Council reported that habitats of special importance account for less than 7% of the county area.	Medium	Neutral due to distance from option.	Neutral	
Grassland	Semi-improved and improved grassland have been recorded within the surveyed area.	Local	Low	Semi-improved and improved grasslands are a widespread habitat in Cambridgeshire	Low	Minor negative - loss and fragmentation of grassland.	Slight adverse	
Broad leaved plantation woodland	This habitat is present to the south of the A428 and this route would affect approximately 1.5km of this habitat.	Local	Low	Cambridgeshire is one of the least wooded areas in the UK., representing 3.6% of the county land area (according to the LBAP).	Low	Intermediate negative - low value habitat but provides ecological network for protected species. Habitat would be lost.	Slight adverse	
Broad leaved semi natural woodland	This habitat is present within the water works park and ride option.	Local	Low	Cambridgeshire is one of the least wooded areas in the UK., representing 3.6% of the county land area (according to the LBAP).	Medium	Intermediate negative - provides ecological network for protected species. A proportion of the habitat would be lost and fragmentation is possible.	Moderate adverse	
Hedgerow	Hedgerows are present throughout this route which would be impacted by the scheme.	County	Medium - these were classified as intact and defunct with trees.	Native species-poor hedgerows are present within this phase of the C2C scheme, however LBAP states all hedgerow stock is important habitat due to post-war agricultural improvements.	Medium	Intermediate negative - hedgerow loss and severance along the route	Moderate adverse	
Water bodies	A number of water bodies are present adjacent to this option including Callow Brook.	County	Medium	LBAP states that there are few natural remaining ponds in Cambridgeshire.	Medium	Neutral - no direct impacts anticipated.	Neutral	
Botanical Interest	Notable plant species have been recorded adjacent to the Option.	County	Medium - there are locations within the survey area that were considered to be of notable botanical interest and of county importance.	England Red Data book species are nationally rare or have experienced national population range contractions or population reductions.	Medium	Minor negative - potential to impact on species of interest.	Slight adverse	
Badger	Setts confirmed on Bourn airfield. Badgers are protected under the Protection of Badgers Act 1992.	Regional	Low	Common and widespread.	Medium	Minor Negative Considered impacts: • Loss and severance vegetation • Vegetation clearance resulting in the disturbance or direct injury/death of badger • Noise, vibration and light (if night works) disturbance during construction and operation • Damage, or permanent exclusion from setts	Slight adverse	
Birds	Breeding bird assemblage including several Birds of Conservation Concern Red List or Amber list species; including dunmcock, song thrush, yellowhammer and reed bunting. All wild birds are protected under the Wildlife and Countryside Act 1981.	Up to county	Medium	Generally woodland and farmland bird trends are in decline in England.	Medium	Minor negative - loss and fragmentation of woodland, hedgerows will result in loss of suitable nesting and foraging habitats	Slight adverse	
Great crested newt	Most water bodies do not contain GCN, however water bodies within Bourn airfield have been confirmed as containing GCN. GCN are protected under the Conservation of Habitats and Species Regulations 2017 and the Wildlife and Countryside Act 1981.	Up to county	Medium	Likely to have undergone steady decline and range contraction at the national level.	Medium	Minor Negative Considered impacts: • Loss of terrestrial GCN habitat Vegetation clearance resulting in the disturbance or direct injury/death of GCN • Noise, vibration and light (if night works) disturbance	Slight Adverse	
Bats	Barbastelle have been confirmed as roosting within Bourn airfield. Bat flight lines have been recorded across route and detailed within third party data. Other bat species of SPI have been confirmed along this option. All bat species are protected under the Conservation of Habitat and Species Regulations 2017 and the Wildlife and Countryside Act 1981.	National	High	Barbastelle are a nationally rare species.	High	Minor Negative Considered impacts: • Fragmentation of foraging and commuting routes, due to vegetation clearance, lighting and noise disturbance • Loss of foraging habitat • Disturbance of bat roosts in trees	Slight Adverse	
Invertebrates	Areas of high invertebrate interest have been identified along the route.	National	High	Twenty species recorded were Red Data Book or equivalent and 134 were Nationally Scarce or equivalent. Four recorded species are Priority Species under Section 41 of the NERC Act 2006 but have no other status.	High	Minor negative - habitats may be lost that provide suitable habitats for such species.	Slight adverse	
Reptiles	Suitable habitat is present along the option. Grass snakes have been confirmed within Bourn airfield. A possible common lizard was observed at Waterworks park and ride option. All native reptile species are protected under the Wildlife and Countryside Act 1981.	Local	Low	Species of Principal Importance but widespread across Cambridgeshire. Common lizard are detailed in the LBAP.	Low	Minor negative	Slight adverse	
Other Species of Principal Importance including harvest mouse, common toad and hedgehog.	Woodland and grassland (hedgehog), freshwater ponds (common toad), rough grassland (harvest mouse)	Up to county	Medium	Species of Principal Importance are recognised conservation priorities in England.	Medium	Minor negative	Slight adverse	

Reference Sources

Ecology reports from Cambridge Ecology in 2018 and 2019, including Phase 1, GCN, winter birds, bat, breeding bird surveys.
Ecology reports relating to Bourn airfield, produced by Thomson Ecology.
Surveys and reporting are ongoing in 2019

Summary Assessment Score

Moderate adverse

Qualitative Comments

There would be an overall moderate adverse effect on biodiversity as a result of Option 1a. Large adverse effects are anticipated for Eversden and Wimpole Woods SAC SSSI due to the third party data provided on barbastelle bats. Barbastelle bats have been recorded within the ZOI and these may be a part of the larger population within the SAC, of which they are a qualifying feature. Waterworks park and ride site would cause the loss of tall rural, grassland, plantation which has high invertebrate interest, trees with high bat potential and reptile likely present. Waterworks park and ride also contains semi-natural broad-leaved woodland which would be lost as part of the development. Option 1a will result in a large area of plantation woodland being removed, with arable, scrub, grassland and hedgerows also lost. The impacts have been assessed using the Department for Transport TAG Unit A3, Environmental Impact Appraisal guidance. The proposed works, without appropriate mitigation, have the potential to adversely affect bats, reptiles, badgers, great crested newts, invertebrates and nesting birds through the loss, fragmentation and isolation of habitats.

TAG Biodiversity Impacts Worksheet - Phase 2 Option 1b (Scotland Farm Travel Hub - off road option)

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Eversden and Wimpole Woods Special Area of Conservation (SAC) and Special Scientific Interest (SSSI)	6.5km to south. A colony of barbastelle associated with the trees in the woodland, used as summer maternity roosts.	International	High - Bats play an important role in many environments by aiding pollination and preying on insects. Some UK species are indicator species because changes to these populations can reflect changes to aspects of biodiversity.	The most recent assessment was in 2009. SSSI condition assessments classed Unit 3 (Eversden Wood) as unfavourable recovering and unit 4 (National Trust area - Wimpole) as favourable. Qualifying feature of the SAC - barbastelle bats are listed as near threatened on the IUCN Red List.	Very high	Minor negative - based on third party data, the barbastelle bats recorded within the airfield may be part of the larger population in the SAC. Changes to their foraging and commuting routes due to vegetation clearance may impact on this species. However, mitigation to be considered on impact - to ensure flight lines are maintained. Furthermore, no habitat to be impacted within the SAC.	Slight Adverse
Madingley Wood SSSI	0.8km to the east. Madingley Wood is of special interest due to the ash-maple woodland type characteristic of the chalky boulder clay of eastern England. The western sector of the wood is of ancient origin whilst the eastern half is relatively recent, thus providing valuable opportunities for study.	National	High - The woodland holds standards of pedunculate oak, ash, field maple with old hazel and hawthorn dominating the shrub layer. The site is of particular educational and research value in view of its association with Cambridge University.	The most recent assessment was in 2012. This unit was assessed as favourable.	High	Neutral due to distance from option and mitigation during construction (general best practice during construction following CEMP)	Neutral
Hardwick Wood SSSI	1.7km to south. Designated for broadleaved mixed and yew woodland.	National	High - The ancient core of the woodland is ash-field maple woodland containing oxlip and primrose, a woodland type which is nationally restricted in distribution to small part of Cambridgeshire, Suffolk and Essex.	The most recent assessment was in 2012. This unit was assessed as favourable.	High	Neutral due to distance from option.	Neutral
Caldecote Meadows SSSI	1.6km to south. Designated for MG5 Cynosurus cristatus - Centaurea nigra grassland.	National	High - Meadows of this type were once widespread throughout Cambridgeshire but are now scarce in the county.	The most recent assessment was in 2012. Units 001, 002, 003, 004 were assessed as favourable.	High	Neutral due to distance from option.	Neutral
Madingley Slip Road RSV CWS	35m to north, other side of A428. Supports frequent numbers of at least 6 strong calcareous grassland indicator species	County	Medium - no further information on the reasons designation.	No information was available to determine conservation status. Cambridgeshire County Council reported that habitats of special importance account for less than 7% of the county area.	Medium	Neutral due to mitigation during construction (general best practice during construction following CEMP) and no direct impacts on nearby site.	Neutral
Bucket Hill Plantation Grassland CWS	0.9km to south. Supports frequent numbers of at least 3 strong neutral grassland indicator species and at least 8 neutral grassland indicator species.	County	Medium - no further information on the reasons designation.	No information was available to determine conservation status. Cambridgeshire County Council reported that habitats of special importance account for less than 7% of the county area.	Medium	Neutral due to distance from option.	Neutral
Grassland	Semi-improved and improved grassland have been recorded within the surveyed area.	Local	Low	Semi-improved and improved grasslands are a widespread habitat in Cambridgeshire	Low	Minor negative - loss and fragmentation of grassland.	Slight adverse
Broad leaved plantation woodland	This habitat is present to the south of the A428 and this route would affect approximately 1.5km of this habitat.	Local	Low	Cambridgeshire is one of the least wooded areas in the UK., representing 3.6% of the county land area (according to the LBAP).	Low	Intermediate negative - low value habitat but provides ecological network for protected species. Habitat would be lost.	Slight adverse
Hedgerow	Hedgerows are present throughout this route which would be impacted by the scheme.	County	Medium - these were classified as intact and defunct with trees.	Native species-poor hedgerows are present within this phase of the C2C scheme, however LBAP states all hedgerow stock is important habitat due to post-war agricultural improvements.	Medium	Intermediate negative - hedgerow loss and severance along the route	Moderate adverse
Water bodies	A number of water bodies are present adjacent to this option including Callow Brook.	County	Medium	LBAP states that there are few natural remaining ponds in Cambridgeshire.	Medium	Neutral - no direct impacts anticipated.	Neutral
Botanical Interest	Notable plant species have been recorded adjacent to the Option.	County	Medium - there are locations within the survey area that were considered to be of notable botanical interest and of county importance.	England Red Data book species are nationally rare or have experienced national population range contractions or population reductions.	Medium	Minor negative - potential to impact on species of interest.	Slight adverse
Badger	Setts confirmed on Bourn airfield. Badgers are protected under the Protection of Badgers Act 1992.	Regional	Low	Common and widespread.	Medium	Minor Negative Considered impacts: • Loss and severance vegetation • Vegetation clearance resulting in the disturbance or direct injury/death of badger • Noise, vibration and light (if night works) disturbance during construction and operation • Damage, or permanent exclusion from setts	Slight adverse
Birds	Breeding bird assemblage including several Birds of Conservation Concern Red List or Amber list species; including dunlock, song thrush, yellowhammer and reed bunting. All wild birds are protected under the Wildlife and Countryside Act 1981.	Up to county	Medium	Generally woodland and farmland bird trends are in decline in England.	Medium	Minor negative - loss and fragmentation of woodland, hedgerows will result in loss of suitable nesting and foraging habitats	Slight adverse
Great crested newt	Most water bodies do not contain GCN, however water bodies within Bourn airfield have been confirmed as containing GCN. GCN are protected under the Conservation of Habitats and Species Regulations 2017 and the Wildlife and Countryside Act 1981.	Up to county	Medium	Likely to have undergone steady decline and range contraction at the national level.	Medium	Minor Negative Considered impacts: • Loss of terrestrial GCN habitat Vegetation clearance resulting in the disturbance or direct injury/death of GCN • Noise, vibration and light (if night works) disturbance	Slight Adverse
Bats	Barbastelle have been confirmed as roosting within Bourn airfield. Bat flight lines across route have been suggested from third party data. Other bat species of SPI have been confirmed along this option. All bat species are protected under the Conservation of Habitat and Species Regulations 2017 and the Wildlife and Countryside Act 1981.	National	High	Barbastelle are a nationally rare species.	High	Minor Negative Considered impacts: • Fragmentation of foraging and commuting routes, due to vegetation clearance, lighting and noise disturbance • Loss of foraging habitat is minimal for on road option • Disturbance to bat roosts	Slight Adverse
Invertebrates	Areas of high invertebrate interest have been identified along the route.	National	High	Twenty species recorded were Red Data Book or equivalent and 134 were Nationally Scarce or equivalent. Four recorded species are Priority Species under Section 41 of the NERC Act 2006 but have no other status.	High	Minor negative - habitats may be lost that provide suitable habitats for such species.	Slight adverse
Reptiles	Suitable habitat is present along the option. Grass snakes have been confirmed within Bourn airfield. A possible common lizard was observed at Waterworks park and ride option. All native reptile species are protected under the Wildlife and Countryside Act 1981.	Local	Low	Species of Principal Importance but widespread across Cambridgeshire. Common lizard are detailed in the LBAP.	Low	Minor negative	Slight adverse
Other Species of Principal Importance including harvest mouse, common toad and hedgehog	Woodland and grassland (hedgehog), freshwater ponds (common toad), rough grassland (harvest mouse)	Up to county	Medium	Species of Principal Importance and recognised conservation priorities in England.	Medium	Minor negative	Slight adverse

Reference Sources

Ecology reports from Cambridge Ecology in 2018 and 2019, including Phase 1, GCN, winter birds, bat, breeding bird surveys.
Ecology reports relating to Bourn airfield, produced by Thomson Ecology.
Surveys and reporting are ongoing in 2019

Summary Assessment Score

Moderate adverse

Qualitative Comments

There would be an overall moderate adverse effect on biodiversity as a result of Option 1b. Large adverse effects are anticipated for Eversden and Wimpole Woods SAC SSSI due to the third party data provided on barbastelle bats. Barbastelle bats have been recorded within the ZOI and these may be a part of the larger population within the SAC, of which they are a qualifying feature. Option 1b will result in a large area of plantation woodland being removed, with arable, scrub, grassland and hedgerows also lost. Scotland Farm site for the park and ride site is on an arable site, which has not been accessed to survey. The impacts have been assessed using the Department for Transport TAG Unit A3, Environmental Impact Appraisal guidance. The proposed works, without appropriate mitigation, have the potential to adversely affect bats, reptiles, badgers, great crested newts, invertebrates and nesting birds through the loss, fragmentation and isolation of habitats.

TAG Biodiversity Impacts Worksheet - Phase 2 Option 2a (Waterworks travel hub and on road option)

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Eversden and Wimpole Woods Special Area of Conservation (SAC) and Special Scientific Interest (SSSI)	6.5km to south. A colony of barbastelle associated with the trees in the woodland, used as summer maternity roosts.	International	High - Bats play an important role in many environments by aiding pollination and preying on insects. Some UK species are indicator species because changes to these populations can reflect changes to aspects of biodiversity.	The most recent assessment was in 2009. SSSI condition assessments classed Unit 3 (Eversden Wood) as unfavourable recovering and unit 4 (National Trust area -Wimpole) as favourable. Qualifying feature of the SAC - barbastelle bats are listed as near threatened on the IUCN Red List.	Very high	Minor negative - based on third party data, the barbastelle bats recorded within the airfield may be part of the larger population in the SAC. Changes to their foraging and commuting routes due to vegetation clearance may impact on this species. However, mitigation to be considered on impact - to ensure flight lines are maintained. No loss of SAC habitat.	Slight Adverse
Madingley Wood SSSI	0.8km to the east. Madingley Wood is of special interest due to the ash-maple woodland type characteristic of the chalky boulder clay of eastern England. The western sector of the wood is of ancient origin whilst the eastern half is relatively recent, thus providing valuable opportunities for study.	National	High - The woodland holds standards of pedunculate oak, ash, field maple with old hazel and hawthorn dominating the shrub layer. The site is of particular educational and research value in view of its association with Cambridge University.	The most recent assessment was in 2012. This unit was assessed as favourable.	High	Neutral due to distance from option and mitigation during construction (general best practice during construction following CEMP)	Neutral
Hardwick Wood SSSI	1.7km to south. Designated for broadleaved mixed and yew woodland.	National	High - The ancient core of the woodland is ash-field maple woodland containing oxlip and primrose, a woodland type which is nationally restricted in distribution to small part of Cambridgeshire, Suffolk and Essex.	The most recent assessment was in 2012. This unit was assessed as favourable.	High	Neutral due to distance from option.	Neutral
Caldecote Meadows SSSI	1.6km to south. Designated for MGS Cynosurus cristatus - Centaurea nigra grassland.	National	High - Meadows of this type were once widespread throughout Cambridgeshire but are now scarce in the county.	The most recent assessment was in 2012. Units 001, 002, 003, 004 were assessed as favourable.	High	Neutral due to distance from option.	Neutral
Madingley Slip Road RSV CWS	35m to north, other side of A428. Supports frequent numbers of at least 6 strong calcareous grassland indicator species	County	Medium - no further information on the reasons designation.	No information was available to determine conservation status. Cambridgeshire County Council reported that habitats of special importance account for less than 7% of the county area.	Medium	Neutral due to mitigation during construction (general best practice during construction following CEMP) and no direct impacts on nearby site.	Neutral
Bucket Hill Plantation Grassland CWS	0.9km to south. Supports frequent numbers of at least 3 strong neutral grassland indicator species and at least 8 neutral grassland indicator species.	County	Medium - no further information on the reasons designation.	No information was available to determine conservation status. Cambridgeshire County Council reported that habitats of special importance account for less than 7% of the county area.	Medium	Neutral due to distance from option.	Neutral
Grassland	Semi-improved and improved grassland have been recorded within the surveyed area.	Local	Low	Semi-improved and improved grasslands are a widespread habitat in Cambridgeshire	Low	Minor negative - loss and fragmentation of grassland.	Slight adverse
Broad leaved semi natural woodland	This habitat is present within the water works park and ride option.	Local	Low	Cambridgeshire is one of the least wooded areas in the UK., representing 3.6% of the county land area (according to the LBAP).	Medium	Intermediate negative - provides ecological network for protected species. A proportion of the habitat would be lost and fragmentation is possible.	Moderate adverse
Hedgerow	Hedgerows are present throughout this route which would be impacted by the scheme.	County	Medium - these were classified as intact and defunct with trees.	Native species-poor hedgerows are present within this phase of the C2C scheme, however LBAP states all hedgerow stock is important habitat due to post-war agricultural improvements.	Medium	Minor negative - hedgerow loss and severance along the route is minimal with this option	Slight adverse
Water bodies	A number of water bodies are present adjacent to this option including Callow Brook.	County	Medium	LBAP states that there are few natural remaining ponds in Cambridgeshire.	Medium	Neutral - no direct impacts anticipated.	Neutral
Botanical Interest	Notable plant species have been recorded adjacent to the Option.	County	Medium - there are locations within the survey area that were considered to be of notable botanical interest and of county importance.	England Red Data book species are nationally rare or have experienced national population range contractions or population reductions.	Medium	Minor negative - potential to impact on species of interest.	Slight adverse
Badger	Setts confirmed on Bourn airfield. Badgers are protected under the Protection of Badgers Act 1992.	Regional	Low	Common and widespread.	Medium	Minor Negative Considered impacts: • Loss and severance vegetation • Vegetation clearance resulting in the disturbance or direct injury/death of badger • Noise, vibration and light (if night works) disturbance during construction and operation • Damage, or permanent exclusion from setts	Slight adverse
Birds	Breeding bird assemblage including several Birds of Conservation Concern Red List or Amber list species; including dunnock, song thrush, yellowhammer and reed bunting. All wild birds are protected under the Wildlife and Countryside Act 1981.	Up to county	Medium	Generally woodland and farmland bird trends are in decline in England.	Medium	Minor negative - loss and fragmentation of woodland, hedgerows will result in loss of suitable nesting and foraging habitats	Slight adverse
Great crested newt	Most water bodies do not contain GCN, however water bodies within Bourn airfield have been confirmed as containing GCN. GCN are protected under the Conservation of Habitats and Species Regulations 2017 and the Wildlife and Countryside Act 1981.	Up to county	Medium	Likely to have undergone steady decline and range contraction at the national level.	Medium	Minor Negative Considered impacts: • Loss of terrestrial GCN habitat • Vegetation clearance resulting in the disturbance or direct injury/death of GCN • Noise, vibration and light (if night works) disturbance	Slight Adverse
Bats	Barbastelle have been confirmed as roosting within Bourn airfield. Bat flight lines across route have been recorded by third party. Other bat species of SPI have been confirmed along this option. All bat species are protected under the Conservation of Habitat and Species Regulations 2017 and the Wildlife and Countryside Act 1981.	National	High	Barbastelle are a nationally rare species.	High	Minor Negative Considered impacts: • Lighting and noise disturbance • Loss of foraging habitat • Disturbance, damage to or loss of bat roosts in trees As option is on road, vegetation clearance is reduced, maintaining connectivity.	Slight Adverse

Invertebrates	Areas of high invertebrate interest have been identified along the route.	National	High	Twenty species recorded were Red Data Book or equivalent and 134 were Nationally Scarce or equivalent. Four recorded species are Priority Species under Section 41 of the NERC Act 2006 but have no other status.	High	Minor negative - habitats may be lost that provide suitable habitats for such species.	Slight adverse
Reptiles	Suitable habitat is present along the option. Grass snakes have been confirmed within Bourn airfield. A possible common lizard was observed at Waterworks park and ride option. All native reptile species are protected under the Wildlife and Countryside Act 1981.	Local	Low	Species of Principal Importance but widespread across Cambridgeshire. Common lizard are detailed in the LBAP.	Low	Minor negative	Slight adverse
Other Species of Principal Importance including harvest mouse, common toad and hedgehog	Woodland and grassland (hedgehog), freshwater ponds (common toad), rough grassland (harvest mouse)	Up to county	Medium	Species of Principal Importance are recognised conservation priorities in England.	Medium	Minor negative	Slight adverse

Reference Sources

Ecology reports from Cambridge Ecology in 2018 and 2019, including Phase 1, GCN, winter birds, bat, breeding bird surveys.
Ecology reports relating to Bourn airfield, produced by Thomson Ecology.
Surveys and reporting are ongoing in 2019

Summary Assessment Score

Moderate adverse

Qualitative Comments

There would be an overall moderate adverse effect on biodiversity as a result of Option 2a. Large adverse effects are anticipated for Eversden and Wimpole Woods SAC SSSI due to the third party data provided on barbastelle bats. Barbastelle bats have been recorded within the Zol and these may be a part of the larger population within the SAC, of which they are a qualifying feature. Option 2a is largely on-road, but would result in habitat loss of areas of grassland, arable and hedgerow. Waterworks park and ride site would cause the loss of tall ruderal, grassland, plantation which has high invertebrate interest, trees with high bat potential and reptile likely present. Waterworks park and ride also contains semi-natural broad-leaved woodland which would be lost as part of the development. The impacts have been assessed using the Department for Transport TAG Unit A3, Environmental Impact Appraisal guidance. The proposed works, without appropriate mitigation, have the potential to adversely affect bats, reptiles, badgers, great crested newts, invertebrates and nesting birds through the loss, fragmentation and isolation of habitats.

TAG Biodiversity Impacts Worksheet - Option 2b (Scotland Farm Travel Hub and on road option)

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Eversden and Wimpole Woods Special Area of Conservation (SAC) and Special Scientific Interest (SSSI)	6.5km to south. A colony of barbastelle associated with the trees in the woodland, used as summer maternity roosts.	International	High - Bats play an important role in many environments by aiding pollination and preying on insects. Some UK species are indicator species because changes to these populations can reflect changes to aspects of biodiversity.	The most recent assessment was in 2009. SSSI condition assessments classed Unit 3 (Eversden Wood) as unfavourable recovering and unit 4 (National Trust area -Wimpole) as favourable. Qualifying feature of the SAC - barbastelle bats are listed as near threatened on the IUCN Red List.	Very high	Minor negative - based on third party data, the barbastelle bats recorded within the airfield may be part of the larger population in the SAC. Changes to their foraging and commuting routes due to vegetation clearance may impact on this species. However, mitigation to be considered on impact - to ensure flight lines are maintained. No impacts on the habitat within the SAC.	Slight Adverse
Madingley Wood SSSI	0.8km to the east. Madingley Wood is of special interest due to the ash-maple woodland type characteristic of the chalky boulder clay of eastern England. The western sector of the wood is of ancient origin whilst the eastern half is relatively recent, thus providing valuable opportunities for study.	National	High - The woodland holds standards of pedunculate oak, ash, field maple with old hazel and hawthorn dominating the shrub layer. The site is of particular educational and research value in view of its association with Cambridge University.	The most recent assessment was in 2012. This unit was assessed as favourable.	High	Neutral due to distance from option and mitigation during construction (general best practice during construction following CEMP)	Neutral
Hardwick Wood SSSI	1.7km to south. Designated for broadleaved mixed and yew woodland.	National	High - The ancient core of the woodland is ash-field maple woodland containing oxlip and primrose, a woodland type which is nationally restricted in distribution to small part of Cambridgeshire, Suffolk and Essex.	The most recent assessment was in 2012. This unit was assessed as favourable.	High	Neutral due to distance from option.	Neutral
Caldecote Meadows SSSI	1.6km to south. Designated for MGS Cynosurus cristatus - Centaurea nigra grassland.	National	High - Meadows of this type were once widespread throughout Cambridgeshire but are now scarce in the county.	The most recent assessment was in 2012. Units 001, 002, 003, 004 were assessed as favourable	High	Neutral due to distance from option.	Neutral
Madingley Slip Road RSV CWS	35m to north, other side of A428. Supports frequent numbers of at least 6 strong calcareous grassland indicator species	County	Medium - no further information on the reasons designation.	No information was available to determine conservation status. Cambridgeshire County Council reported that habitats of special importance account for less than 7% of the county area.	Medium	Neutral due to mitigation during construction (general best practice during construction following CEMP) and no direct impacts on nearby site.	Neutral
Bucket Hill Plantation Grassland CWS	0.9km to south. Supports frequent numbers of at least 3 strong neutral grassland indicator species and at least 8 neutral grassland indicator species.	County	Medium - no further information on the reasons designation.	No information was available to determine conservation status. Cambridgeshire County Council reported that habitats of special importance account for less than 7% of the county area.	Medium	Neutral due to distance from option.	Neutral
Grassland	Semi-improved and improved grassland have been recorded within the surveyed area.	Local	Low	Semi-improved and improved grasslands are a widespread habitat in Cambridgeshire	Low	Minor negative - loss and fragmentation of grassland.	Slight Adverse
Hedgerow	Hedgerows are present throughout this route which would be impacted by the scheme.	County	Medium - these were classified as intact and defunct with trees.	Native species-poor hedgerows are present within this phase of the C2C scheme, however LBAP states all hedgerow stock is important habitat due to post-war agricultural improvements.	Medium	Minor negative - hedgerow loss and severance along the route is minimal with this option	Slight Adverse
Water bodies	A number of water bodies are present adjacent to this option including Calow Brook.	County	Medium	LBAP states that there are few natural remaining ponds in Cambridgeshire.	Medium	Neutral - no direct impacts anticipated.	Neutral
Botanical Interest	Notable plant species have been recorded adjacent to the Option.	County	Medium - there are locations within the survey area that were considered to be of notable botanical interest and of county importance.	England Red Data book species are nationally rare or have experienced national population range contractions or population reductions.	Medium	Minor negative - potential to impact on species of interest.	Slight Adverse
Badger	Setts confirmed on Bourn airfield. Badgers are protected under the Protection of Badgers Act 1992.	Regional	Low	Common and widespread.	Medium	Minor Negative Considered impacts: • Loss and severance vegetation • Vegetation clearance resulting in the disturbance or direct injury/death of badger • Noise, vibration and light (if night works) disturbance during construction and operation • Damage, or permanent exclusion from setts	Slight Adverse
Birds	Breeding bird assemblage including several Birds of Conservation Concern Red List or Amber list species; including dunmuck, song thrush, yellowhammer and reed bunting. All wild birds are protected under the Wildlife and Countryside Act 1981.	Up to county	Medium	Generally woodland and farmland bird trends are in decline in England.	Medium	Minor negative - loss and fragmentation of woodland, hedgerows will result in loss of suitable nesting and foraging habitats	Slight Adverse
Great crested newt	Most water bodies do not contain GCN, however water bodies within Bourn airfield have been confirmed as containing GCN. GCN are protected under the Conservation of Habitats and Species Regulations 2017 and the Wildlife and Countryside Act 1981.	Up to county	Medium	Likely to have undergone steady decline and range contraction at the national level.	Medium	Minor Negative Considered impacts: • Loss of terrestrial GCN habitat Vegetation clearance resulting in the disturbance or direct injury/death of GCN • Noise, vibration and light (if night works) disturbance	Slight Adverse
Bats	Barbastelle have been confirmed as roosting within Bourn airfield. Bat flight lines across route recorded by third party. Other bat species of SPI have been confirmed along this option. All bat species are protected under the Conservation of Habitat and Species Regulations 2017 and the Wildlife and Countryside Act 1981.	National	High	Barbastelle are a nationally rare species.	High	Minor Negative Considered impacts: • Lighting and noise disturbance • Loss of foraging habitat • Disturbance, damage to or loss of bat roosts in trees As option is on road, vegetation clearance is reduced, maintaining connectivity.	Slight Adverse

TAG Biodiversity Impacts Worksheet - Phase 2 Option 3a (Waterworks Travel Hub - bus lane option)

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Eversden and Wimpole Woods Special Area of Conservation (SAC) and Special Scientific Interest (SSSI)	6.5km to south. A colony of barbastelle associated with the trees in the woodland, used as summer maternity roosts.	International	High - Bats play an important role in many environments by aiding pollination and preying on insects. Some UK species are indicator species because changes to these populations can reflect changes to aspects of biodiversity.	The most recent assessment was in 2009. SSSI condition assessments classed Unit 3 (Eversden Wood) as unfavourable recovering and unit 4 (National Trust area - Wimpole) as favourable. Qualifying feature of the SAC - barbastelle bats are listed as near threatened on the IUCN Red List.	Very high	Minor negative - based on third party data, the barbastelle bats recorded within the airfield may be part of the larger population in the SAC. Changes to their foraging and commuting routes due to vegetation clearance may impact on this species. However, mitigation to be considered on impact - to ensure flight lines are maintained. No impacts on the SAC habitat.	Slight Adverse
Madingley Wood SSSI	0.8km to the east. Madingley Wood is of special interest due to the ash-maple woodland type characteristic of the chalky boulder clay of eastern England. The western sector of the wood is of ancient origin whilst the eastern half is relatively recent, thus providing valuable opportunities for study.	National	High - The woodland holds standards of pedunculate oak, ash, field maple with old hazel and hawthorn dominating the shrub layer. The site is of particular educational and research value in view of its association with Cambridge University.	The most recent assessment was in 2012. This unit was assessed as favourable.	High	Neutral due to distance from option and mitigation during construction (general best practice during construction following CEMP)	Neutral
Hardwick Wood SSSI	1.7km to south. Designated for broadleaved mixed and yew woodland.	National	High - The ancient core of the woodland is ash-field maple woodland containing oxlip and primrose, a woodland type which is nationally restricted in distribution to small part of Cambridgeshire, Suffolk and Essex.	The most recent assessment was in 2012. This unit was assessed as favourable.	High	Neutral due to distance from option.	Neutral
Caldecote Meadows SSSI	1.6km to south. Designated for MG5 Cynosurus cristatus - Centaurea nigra grassland.	National	High - Meadows of this type were once widespread throughout Cambridgeshire but are now scarce in the county.	The most recent assessment was in 2012. Units 001, 002, 003, 004 were assessed as favourable.	High	Neutral due to distance from option.	Neutral
Madingley Slip Road RSV CWS	35m to north, other side of A428. Supports frequent numbers of at least 6 strong calcareous grassland indicator species	County	Medium - no further information on the reasons designation.	No information was available to determine conservation status. Cambridgeshire County Council reported that habitats of special importance account for less than 7% of the county area.	Medium	Neutral due to mitigation during construction (general best practice during construction following CEMP) and no direct impacts on nearby site.	Neutral
Bucket Hill Plantation Grassland CWS	0.9km to south. Supports frequent numbers of at least 3 strong neutral grassland indicator species and at least 8 neutral grassland indicator species.	County	Medium - no further information on the reasons designation.	No information was available to determine conservation status. Cambridgeshire County Council reported that habitats of special importance account for less than 7% of the county area.	Medium	Neutral due to distance from option.	Neutral
Grassland	Semi-improved and improved grassland have been recorded within the surveyed area.	Local	Low	Semi-improved and improved grasslands are a widespread habitat in Cambridgeshire	Low	Minor negative - loss and fragmentation of grassland.	Slight adverse
Broad leaved plantation woodland	This habitat is present to the south of the A428 and this route would affect approximately 1.5km of this habitat.	Local	Low	Cambridgeshire is one of the least wooded areas in the UK., representing 3.6% .of the county land area (according to the LBAP).	Low	Intermediate negative - low value habitat but provides ecological network for protected species. Habitat would be lost.	Slight adverse
Broad leaved semi natural woodland	This habitat is present within the water works park and ride option.	Local	Low	Cambridgeshire is one of the least wooded areas in the UK., representing 3.6% .of the county land area (according to the LBAP).	Medium	Intermediate negative - provides ecological network for protected species. A proportion of the habitat would be lost and fragmentation is possible.	Moderate adverse
Hedgerow	Hedgerows are present throughout this route which would be impacted by the scheme.	County	Medium - these were classified as intact and defunct with trees.	Native species-poor hedgerows are present within this phase of the C2C scheme, however LBAP states all hedgerow stock is important habitat due to post-war agricultural improvements.	Medium	Intermediate negative - hedgerow loss and severance along the route	Moderate adverse
Water bodies	A number of water bodies are present adjacent to this option including Callow Brook.	County	Medium	LBAP states that there are few natural remaining ponds in Cambridgeshire.	Medium	Neutral - no direct impacts anticipated.	Neutral
Botanical Interest	Notable plant species have been recorded adjacent to the Option.	County	Medium - there are locations within the survey area that were considered to be of notable botanical interest and of county importance.	England Red Data book species are nationally rare or have experienced national population range contractions or population reductions.	Medium	Minor negative - potential to impact on species of interest.	Slight adverse
Badger	Setts confirmed on Bourn airfield. Badgers are protected under the Protection of Badgers Act 1992.	Regional	Low	Common and widespread.	Medium	Minor Negative Considered impacts: • Loss and severance vegetation • Vegetation clearance resulting in the disturbance or direct injury/death of badger • Noise, vibration and light (if night works) disturbance during construction and operation • Damage, or permanent exclusion from setts	Slight adverse

Birds	Breeding bird assemblage including several Birds of Conservation Concern Red List or Amber list species; including duncock, song thrush, yellowhammer and reed bunting. All wild birds are protected under the Wildlife and Countryside Act 1981.	Up to county	Medium	Generally woodland and farmland bird trends are in decline in England.	Medium	Minor negative - loss and fragmentation of woodland, hedgerows will result in loss of suitable nesting and foraging habitats	Slight adverse
Great crested newt	Most water bodies do not contain GCN, however water bodies within Bourn airfield have been confirmed as containing GCN. GCN are protected under the Conservation of Habitats and Species Regulations 2017 and the Wildlife and Countryside Act 1981.	Up to county	Medium	Likely to have undergone steady decline and range contraction at the national level.	Medium	Minor Negative Considered impacts: • Loss of terrestrial GCN habitat Vegetation clearance resulting in the disturbance or direct injury/death of GCN • Noise, vibration and light (if night works) disturbance	Slight Adverse
Bats	Barbastelle have been confirmed as roosting within Bourn airfield. Known bat flight lines across route. Other bat species of SPI have been confirmed along this option. All bat species are protected under the Conservation of Habitat and Species Regulations 2017 and the Wildlife and Countryside Act 1981.	National	High	Barbastelle are a nationally rare species.	High	Minor Negative Considered impacts: • Fragmentation of foraging and commuting routes, due to vegetation clearance, lighting and noise disturbance • Loss of foraging habitat • Disturbance, damage to or loss of bat roosts in trees On road so vegetation loss is expected to be reduced.	Slight Adverse
Invertebrates	Areas of high invertebrate interest have been identified along the route.	National	High	Twenty species recorded were Red Data Book or equivalent and 134 were Nationally Scarce or equivalent. Four recorded species are Priority Species under Section 41 of the NERC Act 2006 but have no other status.	High	Minor negative - habitats may be lost that provide suitable habitats for such species.	Slight adverse
Reptiles	Suitable habitat is present along the option. Grass snakes have been confirmed within Bourn airfield. A possible common lizard was observed at Waterworks park and ride option. All native reptile species are protected under the Wildlife and Countryside Act 1981.	Local	Low	Species of Principal Importance but widespread across Cambridgeshire. Common lizard are detailed in the LBAP.	Low	Minor negative	Slight adverse
Other Species of Principal Importance including harvest mouse, common toad and hedgehog	Woodland and grassland (hedgehog), freshwater ponds (common toad), rough grassland (harvest mouse)	Up to county	Medium	Species of Principal Importance are recognised conservation priorities in England.	Medium	Minor negative	Slight adverse

Reference Sources

Ecology reports from Cambridge Ecology in 2018 and 2019, including Phase 1, GCN, winter birds, bat, breeding bird surveys.
Ecology reports relating to Bourn airfield, produced by Thomson Ecology.
Surveys and reporting are ongoing in 2019

Summary Assessment Score

Moderate adverse

Qualitative Comments

There would be an overall moderate adverse effect on biodiversity as a result of Option 3a. Large adverse effects are anticipated for Eversden and Wimpole Woods SAC SSSI due to the third party data provided on barbastelle bats. Barbastelle bats have been recorded within the ZOI and these may be a part of the larger population within the SAC, of which they are a qualifying feature. Option 3a will result in habitat loss of plantation woodland, arable, grassland and hedgerows. Waterworks park and ride site would cause the loss of tall ruderal, grassland, plantation which has high invertebrate interest, trees with high bat potential and reptile likely present. Waterworks park and ride also contains semi-natural broad-leaved woodland which would be lost as part of the development. The impacts have been assessed using the Department for Transport TAG Unit A3, Environmental Impact Appraisal guidance. The proposed works, without appropriate mitigation, have the potential to adversely affect bats, reptiles, badgers, great crested newts, invertebrates and nesting birds through the loss, fragmentation and isolation of habitats.

TAG Biodiversity Impacts Worksheet - Phase 2 Option 3b (Scotland Farm Travel Hub and bus lane option)

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Eversden and Wimpole Woods Special Area of Conservation (SAC) and Special Scientific Interest (SSSI)	6.5km to south. A colony of barbastelle associated with the trees in the woodland, used as summer maternity roosts.	International	High - Bats play an important role in many environments by aiding pollination and preying on insects. Some UK species are indicator species because changes to these populations can reflect changes to aspects of biodiversity.	The most recent assessment was in 2009. SSSI condition assessments classed Unit 3 (Eversden Wood) as unfavourable recovering and unit 4 (National Trust area - Wimpole) as favourable. Qualifying feature of the SAC - barbastelle bats are listed as near threatened on the IUCN Red List.	Very high	Minor negative - based on third party data, the barbastelle bats recorded within the airfield may be part of the larger population in the SAC. Changes to their foraging and commuting routes due to vegetation clearance may impact on this species. However, mitigation to be considered on impact - to ensure flight lines are maintained. No loss of SAC habitat.	Slight Adverse
Madingley Wood SSSI	0.8km to the east. Madingley Wood is of special interest due to the ash-maple woodland type characteristic of the chalky boulder clay of eastern England. The western sector of the wood is of ancient origin whilst the eastern half is relatively recent, thus providing valuable opportunities for study.	National	High - The woodland holds standards of pedunculate oak, ash, field maple with old hazel and hawthorn dominating the shrub layer. The site is of particular educational and research value in view of its association with Cambridge University.	The most recent assessment was in 2012. This unit was assessed as favourable.	High	Neutral due to distance from option and mitigation during construction (general best practice during construction following CEMP)	Neutral
Hardwick Wood SSSI	1.7km to south. Designated for broadleaved mixed and yew woodland.	National	High - The ancient core of the woodland is ash-field maple woodland containing oxlip and primrose, a woodland type which is nationally restricted in distribution to small part of Cambridgeshire, Suffolk and	The most recent assessment was in 2012. This unit was assessed as favourable.	High	Neutral due to distance from option.	Neutral
Caldecote Meadows SSSI	1.6km to south. Designated for MG5 Cynosurus cristatus - Centaurea nigra grassland.	National	High - Meadows of this type were once widespread throughout Cambridgeshire but are now scarce in the county.	The most recent assessment was in 2012. Units 001, 002, 003, 004 were assessed as favourable.	High	Neutral due to distance from option.	Neutral
Madingley Slip Road RSV CWS	35m to north, other side of A428. Supports frequent numbers of at least 6 strong calcareous grassland indicator species	County	Medium - no further information on the reasons designation.	No information was available to determine conservation status. Cambridgeshire County Council reported that habitats of special importance account for less than 7% of the county area.	Medium	Neutral due to mitigation during construction (general best practice during construction following CEMP) and no direct impacts on nearby site.	Neutral
Bucket Hill Plantation Grassland CWS	0.9km to south. Supports frequent numbers of at least 3 strong neutral grassland indicator species and at least 8 neutral grassland indicator species.	County	Medium - no further information on the reasons designation.	No information was available to determine conservation status. Cambridgeshire County Council reported that habitats of special importance account for less than 7% of the county area.	Medium	Neutral due to distance from option.	Neutral
Grassland	Semi-improved and improved grassland have been recorded within the surveyed area.	Local	Low	Semi-improved and improved grasslands are a widespread habitat in Cambridgeshire	Low	Minor negative - loss and fragmentation of grassland.	Slight adverse
Broad leaved plantation woodland	This habitat is present to the south of the A428 and this route would affect approximately 1.5km of this habitat.	Local	Low	Cambridgeshire is one of the least wooded areas in the UK., representing 3.6% of the county land area (according to the LBAP).	Low	Intermediate negative - low value habitat but provides ecological network for protected species. Habitat would be lost.	Slight adverse
Hedgerow	Hedgerows are present throughout this route which would be impacted by the scheme.	County	Medium - these were classified as intact and defunct with trees.	Native species-poor hedgerows are present within this phase of the C2C scheme, however LBAP states all hedgerow stock is important habitat due to post-war agricultural improvements.	Medium	Intermediate negative - hedgerow loss and severance along the route	Moderate adverse
Water bodies	A number of water bodies are present adjacent to this option including Callow Brook.	County	Medium	LBAP states that there are few natural remaining ponds in Cambridgeshire.	Medium	Neutral - no direct impacts anticipated.	Neutral
Botanical Interest	Notable plant species have been recorded adjacent to the Option.	County	Medium - there are locations within the survey area that were considered to be of notable botanical interest and of county importance.	England Red Data book species are nationally rare or have experienced national population range contractions or population reductions.	Medium	Minor negative - potential to impact on species of interest.	Slight adverse
Badger	Setts confirmed on Bourn airfield. Badgers are protected under the Protection of Badgers Act 1992.	Regional	Low	Common and widespread.	Medium	Minor Negative Considered impacts: • Loss and severance vegetation • Vegetation clearance resulting in the disturbance or direct injury/death of badger • Noise, vibration and light (if night works) disturbance during construction and operation • Damage, or permanent exclusion from setts	Slight adverse
Birds	Breeding bird assemblage including several Birds of Conservation Concern Red List or Amber list species; including dunnoek, song thrush, yellowhammer and reed bunting. All wild birds are protected under the Wildlife and Countryside Act 1981.	Up to county	Medium	Generally woodland and farmland bird trends are in decline in England.	Medium	Minor negative - loss and fragmentation of woodland, hedgerows will result in loss of suitable nesting and foraging habitats	Slight adverse
Great crested newt	Most water bodies do not contain GCN, however water bodies within Bourn airfield have been confirmed as containing GCN. GCN are protected under the Conservation of Habitats and Species Regulations 2017 and the Wildlife and Countryside Act 1981.	Up to county	Medium	Likely to have undergone steady decline and range contraction at the national level.	Medium	Minor Negative Considered impacts: • Loss of terrestrial GCN habitat Vegetation clearance resulting in the disturbance or direct injury/death of GCN • Noise, vibration and light (if night works) disturbance	Slight Adverse

Bats	Barbastelle have been confirmed as roosting within Bourn airfield. Known bat flight lines across route. Other bat species of SPI have been confirmed along this option. All bat species are protected under the Conservation of Habitat and Species Regulations 2017 and the Wildlife and Countryside Act 1981.	National	High	Barbastelle are a nationally rare species.	High	Minor Negative Considered impacts: • Fragmentation of foraging and commuting routes, due to vegetation clearance, lighting and noise disturbance • Loss of foraging habitat • Disturbance, damage to or loss of bat roosts in trees On road so vegetation loss is expected to be minimal	Slight Adverse
Invertebrates	Areas of high invertebrate interest have been identified along the route.	National	High	Twenty species recorded were Red Data Book or equivalent and 134 were Nationally Scarce or equivalent. Four recorded species are Priority Species under Section 41 of the NERC Act 2006 but have no other status.	High	Minor negative - habitats may be lost that provide suitable habitats for such species.	Slight adverse
Reptiles	Suitable habitat is present along the option. Grass snakes have been confirmed within Bourn airfield. A possible common lizard was observed at Waterworks park and ride option. All native reptile species are protected under the Wildlife and Countryside Act 1981.	Local	Low	Species of Principal Importance but widespread across Cambridgeshire. Common lizard are detailed in the LBAP.	Low	Minor negative	Slight adverse
Other Species of Principal Importance including harvest mouse, common toad and hedgehog	Woodland and grassland (hedgehog), freshwater ponds (common toad), rough grassland (harvest mouse)	Up to county	Medium	Species of Principal Importance are recognised conservation priorities in England.	Medium	Minor negative	Slight adverse

Reference Sources

Ecology reports from Cambridge Ecology in 2018 and 2019, including Phase 1, GCN, winter birds, bat, breeding bird surveys.
Ecology reports relating to Bourn airfield, produced by Thomson Ecology.
Surveys and reporting are ongoing in 2019

Summary Assessment Score

Moderate adverse

Qualitative Comments

There would be an overall moderate adverse effect on biodiversity as a result of Option 3b. Large adverse effects are anticipated for Eversden and Wimpole Woods SAC SSSI due to the third party data provided on barbastelle bats. Barbastelle bats have been recorded within the ZOI and these may be a part of the larger population within the SAC, of which they are a qualifying feature. Option 3b will in habitat loss of plantation woodland, arable, grassland and hedgerows. Scotland Farm site for the park and ride site is on an arable site, which has not been accessed to survey. The impacts have been assessed using the Department for Transport TAG Unit A3, Environmental Impact Appraisal guidance. The proposed works, without appropriate mitigation, have the potential to adversely affect bats, reptiles, badgers, great crested newts, invertebrates and nesting birds through the loss, fragmentation and isolation of habitats.

E. Greenhouse Gases

Project:	Cambourne to Cambridge		
Our reference:	392438		
Prepared by:	R. Bhavsar	Date:	05/09/2019
Approved by:	A Greenwood	Checked by:	A. Winter
Subject:	Carbon – Environmental Appraisal Report (Phase 1)		

1 Qualitative Carbon Assessment

1.1 Overview

A semi-quantitative carbon assessment of the six options for the Cambourne to Cambridge Busway has been undertaken. At the time of assessment detailed traffic information was not available, as such it was not feasible to undertake an assessment based on the carbon methodology set out in WebTAG Unit A3.

The following options have been assessed:

- Low Cost A - Completion of preferred on-road + Park & Ride (P&R) at Waterworks
- Low Cost B - Completion of preferred on-road + P&R at Scotland Farm
- Do Something 1a - Preferred off-road + P&R at Waterworks
- Do Something 1b - Preferred off-road + P&R at Scotland Farm
- Illustrative Comparator a - Preferred off-road Phase 1 and 2 + P&R at Waterworks
- Illustrative Comparator b - Preferred off-road Phase 1 and 2 + P&R at Scotland Farm

1.2 Do Minimum – Committed Schemes

IMPORTANT NOTE: After production of the assessment below, the Do Minimum scheme was reduced to only be a cycleway / lane alongside Madingley Road from near the existing Madingley Road P&R site into the city – as such the carbon effects were judged to be neutral for operations.

The OAR2 report is based on the operational effects on carbon emissions only – not the Construction Impacts (which are not covered in WebTAG assessments).

Whilst the assessment below for operations is inconclusive in the absence of traffic information, the assumption in OAR2 is that the carbon impacts would be neutral to slight benefits due to improved traffic flow through improved journey reliability.

1.2.1 Construction

The do minimum scenario does include some construction works in the form of the committed schemes. These construction works will result in carbon emissions, from plant use on site, the transport of materials to site, and from emissions embodied in the materials. This option is expected to have the least amount of construction activities and as such is expected to result in fewest construction emissions.

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This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

1.2.2 Operation

The committed schemes in the do minimum scenario involve works to improve the flow of vehicles on the A428. The works to improve the flow of vehicles on the A428 has the potential to relieve congestion, which would be expected to reduce emissions. However, improved traffic flow on the A428 may also incentivise vehicle use resulting in an increase in emissions. Without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change due to some of the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions.

1.3 Low Cost A – Preferred on-road Phase 1, and Park and Ride at Water Works

1.3.1 Construction

The Low Cost A option includes construction of the park and ride facilities at the waterworks, and the construction of a new pedestrian / cycle bridge. These construction works will result in carbon emissions, from plant use on site, the transport of materials to site, and from emissions embodied in the materials.

Both of the Low Cost options are expected to have the second lowest amount of construction activities and as such are expected to result in the second lowest level of construction emissions.

1.3.2 Operation

During operation the new pedestrian / cycle bridge is not expected to impact upon emissions as it is being designed to replace an existing amenity. In scenario Low Cost A, buses will run on the existing road network, however there will be an additional lane on the M11 J13 roundabout, which will allow both lanes to turn right coming from the M11 northbound slip, and a section of St Neots Road between Long Road and Madingley Mulch Roundabout will be closed to general traffic.

The addition of buses to the existing road network has the potential to reduce the numbers of vehicle journeys on the road network due to modal shift, which would consequently reduce emissions. However, buses also have the potential to disrupt the flow of vehicles on the network increasing journey times. This has the potential to increase emissions because of congestion, although it may disincentivise some journeys resulting in lower emissions.

The additional lane on the M11 J13 roundabout is expected to result in improved traffic flow from the M11 northbound slip. This has the potential to decrease emissions because of congestion, although it may incentivise some journeys resulting in an increase in emissions.

The closure of a section of the St Neots Road to general traffic is expected to disincentivise some journeys leading to lower emissions. However, it also has the potential to increase congestion on other routes. This has the potential to increase emissions because of congestion, although may disincentivise some journeys resulting in lower emissions.

Without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change due to some of the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions.

1.4 Low Cost B – Preferred on-road Phase 1, and Park and Ride at Scotland Farm

1.4.1 Construction

The Low Cost B option includes construction of the park and ride facilities at the Scotland Farm, and the construction of a new pedestrian / cycle bridge. These construction works will result in carbon emissions,

from plant use on site, the transport of materials to site, and from emissions embodied in the materials. Both of the Low Cost options are expected to have the second lowest amount of construction activities and as such are expected to result in the second lowest level of construction emissions.

1.4.2 Operation

During operation the new pedestrian / cycle bridge is not expected to impact upon emissions as it is being designed to replace existing amenity. In Low Cost B, buses will run on the existing road network, however there will be an additional lane on the M11 J13 roundabout, which will allow both lanes to turn right coming from the M11 northbound slip, and a section of St Neots Road between Long Road and Madingley Mulch Roundabout will be closed to general traffic.

The addition of buses to the existing road network has the potential to reduce the numbers of vehicle journeys on the road network due to modal shift, which would consequently reduce emissions. However, buses also have the potential to disrupt the flow of vehicles on the network increasing journey times. This has the potential to increase emissions because of congestion, although may disincentivise some journeys resulting in lower emissions.

The additional lane on the M11 J13 roundabout is expected to result in improved traffic flow from the M11 northbound slip. This has the potential to decrease emissions because of congestion, although it may incentivise some journeys resulting in an increase in emissions.

The close of a section of the St Neots Road to general traffic is expected to disincentivise some journeys leading to lower emissions. However, it also has the potential to increase congestion on other routes. This has the potential to increase emissions because of congestion, although may disincentivise some journeys resulting in lower emissions.

Without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change due to some of the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions.

1.5 Do Something 1a – Preferred off-road Phase 1, and Park and Ride at Water Works

1.5.1 Construction

The do something option for 1a includes construction of the park and ride facilities at the Waterworks, and the construction of a new busway between Madingley Mulch Roundabout and Grange Road which will include a pedestrian / cycle path. These construction works will result in carbon emissions, from plant use on site, the transport of materials to site, and from emissions embodied in the materials. Both of the Do Something 1 options are expected to have the second highest amount of construction activities and as such are expected to result in second highest level of construction emissions.

1.5.2 Operation

The construction of additional pedestrian / cycle amenities is expected to result in increased uptake of active travel, which is expected to result in fewer vehicle journeys on the road network, which is expected to reduce emissions. In addition, a reduction in journeys has the potential to decrease emissions because of congestion, although it may incentivise some journeys resulting in an increase in emissions.

It is expected that the use of a busway will reduce bus journey times and congestion. This is expected to incentivise the use of buses, resulting in fewer vehicle journeys on the road network, and therefore further reduce congestion and emissions. However, a reduction in congestion may incentivise some journeys resulting in an increase in emissions.

Without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change due to some of the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions.

1.6 Do Something 1b – Preferred off-road Phase 1, and Park and Ride at Scotland Farm

1.6.1 Construction

The do something option for 1b includes construction of the park and ride facilities at Scotland Farm, the construction of a new busway between Madingley Mulch Roundabout and Grange Road which will include a pedestrian / cycle path. These construction works will result in carbon emissions, from plant use on site, the transport of materials to site, and from emissions embodied in the materials. Both of the Do Something 1 options are expected to have the second highest amount of construction activities and as such are expected to result in second highest level of construction emissions.

1.6.2 Operation

The construction of additional pedestrian / cycle amenities is expected to result in increased uptake of active travel, which is expected to result in fewer vehicle journeys on the road network, which is expected to reduce congestion and emissions. Reducing congestion however may incentivise some journeys resulting in an increase in emissions.

It is expected that the use of a busway will reduce bus journey times and congestion. This is expected to incentivise the use of buses, resulting in fewer vehicle journeys on the road network, and therefore further reduce congestion and emissions. However, a reduction in congestion may incentivise some journeys resulting in an increase in emissions.

Without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change due to some of the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions.

1.7 Illustrative Comparator A – Preferred on-road Phase 1 and 2, and Park and Ride at Water Works

1.7.1 Construction

The Illustrative Comparator A option includes construction of the park and ride facilities at the Waterworks, and the construction of a new busway between Cambourne and Grange Road which will include a pedestrian / cycle path. These construction works will result in carbon emissions, from plant use on site, the transport of materials to site, and from emissions embodied in the materials. Both of the Illustrative Comparator options are expected to have the highest amount of construction activities and as such are expected to result in highest level of construction emissions.

1.7.2 Operation

The construction of additional pedestrian / cycle amenities is expected to result in increased uptake of active travel, which is expected to result in fewer vehicle journeys on the road network (and therefore anticipated reduced emissions). In addition, a reduction in journeys has the potential to decrease emissions because of congestion, although it may incentivise some journeys resulting in an increase in emissions.

It is expected that the use of a busway will reduce bus journey times and congestion. This is expected to incentivise the use of buses, resulting in fewer vehicle journeys on the road network, and therefore further reduce congestion and emissions. However, a reduction in congestion may incentivise some journeys resulting in an increase in emissions.

Without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change due to some of the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions.

1.8 Illustrative Comparator B – Preferred on-road Phase 1 and 2, and Park and Ride at Scotland Farm

1.8.1 Construction

The Illustrative Comparator B option includes construction of the park and ride facilities at Scotland Farm, and the construction of a new busway between Cambourne and Grange Road which will include a pedestrian / cycle path. These construction works will result in carbon emissions, from plant use on site, the transport of materials to site, and from emissions embodied in the materials. Both of the Illustrative Comparator options have the highest amount of construction activities and as such are expected to result in highest level of construction emissions.

1.8.2 Operation

The construction of additional pedestrian / cycle amenities is expected to result in increased uptake of active travel, which is expected to result in fewer vehicle journeys on the road network, which is expected to reduce emissions. In addition, a reduction in journeys has the potential to decrease emissions because of congestion, although it may incentivise some journeys resulting in an increase in emissions.

It is expected that the use of a busway will reduce bus journey times and congestion. This is expected to incentivise the use of buses, resulting in fewer vehicle journeys on the road network, and therefore further reduce congestion and emissions. However, a reduction in congestion may incentivise some journeys resulting in an increase in emissions.

Without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change due to some of the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions.

Table 1.1: Summary Table

Scenario	Project Stage	Summary	Score
Do Minimum – Committed Schemes	Construction	There will be some limited construction associated with the committed schemes.	4
	Operation	The committed schemes are expected to improve flow on the A428. This has the potential to increase or decrease emissions from the road network.	N/A
Low cost A – Preferred on-road Phase 1, and Park and Ride at Water Works	Construction	A new park and ride and pedestrian / cycle bridge will be constructed. This will result in some emissions.	3
	Operation	Changes to M11 J13, the closure to general traffic of the St Neots road, and the operation of the on-road bus services has the potential to increase or decrease emissions from the road network.	N/A
Low cost B – Preferred on-road Phase 1, and Park and Ride at Scotland Farm	Construction	A new park and ride and pedestrian / cycle bridge will be constructed. This will result in some emissions.	3
	Operation	Changes to M11 J13, the closure to general traffic of the St Neots road, and the operation of the on-road bus services has the potential to increase or decrease emissions from the road network.	N/A

Scenario	Project Stage	Summary	Score
Do Something 1a – Preferred off-road Phase 1, and Park and Ride at Water Works	Construction	A new park and ride and shorter busway will be constructed. This will result in some emissions.	2
	Operation	The operation of the busway and associated pedestrian and cycle amenity has the potential to increase or decrease emissions from the road network.	N/A
Do Something 1b – Preferred off-road Phase 1, and Park and Ride at Scotland Farm	Construction	A new park and ride and shorter busway will be constructed. This will result in some emissions.	2
	Operation	The operation of the busway and associated pedestrian and cycle amenity has the potential to increase or decrease emissions from the road network.	N/A
Illustrative Comparator A – Preferred on-road Phase 1 and 2, and Park and Ride at Water Works	Construction	A new park and ride and longer busway will be constructed. This will result in some emissions.	1
	Operation	The operation of the busway and associated pedestrian and cycle amenity has the potential to increase or decrease emissions from the road network.	N/A
Illustrative Comparator B – Preferred on-road Phase 1 and 2, and Park and Ride at Scotland Farm	Construction	A new park and ride and longer busway will be constructed. This will result in some emissions.	1
	Operation	The operation of the busway and associated pedestrian and cycle amenity has the potential to increase or decrease emissions from the road network.	N/A

Greenhouse Gases Workbook - Worksheet 1

Scheme Name:

Camborne to Cambridge: Phase 2 Option 1a

Present Value Base Year

2010

Current Year

2019

Proposal Opening year:

0

Project (Road/Rail or Road and Rail):

road

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

£0

*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):

0

(between 'with scheme' and 'without scheme' scenarios)

Of which Traded

0

Change in carbon dioxide equivalent emissions in opening year (tonnes):

0

(between 'with scheme' and 'without scheme' scenarios)

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):

£0

(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	0	0

Qualitative Comments:

As there is no traffic data available at this stage, the extent of the ARN cannot be determined. Therefore, it is not possible to comment on the likely local traded and non-traded CO2e NPV for this scheme option. Option 1a is a new public transport route adjacent to the A428 and St Neots Road passing through the Waterworks P&R. The route would be entirely off-road with minimal interaction with general traffic, except at junctions. It is expected that as the buses are running off-road separated from the main traffic this would have the smallest change in existing traffic flows in the area. During the construction period, minor impact on other road users due to construction taking place off-road, with only construction vehicles using the local network to get to site affecting the flow of traffic marginally. During the operation of the scheme minor queuing may occur at junctions when the buses merge with the local traffic, which will lower the flows of traffic resulting in a slight increase of GHG emissions. As the Waterworks P&R is located closer to Cambridge along the A428, private vehicles will be required to travel 2 miles further than the Scotland Farm P&R b options adding to operational GHG emissions. With vehicles using the park and ride and bus when heading into Cambridge from Camborne a reduction in overall GHGs may be achieved as less members of the public use their private vehicle. The journey time by bus is projected to be considerably reduced with Option 1a, which indicates better flow of journey and therefore reduced bus journey emissions. However, without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change resulting from the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions - this will be assessed within the Environmental Assessment Report when a full WebTAG assessment is undertaken (if this scheme option is taken forward).

Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£0

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£0

Data Sources:

Greenhouse Gases Workbook - Worksheet 2

Scheme Name:

Camborne to Cambridge: Phase 2 Option 1b

Present Value Base Year

2010

Current Year

2019

Proposal Opening year:

0

Project (Road/Rail or Road and Rail):

road

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

£0

*positive value reflects a net benefit (i.e. CO2e emissions reduction)

Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):

0

(between 'with scheme' and 'without scheme' scenarios)

Of which Traded

0

Change in carbon dioxide equivalent emissions in opening year (tonnes):

0

(between 'with scheme' and 'without scheme' scenarios)

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):

£0

(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

*positive value reflects a net benefit (i.e. CO2e emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	0	0

Qualitative Comments:

As there is no traffic data available at this stage, the extent of the ARN cannot be determined. Therefore, it is not possible to comment on the likely local traded and non-traded CO2e NPV for this scheme option. Option 1b is a new public transport route adjacent to the A428 and St Neots Road passing through Scotland Farm P&R. The route would be entirely off-road with minimal interaction with general traffic, except at junctions. It is expected that as the buses are running off-road separated from the main traffic this would have the smallest change in existing traffic flows in the area. During the construction period, minor impact on other road users due to construction taking place off-road with only construction vehicles using the local network to get to site affecting the flow of traffic marginally. During the operation of the scheme minor queuing may occur at junctions when the buses merge with the local traffic, which will lower the flows of traffic resulting in a slight increase of GHG emissions. Additional GHG emissions will result from the buses crossing the A428 using Scotland Road overbridge along with the 2 roundabouts either end of the bridge to enter the P&R followed by crossing a second time to re-join the buses designated route upon exiting. With vehicles using the park and ride and bus when heading into Cambridge from Camborne a reduction in overall GHGs may be achieved as less members of the public use their private vehicle. The journey time by bus is projected to be considerably reduced with Option 1b, which indicates better flow of journey and therefore reduced bus journey emissions. However, without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change resulting from the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions - this will be assessed within the Environmental Assessment Report when a full WebTAG assessment is undertaken (if this scheme option is taken forward).

Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£0

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£0

Data Sources:

Greenhouse Gases Workbook - Worksheet 3

Scheme Name:

Camborne to Cambridge: Phase 2 Option 2a

Present Value Base Year

2010

Current Year

2019

Proposal Opening year:

0

Project (Road/Rail or Road and Rail):

road

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

£0

*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):

0

(between 'with scheme' and 'without scheme' scenarios)

Of which Traded

0

Change in carbon dioxide equivalent emissions in opening year (tonnes):

0

(between 'with scheme' and 'without scheme' scenarios)

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):

£0

(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	0	0

Qualitative Comments:

As there is no traffic data available at this stage, the extent of the ARN cannot be determined. Therefore, it is not possible to comment on the likely local traded and non-traded CO2e NPV for this scheme option. Option 2a is where public transport vehicles would run on-road along St Neots Road with general traffic east of the Bourn roundabout passing through the Waterworks P&R. The scheme would also entail basic junction improvements. During the construction period, diversions may be required as this option consists of minor junction and pavement improvements which will have a minor impact on other road users. During the operational phase of the scheme, the buses are running on-road with the traffic on St Neots Road which would result in a reduction in traffic flows and speeds as the buses stop at the bus stops and may be travelling at slower speeds than general traffic. With the minor junction improvements it would be expected to better the flows of traffic which may result in a reduction of GHG emissions. As the Waterworks P&R is located closer to Cambridge along the A428, private vehicles will be required to travel 2 miles further than the Scotland Farm P&R b options adding to operational GHG emissions. With vehicles using the park and ride and bus when heading into Cambridge from Camborne a reduction in overall GHGs may be achieved as less members of the public use their private vehicle, and an estimated reduction in bus journey time. However, without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change due to some of the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions - this will be assessed within the Environmental Assessment Report when a full WebTAG assessment is undertaken (if this scheme option is taken forward).

Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£0

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£0

Data Sources:

Greenhouse Gases Workbook - Worksheet 4

Scheme Name:

Camborne to Cambridge: Phase 2 Option 2b

Present Value Base Year

2010

Current Year

2019

Proposal Opening year:

0

Project (Road/Rail or Road and Rail):

road

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

£0

*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):

0

(between 'with scheme' and 'without scheme' scenarios)

Of which Traded

0

Change in carbon dioxide equivalent emissions in opening year (tonnes):

0

(between 'with scheme' and 'without scheme' scenarios)

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):

£0

(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	0	0

Qualitative Comments:

As there is no traffic data available at this stage, the extent of the ARN cannot be determined. Therefore, it is not possible to comment on the likely local traded and non-traded CO2e NPV for this scheme option. Option 2b is where public transport vehicles would run on-road along St Neots Road with general traffic east of the Bourn roundabout passing through Scotland Farm P&R. The scheme would also entail basic junction improvements. During the construction period, diversions may be required as this option consists of minor junction and pavement improvements which will have a minor impact on vehicle users. During the operational phase of the scheme, the buses are running on-road with the traffic on St Neots Road which would result in a reduction in traffic flows and speeds as the buses stop at the bus stops and may be travelling at slower speeds than general traffic. With the minor junction improvements it would be expected to better the flows of traffic which may result in a reduction of GHG emissions.

Additional GHG emissions will result from the buses crossing the A428 using Scotland Road overbridge along with the 2 roundabouts either end of the bridge to enter the P&R followed by crossing a second time to re-join the buses designated route upon exiting. With vehicles using the park and ride and bus when heading into Cambridge from Camborne a reduction in overall GHGs may be achieved as less members of the public use their private vehicle, and an estimated reduction in bus journey time. However, without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change due to some of the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions - this will be assessed within the Environmental Assessment Report when a full WebTAG assessment is undertaken (if this scheme option is taken forward).

Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£0

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£0

Data Sources:

Greenhouse Gases Workbook - Worksheet 5

Scheme Name:

Camborne to Cambridge: Phase 2 Option 3a

Present Value Base Year

2010

Current Year

2019

Proposal Opening year:

0

Project (Road/Rail or Road and Rail):

road

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

£0

*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):

0

(between 'with scheme' and 'without scheme' scenarios)

Of which Traded

0

Change in carbon dioxide equivalent emissions in opening year (tonnes):

0

(between 'with scheme' and 'without scheme' scenarios)

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):

£0

(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	0	0

Qualitative Comments:

As there is no traffic data available at this stage, the extent of the ARN cannot be determined. Therefore, it is not possible to comment on the likely local traded and non-traded CO2e NPV for this scheme option. Option 3a is where public transport vehicles would run on-road along St Neots Road in priority lanes running in both directions passing through the Waterworks P&R. During the construction period, diversions may be required as construction works will be taking place on-road to widen the road and improve existing junctions which will have a minor impact on traffic. During operation of the scheme the buses segregated from the main traffic this option should not impact the traffic flows and speeds with levels of GHG remaining neutral. At junctions where buses and vehicles will be required to merge it may result in flows of traffic to slow increasing the GHG emissions. As the Waterworks P&R is located closer to Cambridge along the A428, private vehicles will be required to travel 2 miles further than the Scotland Farm P&R b options adding to operational GHG emissions. With vehicles using the park and ride and bus when heading into Cambridge from Camborne a reduction in overall GHGs may be achieved as less members of the public use their private vehicle, and an estimated reduction in bus journey time. However, without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change due to some of the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions - this will be assessed within the Environmental Assessment Report when a full WebTAG assessment is undertaken (if this scheme option is taken forward).

Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£0

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£0

Data Sources:

Greenhouse Gases Workbook - Worksheet 6

Scheme Name:

Camborne to Cambridge: Phase 2 Option 3b

Present Value Base Year

2010

Current Year

2019

Proposal Opening year:

0

Project (Road/Rail or Road and Rail):

road

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

£0

*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):

0

(between 'with scheme' and 'without scheme' scenarios)

Of which Traded

0

Change in carbon dioxide equivalent emissions in opening year (tonnes):

0

(between 'with scheme' and 'without scheme' scenarios)

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):

£0

(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	0	0

Qualitative Comments:

As there is no traffic data available at this stage, the extent of the ARN cannot be determined. Therefore, it is not possible to comment on the likely local traded and non-traded CO2e NPV for this scheme option. Option 3b is where public transport vehicles would run on-road along St Neots Road in priority lanes running in both directions passing through Scotland Farm P&R. During the construction period, diversions may be required as construction works will be taking place on-road to widen the road and improve existing junctions which will have a minor impact on traffic. During operation of the scheme the buses segregated from the main traffic this option should not impact the traffic flows and speeds with levels of GHG remaining neutral. At junctions where the buses and vehicles will be required to merge it may result in flows of traffic to slow increasing the GHG emissions. Additional GHG emissions will result from the buses crossing the A428 using Scotland Road overbridge along with the 2 roundabouts either end of the bridge to enter the P&R followed by crossing a second time to re-join the buses designated route upon exiting. With vehicles using the park and ride and bus when heading into Cambridge from Camborne a reduction in overall GHGs may be achieved as less members of the public use their private vehicle, and an estimated reduction in bus journey time. However, without a full assessment of modelled traffic data, it is not possible to determine the direction of change or the magnitude of change due to some of the scheme elements. As such it is not possible to state which options are expected to result in the highest or lowest operational emissions - this will be assessed within the Environmental Assessment Report when a full WebTAG assessment is undertaken (if this scheme option is taken forward).

Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£0

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£0

Data Sources:

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F. Historic Environment

TAG Historic Environment Impacts Worksheet - Phase 1 Conservation Area

Step 2		Step 3			Step 4
Feature	Description	Scale it matters	Significance	Rarity	Impact
Form	The option route runs through the West Cambridge Conservation Area.	Designated asset, regionally important. Relevant legislation and planning policy includes: Planning (Listed Buildings and Conservation Areas) Act 1990 ; National Planning Policy Framework (NPPF) 2019, City of Cambridge Local Plan (2018).	Conservation areas are considered to be of medium significance. The form of each conservation area is unique and reflects a unique set of circumstances resulting in the development of the area into one that warrants special protection.	Each conservation area is unique and as such, the assets are very rare.	No impact.
Survival	The conservation areas survive in good condition.	Conservation areas are nationally important, their level of survival contributes to their significance and therefore their national importance.	The survival of the conservation areas contributes to their medium significance.	The survival of the assets contributes to their rarity.	No impact
Condition	The conservation areas are in good condition.	The good condition of the assets contributes to their high national importance.	The condition of the assets contributes to their medium significance.	The condition of the assets contributes to their rarity.	No impact
Complexity	The assets are complex as they incorporates a variety of structures built over a number of years.	The complexity of the assets contributes to their national importance.	The complexity of the assets contributes to their medium significance.	The complexity of the assets contributes to their rarity.	No impact
Context	The surviving rural landscape around Coton ensures that the conservation area retains its rural village context. West Cambridge has an urban fringe/collegic context .The internal context of each has seen some alteration during the modern period though the original context is largely preserved.	The preservation of the context of the assets contributes to their national importance.	The context of the assets contributes to their significance.	The context of the assets contributes to their rarity.	Changes to the road junctions at Wilberforce Road and Grange Road will cause a slight impact to the context West Cambridge Conservation Area. Encroachment on the open spaces either side of the multi -user route between the West Cambridge Campus and Wilberforce will cause a slight impact on the Conservation Area.
Period	Coton dates to the medieval period, while West Cambridge contain post medieval elements.	The age of the assets identifies them as regionally important.	The age of the assets contributes to their medium significance.	It is not unusual for conservation areas to be dated to this period.	No impact

Reference Sources

City of Cambridge Local Plan (2018)
West Cambridge Conservation Area Appraisal

Step 5 - Summary Assessment Score

Slight adverse effect

Qualitative Comments

The triangular field to the north of the multiuser track and the University sports playing field to the south are designated as open spaces and are character features within the Conservation Area. The construction of the scheme will reduce the area of these two open spaces, which will cause a slight impact on the context of the Conservation areas causing slight adverse effect.

TAG Historic Environment Impacts Worksheet

Step 2		Step 3			Step 4
Feature	Description	Scale it matters	Significance	Rarity	Impact
Form	<p>A provisional appraisal of the Cambridgeshire County Council Historic Environment Record, identified the following non designated burial archaeological assets within the footprint or adjacent to the option.</p> <p>At Bourne Airfield the HER identified the World War II Airfield (CB15128), Iron Age/Roman remains (MCB16808), a Mesolithic pick (MCB16812), pits (MCB16335), ditches (MCB16334) and a medieval routeway (MCB16809), were recorded during the construction of the A428, and Iron Age/Roman enclosures have been identified from air photos within the airfield (MCB21977); The site of a former school building is located at the eastern edge of the airfield (MCB20905);</p> <p>At Childerley Gate roundabout the HER identifies Roman field system and structure (MCB17870), the site of a former milepost (MCB20888), an Iron Age coin findspot (03304) and a post medieval moated garden feature (01099);</p> <p>Between Childerley Gate roundabout and Hanwick Junction, a Roman settlement (MCB16337), a Mid Iron Age farmstead (MCB16338), and a Roman droveway (MCB18507) were recorded during the construction of the A428;</p> <p>Between Hardwick Junction and Long Road, an Iron Age/Roman enclosure (MCB21424), undated features recorded during the construction of the A428 (MCB16813) and the site of a former milestone (MCB20890).</p> <p>In addition:</p> <p>Archaeological evaluation works across the route of the option through Bourn Airfield identified a Iron Age/Roman settlement in the area of the cropmarks (MCB21977), a spread of pre medieval land division features and pits, and medieval ridge and furrow.</p> <p>Archaeological remains have been identified within Cambourne but all remains within this development have been removed.</p>	<p>Non-designated asset, Local/regional importance, with potential for previously unrecorded archaeological remains to be of national significance. Relevant planning policy includes: National Planning Policy Framework (NPPF) 2019, South Cambridgeshire District Local Plan 2018.</p>	<p>The predicted significance of the potential remains is considered to be low to moderate with the exception of possible Roman villa, which would be nationally significant were it proven to be such.</p>	<p>It is not rare within rural England to encounter archaeological remains associated with the former landscape, however it is rare to encounter archaeological remains of national significance.</p>	<p>Potential for major adverse impact on unknown archaeological remains, in areas of development outside of the current road footprint and outside impacted by the construction of the A428.</p> <p>In addition the option has potential to impact known assets; The Iron Age/Roman settlement in the area of the cropmarks (MCB21977) at Bourn Airfield; Structures associated with Bourn Airfield (CB15128); The post medieval moated garden feature, at Childerley Gate roundabout (01099); The Roman settlement (MCB16337), a Mid Iron Age farmstead (MCB16338), and a Roman droveway (MCB18507), between Childerley Gate and Hardwick Junction.</p>
Survival	<p>Unknown - where the proposed route follows the existing road, below ground remains will have been removed. It is probable that the majority of the previously undeveloped land take will have been ploughed which is likely to have disturbed archaeological remains to an unknown degree dependent upon the depth of the remains and the depth of the plough.</p>	<p>Non-designated asset, Local/regional importance, with potential for previously unrecorded archaeological remains to be of national significance. Relevant planning policy includes: National Planning Policy Framework (NPPF) 2019, South Cambridgeshire District Local Plan 2018.</p>	<p>Should archaeological remains survive well then they have the potential to be regionally and nationally significant.</p>	<p>Undisturbed archaeological remains are extremely rare. It is likely that any remains within the footprint of the proposed option would have been subjected to a limited degree of disturbance through use of plough machinery. It is not rare for archaeological remains to be plough-damaged.</p>	<p>Where archaeological remains survive there will be a major adverse impact.</p>
Condition	<p>Unknown - where the proposed route follows the existing road, below ground remains will have been removed. It is probable that the majority of the previously undeveloped land take will have been ploughed which is likely to have disturbed archaeological remains to an unknown degree dependent upon the depth of the remains and the depth of the plough.</p>	<p>Non-designated asset, Local/regional importance, with potential for previously unrecorded archaeological remains to be of national significance. Relevant planning policy includes: National Planning Policy Framework (NPPF) 2019, South Cambridgeshire District Local Plan 2018.</p>	<p>Should archaeological remains survive well then they have the potential to be regionally and nationally significant.</p>	<p>Undisturbed archaeological remains are extremely rare. It is likely that any remains within the footprint of the proposed option would have been subjected to a limited degree of disturbance through use of plough machinery. It is not rare for archaeological remains to be plough-damaged.</p>	<p>Where archaeological remains survive there will be a major adverse impact.</p>
Complexity	<p>Unknown - Should remains be present they will likely be moderately complex as they lie within a rich archaeological landscape which shows evidence of activity and settlement since the prehistoric period.</p>	<p>Non-designated asset, Local/regional importance, with potential for previously unrecorded archaeological remains to be of national significance. Relevant planning policy includes: National Planning Policy Framework (NPPF) 2019, South Cambridgeshire District Local Plan 2018.</p>	<p>Unknown. Should archaeological remains survive their complexity will contribute to their significance.</p>	<p>Moderately complex archaeological remains are not rare within the agricultural landscape.</p>	<p>Major adverse impact - the complexity of any surviving remains will be affected by their removal or disturbance through the construction of the option.</p>
Context	<p>There is a known pattern of late prehistoric/Roman occupation/settlement across the wider area, with settlement usually occurring every 400m. St Neots road follows the line of a prehistoric/Roman routeway. The medieval/post medieval occupation focus of the area was away from the ridgeline, with villages being located to the north and south (of the ridge and the option) towards the valley floor, with roads running from the ridgeway road to the settlements. closer to the ridge line settlement took the form of farmsteads (some moated).</p> <p>Bourn Airfield was a World War II airfield used for heavy bombers. Some of the runways, taxiways, dispersal sites and roads survive. The airfield is still north used for light aircraft.</p> <p>Mesolithic through to the modern period.</p>	<p>Non-designated asset, Local/regional importance, with potential for previously unrecorded archaeological remains to be of national significance. Relevant planning policy includes: National Planning Policy Framework (NPPF) 2019, South Cambridgeshire District Local Plan 2018.</p>	<p>The context of any archaeological remains will contribute to their significance.</p>	<p>Buried archaeological remains generally do not survive in an undisturbed original context. Should they be found to survive in their original context then they this will contribute to their significance.</p>	<p>Moderate adverse impact on the context. The wider context of the archaeological pattern will survive but will be impacted</p>
Period		<p>Non-designated asset, Local/regional importance, with potential for previously unrecorded archaeological remains to be of national significance. Relevant planning policy includes: National Planning Policy Framework (NPPF) 2019, South Cambridgeshire District Local Plan 2018.</p>	<p>Undesignated asset. Unknown. Prehistoric remains of good quality would be of particular significance.</p>	<p>It is not rare to encounter archaeological remains.</p>	<p>No impact.</p>

Reference Sources

[Cambridgeshire County Council Historic Environment Record](https://library.thehumanjourney.net/47111/1/Report%202256_LR.pdf)
https://library.thehumanjourney.net/47111/1/Report%202256_LR.pdf
https://archaeologydataservice.ac.uk/archiveDS/archiveDownload?t=arch-690-1/dissemination/pdf/albionar1-18976_2.pdf

Step 5 - Summary Assessment Score

Major impact on a low/medium value asset during construction resulting in a moderate adverse effect

Qualitative Comments

In summary a moderate adverse impact is predicted to unknown archaeological remains within the proposed option area through the construction of the option. Where remains are present they will be removed by necessary excavations. Although the form, nature and extent of potential remains is unknown there is regionally significant archaeology within the vicinity of the proposed option and the area is considered to have a moderate to high archaeological potential in areas outside of the existing road corridor and the A428 construction corridor. This assessment is subject to change following proper assessment and investigation of archaeological potential and finalisation of construction methodology.

TAG Historic Environment Impacts Worksheet

Step 2		Step 3			Step 4
Feature	Description	Scale it matters	Significance	Rarity	Impact
Form	There is a Grade II listed building located 250m to the south of the option at Hardwick. Pump on the south east corner of Small Green (NHLE 1163604). There is a Grade II listed building located 300m to the south of the option at Broadway (Bourn). Great Common Farmhouse, Broadway, Bourn (NHLE 1331371).	Designated asset, nationally important. Relevant legislation and planning policy includes: Planning (Listed Buildings and Conservation Areas) Act 1990 ; National Planning Policy Framework (NPPF) 2019; South Cambridgeshire District Council Local Plan 2018.	Grade II listed buildings are of medium national significance. Each asset is significant for its aesthetic, historic and evidential value.	Grade II listed buildings total 92% of all listed buildings and though not rare within the listing categories, they make up a small percentage of the entire building stock of England and Wales, and are therefore moderately rare at a national level.	No impact
Survival	Assumed good survival.	Grade II listed buildings are nationally important structures, their level of survival contributes to their listing status and therefore their national importance.	Grade II listed buildings are inherently of medium national significance. The levels at which they survive determine their listing status and contribute to their significance.	Grade II listed buildings total 92% of all listed buildings. Though not rare within the listing categories, they make up a small percentage of the entire building stock of England and Wales, and are therefore moderately rare at a national level. Late medieval to 20th century buildings tend to survive better than earlier structures due to changes in construction and fabric, particularly the wider availability of brick. This contributes to the structures' good survival.	No impact
Condition	The structures are assumed to be in generally good condition. More detailed study will be undertaken at a later assessment stage.	The good condition of the assets contributes to their grade II listing and their national importance.	The condition of the assets contributes to their listed status and therefore to their medium national significance.	Grade II listed buildings total 92% of all listed buildings. Though not rare within the listing categories, they make up a small percentage of the entire building stock of England and Wales, and are therefore moderately rare at a national level. 17th to 19th century buildings tend to survive in better condition than earlier structures due to changes in construction and fabric during the period, particularly the wider availability of brick.	No impact
Complexity	Limited complexity.	The limited complexity of these structures contributes to their grade II listed status.	The limited complexity of these structures contributes to their significance and grade II listed status.	Grade II listed buildings total 92% of all listed buildings. Though not rare within the listing categories, they make up a small percentage of the entire building stock of England and Wales, and are therefore moderately rare at a national level. The majority of these structures are of limited complexity and are therefore not particularly rare but are good examples of particular architectural practices.	No impact
Context	Great Common Farmhouse retains some of its original rural roadside context. However the modern development of Cambourne, is separated from the asset by a single field and there is some Intervisibility. The pump, is located in a area of Hardwick that has been developed in the last 50 years.	The preservation of the context of these buildings contributes to their national importance and Grade II listed status.	The preservation of the context of these buildings contributes to their medium national significance.	It is not rare for surviving buildings of this date to be set within their original context. However their contexts are gradually being eroded with modern development.	No impact
Period	Great Common Farmhouse is 16th/17th century with later alterations and additions.	The period the structures were built identifies them as nationally important.	The age of the structures identifies them as of medium national significance. They were likely selected as they are good examples of that period and building type.	The majority of grade II listed buildings date to this broad period, within this category they are therefore not rare. However, buildings of this date comprise a generally small percentage nationwide.	No impact

Reference Sources

<https://historicengland.org.uk/listing/the-list/list-entry/1163604>

Step 5 - Summary Assessment Score

Neutral

Qualitative Comments

Both assets are screened from the proposed options by intervening buildings and vegetation.

TAG Historic Environment Impacts Worksheet

Step 2		Step 3			Step 4
Feature	Description	Scale it matters	Significance	Rarity	Impact
Form	A Grade II Listed 18th Century registered park and garden (Madingley Hall NHLE 1000627) is situated 350m north of the option near Madingley Hill service reservoir.	Designated asset, nationally important. Relevant legislation and planning policy includes: Ancient Monuments and Archaeological Areas Act 1979; National Planning Policy Framework (NPPF) 2019; South Cambridgeshire District Council Local Plan (2018).	Grade II registered parks and gardens are of medium national significance.	Grade II registered parks and gardens are all rare; each asset is unique, they all have different histories, forms, landscape architects, owners etc, which contribute to their importance in varying degrees.	No impact.
Survival	Good survival.	Registered parks and gardens are nationally important areas, their level of survival contributes to their listing status and therefore their national importance.	Grade II registered parks and gardens are inherently of medium national significance. The levels at which they survive determine their listing status and contribute to their significance.	Grade II registered parks and gardens are all rare, and the majority do not have all their historic features surviving fully.	No impact.
Condition	The registered park and garden is not included in the Historic England Heritage at Risk Register. The registered park and garden identified for potential impact is assumed to be in good condition.	The good condition of the asset contributes to its listing and its national importance.	The condition of the asset contributes to its registered status and therefore to their medium significance.	It is not rare for a registered historic park and garden of this date to be in good condition, as they often remain well-managed.	No impact.
Complexity	Registered parks and gardens are often fairly complex heritage assets, displaying evidence of several phases of park creation and alteration.	The complexity of the area contributes to its registered status.	The complexity of the park contributes to its registered status.	It is rare for an historic park and garden of this date to be complex as the number of similar memorial cemeteries of this date are rare.	No impact.
Context	It is situated within its original context, with later alterations.	The preservation of the context of the registered park and garden contributes to its national importance.	The preservation of the context of the registered park and garden contributes to its medium national significance.	It is somewhat rare for registered parks and gardens of this date to be set, untouched, within their original context.	No impact.
Period	The registered park and garden is 18th Century.	The age of the registered park and garden is unique and adds to its value.	The age of the registered park and garden identifies it as of medium national significance.	Many surviving parks and gardens date to this period.	No impact.

Reference Sources

<https://historicengland.org.uk/listing/the-list/list-entry/1000627>

Step 5 - Summary Assessment Score

Neutral

Qualitative Comments

The A428 dual carriageway, associated planting and earthworks are located between the asset and the proposed option.

G. Landscape

TAG Landscape Impacts Worksheet (Phase 1)

Do Minimum

Features	Step 2	Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Do Minimum Impact
Pattern	The area is part of the rural lowland mosaic and West Cambridge Claylands. Fields tend to be of medium size, although generally smaller around the rural settlements, and the pattern is post Enclosure. Fields are generally bounded by either open ditches or sparse closely trimmed hedgerows (with denser more intact hedgerows generally located closer towards the city of Cambridge), both containing a variable number and quality of hedger trees.	Local	Commonplace at the local level	Low	Not substitutable	The proposed route option would constitute the widening of the existing A1303 road corridor, on the northern and southern sides, from Madingley Mulch roundabout heading east to Cambridge. The proposal also allows for the use of the existing Madingley Park & Ride facility.
	The local road network of rural lanes integrates well with the field pattern but the larger corridors of the A428, A1303, M11 and A14 transect the field pattern with their linear form. The topography of the area is generally low-lying to the west within and around Cambridge, rising west of Coton towards Cambourne. The Bourn Brook valley and Red Meadow Hill are notable topographic features.					This route would be broadly consistent with the existing landscape pattern. The main alterations to the landscape pattern would be incremental through the loss of roadside vegetation on both sides of the road. There is the potential to replace this vegetation in the more rural areas but this will be limited in certain areas, particularly east of the M11. Overall this would result in a Minor Adverse magnitude of impact to the landscape pattern, depending on the amount, location and quality of the vegetation lost and its substitutability.
Tranquillity	The CPRE tranquillity map identifies the broad range of tranquillity across the study area (assessed in 2007). Within the study area there is a noticeable decrease in tranquillity to the west in and around Cambridge. Other less tranquil places include alongside the major road corridors of the A428, M11 and A14 and within smaller rural settlements.	Local	Commonplace at the local level	Medium	Not substitutable	The proposed widening of the A1303 road corridor heading east from the roundabout would result in a loss of vegetation and an increase in the prominence of the A1303 road corridor within the landscape. This change is limited by the presence of the M11 and A428. However, there may be a change to the tranquillity and/or visual intrusion for visitors to the American Military Cemetery due to the closer proximity of highway infrastructure to the formal entrance.
	Notable trends from the 1960s to 2007 are light pollution resulting from intensive agriculture, growth of settlements and road infrastructure improvements, particularly apparent in the low-lying areas.					These changes would result in visual intrusion, with the degree and duration of negative impact upon tranquillity dependant on the scope of mitigation/replacement planting which could be achieved along the route. However, given the nature of the existing road corridor, with its already reduced tranquillity, a Minor Adverse impact has been assessed.
Cultural	Recreation is a significant ecosystem service in this National Character Area. It is generally low key, close to the main urban populations and associated with the river valleys, existing sites and restored post industrial landscapes. There is an extensive network of public rights of way and bridleways through the area.	Regional	Commonplace at the local level	High	Not substitutable	The proposed route would pass directly adjacent to the Madingley Wood ancient and semi-natural woodland (which is also an SSSI) with a potential for loss of edge vegetation at a couple of locations, encroach upon and alter the access arrangements to the Grade I Registered Park and Garden of the American Military, pass through conservation areas on the western edge of Cambridge and potentially affect the distant setting of the Coton Conservation area.
	There are a number of listed buildings and scheduled monuments within the wider landscape and conservation areas covering rural settlements including Hardwick, Coton, Madingley, and the west of Cambridge (West Cambridge, Conduit Head Road and Storey's Way). Registered Parks and Gardens within the area include the Grade I American Military Cemetery and Grade II Madingley Hall. Coton Country Park is located south of Coton and west of the M11, and is "managed to enhance the local landscape and benefit wildlife. It's a great place to experience the changing seasons with wildlife habitats, a hilltop picnic area, panoramic views, and routes for walkers, cyclists, runners, disabled people and horse riders that link to adjacent public footpaths and bridleways." (www.cambridgepff.org). From several locations, including Red Meadow Hill and from/around the M11 corridor, there are panoramic views east, towards the historic city skyline. The University Library, Addenbrooke's chimney and various church spires are important landmarks of Cambridge. National Cycle Routes 11, 51 and Regional Cycle Route 24 pass north-south through the west of the area.					The loss of vegetation and increase in prominence of the A1303 road corridor would have a negative impact on the setting of these features, with the degree and duration of negative impact dependent upon the scope of mitigation/replacement planting which could be achieved along the route. The proposal's route directly adjacent to an Ancient Woodland with low substitutability means that due to the possibility of adverse effects upon this feature, a Minor Adverse to Moderate Adverse impact is assessed.
Landcover	The landcover is primarily rural with the exception of Cambridge to the east, Cambourne in the west and rural settlements within the wider landscape. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing.	Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	The proposed route would have the potential to affect trees with Tree Preservation Orders at the eastern end of the scheme. It is assumed that there will not be a requirement to remove any vegetation but there remains potential for damage to the root zones of these trees and/or vegetative pruning to meet clearance offset requirements when widening the road corridor. However, outside of these localised effects, the impact on landcover would be limited so overall this proposal would result in a Minor Adverse impact.
	There are a series of traditional orchards throughout the area which now account for 20% of the amount present in 1950. Losses are due to development, neglect and land use change. Small woodland blocks are notable features within the wider landscape, as part of historic parkland or within the wider agricultural landscape. Within Cambridge, mature trees are a notable feature of the environment and there are a large number of Tree Preservation Orders protecting them from development. Bourn Airport is a notable land-use feature between Upper Cambourne and Caldecote. Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS/6 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area. Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW 1 of Proposed Submission SC Local Plan).					
Summary of character	The study area is located within National Character Area 88: Bedfordshire and Cambridgeshire Claylands and the Cambridge landscape character area West Cambridge Claylands. It can be characterised by the rural landscape containing smaller settlements, main road corridors and the number of historic features within the area such as Registered Parks and Gardens, Listed Buildings and Scheduled Monuments.	Regional	A combination of scarce and commonplace features at the local level	Medium	Generally not substitutable	The proposal would result in the widening of the existing road corridor and in most cases the impacts would be small scale and localised. The key issues resulting from this proposal are the possibility for adverse effects on a Grade I Park and Garden, the scale of vegetation removal required along the route and potential or otherwise to be able to replace or mitigate these removals. Overall, the magnitude of impact is assessed to be Minor Adverse to Moderate Adverse.

Reference Sources

The following sources have been used in the preparation of this WebTAG worksheet:

- DfT TAG Unit A3, December 2015 (www.gov.uk/transport-analysis-guidance-webtag)
- Drawings 5020059_HW_FS_110 to 5020059_HW_FS_160 issued 12th April 2018
- A428 Cambourne to Cambridge Better Bus Journeys, Landscape and Planning Appraisal, Atkins, January 2017
- A428 Cambourne to Cambridge Better Bus Journeys, Green Lane Concept, Atkins and Strutt & Parker, August 2017

Step 5 - Summary Assessment Score

Minor Adverse to Moderate Adverse

Qualitative Comments

On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Minor Adverse to Moderate Adverse impact. This is to identify that the proposal:

- does not quite fit the landform and scale of the landscape (Minor Adverse)
- although not very visually intrusive, will impact on certain views into and across the area (Slight Adverse)
- cannot be completely integrated because of the nature of the scheme itself or the character of the landscape through which it passes (Slight Adverse)
- will have an adverse impact on a landscape of recognised quality or on vulnerable and important characteristics or elements (Moderate Adverse)
- conflicts with local authority policies for protecting the local character of the countryside (Slight Adverse)

TAG Landscape Impacts Worksheet (Phase 1)

Low Cost a

Features	Step 2	Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Low Cost a Impact
Pattern	The area is part of the rural lowland mosaic and West Cambridge Claylands. Fields tend to be of medium size, although generally smaller around the rural settlements, and the pattern is post Enclosure. Fields are generally bounded by either open ditches or sparse closely trimmed hedgerows (with denser more intact hedgerows generally located closer towards the city of Cambridge), both containing a variable number and quality of hedger trees.	Local	Commonplace at the local level	Low	Not substitutable	The proposed route option would constitute the widening of the existing road corridor on the northern and southern sides from Madingley Mulch roundabout heading east to Cambridge.
	The local road network of rural lanes integrates well with the field pattern but the larger corridors of the A428, A1303, M11 and A14 transect the field pattern with their linear form. The topography of the area is generally low-lying to the west within and around Cambridge, rising west of Coton towards Cambourne. The Bourn Brook valley and Red Meadow Hill are notable topographic features.					The proposed Park & Ride facility adjacent to Madingley Mulch Roundabout would occupy part of two fields. Loss of existing hedgerow will be relatively limited but the facility's positioning will mean the addition of an incongruous element within the pattern of the immediate landscape.
						This route would be broadly consistent with the existing landscape pattern. The main alterations to the landscape pattern would be through the loss of roadside vegetation and trees on both sides of the road. There is the potential to replace this vegetation in the more rural areas but this will be limited in certain areas, particularly east of the M11.
Tranquillity	The CPRE tranquillity map identifies the broad range of tranquillity across the study area (assessed in 2007). Within the study area there is a noticeable decrease in tranquillity to the west in and around Cambridge. Other less tranquil places include alongside the major road corridors of the A428, M11 and A14 and within smaller rural settlements.	Local	Commonplace at the local level	Medium	Not substitutable	The proposed widening of the bus corridor heading east from the roundabout would result in a loss of vegetation (including some larger trees) and an increase in the prominence of the A1303 road corridor within the landscape. This change is limited by the presence of the M11 and A428. However, there may be a change to the tranquillity and/or visual intrusion for visitors to the American Military Cemetery due to periodic bus movements.
	Notable trends from the 1960s to 2007 are light pollution resulting from intensive agriculture, growth of settlements and road infrastructure improvements, particularly apparent in the low-lying areas.					The proposed Park & Ride facility would result in an increase in traffic movements, lighting and visual intrusion adjacent to Madingley Mulch Roundabout. There would also be a reduction in the tranquillity of the landscape to the east, west and south of the facility. However, this change is limited by the presence of an existing concrete depot and communications mast in the direct vicinity.
	Areas that a relatively tranquil within the local context include the fields west of Grange Road, Coton Countryside Reserve and the American Military Cemetery.					These changes would result in visual intrusion, with the degree and duration of negative impact upon tranquillity dependant on the scope of mitigation/replacement planting which could be achieved along the route and surrounding the Park & Ride facility. However, given the nature of the existing road corridor, with its already reduced tranquillity, and existing features, a Minor Adverse to Moderate Adverse impact has been assessed.
Cultural	Recreation is a significant ecosystem service in this National Character Area. It is generally low key, close to the main urban populations and associated with the river valleys, existing sites and restored post industrial landscapes. There is an extensive network of public rights of way and bridleways through the area.	Regional	Commonplace at the local level	High	Not substitutable	The proposed route would pass directly adjacent to the Madingley Wood ancient and semi-natural woodland (which is also an SSSI) with a potential for loss of edge vegetation and trees outside the SSSI within the road corridor, encroach upon and alter the access arrangements to, the Grade I Registered Park and Garden of the American Military. There would also potentially be a loss of trees on both sides of the A1303 moving towards the M11 (opposite Cambridge Road to Coton). The scheme potentially affects the distant setting of the Coton Conservation area. The conservation areas on the western edge of Cambridge, Conduit Road and Storeys Way, are more vulnerable to impact from the proposal. The proposed route runs along the entire southern boundary of the Conduit Head area, may cause damage to some of the larger trees along this southern fringe and would affect the setting for the area. The proposal is slightly further away from the Storeys Way area and so has little chance of direct impact but the possibility remains that the proposal may affect it's setting.
	There are a number of listed buildings and scheduled monuments within the wider landscape and conservation areas covering rural settlements including Hardwick, Coton, Madingley, and the west of Cambridge (West Cambridge, Conduit Head Road and Storey's Way).					The proposed Park & Ride facility is not located within the boundary or setting of any conservation areas and is not directly adjacent to any notable landscape features.
	Registered Parks and Gardens within the area include the Grade I American Military Cemetery and Grade II Madingley Hall. Coton Country Park is located south of Coton and west of the M11, and is "managed to enhance the local landscape and benefit wildlife, it's a great place to experience the changing seasons with wildlife habitats, a hilltop picnic area, panoramic views, and routes for walkers, cyclists, runners, disabled people and horse riders that link to adjacent public footpaths and bridleways." (www.cambridgepff.org).					The loss of vegetation and increase in prominence of the A1303 road corridor would have a negative impact on the setting of these features, with the degree and duration of negative impact dependant upon the scope of mitigation/replacement planting which could be achieved along the route.
Landcover	From several locations, including Red Meadow Hill and from/around the M11 corridor, there are panoramic views east, towards the historic city skyline. The University Library, Addenbrooke's chimney and various church spires are important landmarks of Cambridge. National Cycle Routes 11, 51 and Regional Cycle Route 24 pass north-south through the west of the area.					Although the Park & Ride facility would have minimal impact on the cultural aspect, the proposal's route directly adjacent to an Ancient Woodland with low substitutability means that due to the possibility of adverse effects upon this feature, a Minor Adverse to Moderate Adverse impact is assessed.
	The landcover is primarily rural with the exception of Cambridge to the east, Cambourne in the west and rural settlements within the wider landscape. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing.	Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	The proposed route would have the potential to result in losses of trees with Tree Preservation Orders at the proposed Park and Ride site at the western end of the scheme. To permit the access roads into and out of the proposed Park and Ride site. There could be some impact on TPO trees on Madingley Road east of the M11 due to works impacting the root bowl of the trees.
	There are a series of traditional orchards throughout the area which now account for 20% of the amount present in 1950. Losses are due to development, neglect and land use change. Small woodland blocks are notable features within the wider landscape, as part of historic parkland or within the wider agricultural landscape. Within Cambridge, mature trees are a notable feature of the environment and there are a large number of Tree Preservation Orders protecting them from development. Bourn Airport is a notable land-use feature between Upper Cambourne and Caldecote.					The proposed Park & Ride facility would result in a change in landcover from a part wood/grass parcel of land and part arable field to a hard-surfaced urban feature. A well-designed proposal could increase the vegetation coverage and biodiversity value of the site through planting proposals and retention of existing vegetation, where possible.
Summary of character	Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS16 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area.					However, outside of these localised effects, the impact on landcover would be limited so overall this proposal would result in a Minor Adverse to Moderate Adverse.
	Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW1 of Proposed Submission SC Local Plan).					
	The study area is located within National Character Area 88: Bedfordshire and Cambridgeshire Claylands and the Cambridge landscape character area West Cambridge Claylands.	Regional	A combination of scarce and commonplace features at the local level	Medium	Generally not substitutable	The proposal would result in the widening of the existing road corridor and in most cases the impacts would be small scale and localised. The proposed Park & Ride facility would result in small scale, localised impacts on the overall landscape character but there is considerable scope to mitigate these and to integrate the proposal into the landscape during the detailed design stage.
	It can be characterised by the rural landscape containing smaller settlements, main road corridors and the number of historic features within the area such as Registered Parks and Gardens, Listed Buildings and Scheduled Monuments.					The key issues resulting from this proposal are the possibility for adverse effects on a Grade I Park and Garden, the scale of vegetation removal required along the route and potential or otherwise to be able to replace or mitigate these removals. Overall, the magnitude of impact is assessed to be Minor Adverse to Moderate Adverse.

Reference Sources

The following sources have been used in the preparation of this WebTAG worksheet:

- DfT TAG Unit A3, December 2015 (www.gov.uk/transport-analysis-guidance-webtag)
- Drawings 5020059_HW_FS_110 to 5020059_HW_FS_160 issued 12th April 2018
- A428 Cambourne to Cambridge Better Bus Journeys, Landscape and Planning Appraisal, Atkins, January 2017
- A428 Cambourne to Cambridge Better Bus Journeys, Green Lane Concept, Atkins and Strutt & Parker, August 2017

Step 5 - Summary Assessment Score

Moderate Adverse

Qualitative Comments

On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Minor Adverse to Moderate Adverse impact. This is to identify that the proposal:

- out of scale with the landscape, or at odds with the local landscape pattern and landform (Moderate Adverse)
- although not very visually intrusive, will impact on certain views into and across the area (Minor Adverse)
- cannot be completely integrated because of the nature of the scheme itself or the character of the landscape through which it passes (Minor Adverse)
- will have an adverse impact on a landscape of recognised quality or on vulnerable and important characteristics or elements (Moderate Adverse)
- conflicts with local authority policies for protecting the local character of the countryside (Minor Adverse)

TAG Landscape Impacts Worksheet (Phase 1)

Low Cost b

Features	Step 2	Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Low Cost b Impact
Pattern	The area is part of the rural lowland mosaic and West Cambridge Claylands. Fields tend to be of medium size, although generally smaller around the rural settlements, and the pattern is post Enclosure. Fields are generally bounded by either open ditches or sparse closely trimmed hedgerows (with denser more intact hedgerows generally located closer towards the city of Cambridge), both containing a variable number and quality of hedger trees.	Local	Commonplace at the local level	Low	Not substitutable	The proposed route option would constitute the widening of the existing road corridor on the northern and southern sides from Madingley Mulch roundabout heading east to Cambridge.
	The local road network of rural lanes integrates well with the field pattern but the larger corridors of the A428, A1303, M11 and A14 transect the field pattern with their linear form. The topography of the area is generally low-lying to the west within and around Cambridge, rising west of Coton towards Camboorne. The Bourn Brook valley and Red Meadow Hill are notable topographic features.					The proposed Park & Ride facility adjacent to Scotland Farm would occupy part of a single field. Loss of existing hedgerow will be minimal but the facility's positioning directly adjacent to the A428, Scotland road and the junction of these two roads, will limit its intrusion into the agricultural field pattern and will mean the addition of a slightly incongruous element within the pattern of the immediate landscape. This route would be broadly consistent with the existing landscape pattern. The main alterations to the landscape pattern would be through the loss of roadside vegetation and trees on both sides of the road. There is the potential to replace this vegetation in the more rural areas but this will be limited in certain areas, particularly east of the M11. Overall this would result in a Minor Adverse magnitude of impact to the landscape pattern, depending on the amount, location and quality of the vegetation lost and its substitutability.
Tranquillity	The CPRE tranquillity map identifies the broad range of tranquillity across the study area (assessed in 2007). Within the study area there is a noticeable decrease in tranquillity to the west in and around Cambridge. Other less tranquil places include alongside the major road corridors of the A428, M11 and A14 and within smaller rural settlements.	Local	Commonplace at the local level	Medium	Not substitutable	The proposed widening of the bus corridor heading east from the roundabout would result in a loss of vegetation (including some larger trees) and an increase in the prominence of the A1303 road corridor within the landscape. This change is limited by the presence of the M11 and A428. However, there may be a change to the tranquillity and/or visual intrusion for visitors to the American Military Cemetery due to periodic bus movements.
	Notable trends from the 1960s to 2007 are light pollution resulting from intensive agriculture, growth of settlements and road infrastructure improvements, particularly apparent in the low-lying areas. Areas that a relatively tranquil within the local context include the fields west of Grange Road, Coton Countryside Reserve and the American Military Cemetery.					The proposed Park & Ride facility would result in an increase in traffic movements, lighting and visual intrusion adjacent to the A428-Scotland Road junction and Scotland road. There would also be a reduction in the tranquillity of the landscape to the north and east of the facility. However, this change is limited by the presence of the A428 and an existing industrial estate in the direct vicinity. These changes would result in visual intrusion, with the degree and duration of negative impact upon tranquillity dependant on the scope of mitigation/replacement planting which could be achieved along the route and surrounding the Park & Ride facility. However, given the nature of the existing road corridor, with its already reduced tranquillity, and existing features, a Minor Adverse impact has been assessed.
Cultural	Recreation is a significant ecosystem service in this National Character Area. It is generally low key, close to the main urban populations and associated with the river valleys, existing sites and restored post industrial landscapes. There is an extensive network of public rights of way and bridleways through the area. There are a number of listed buildings and scheduled monuments within the wider landscape and conservation areas covering rural settlements including Hardwick, Coton, Madingley, and the west of Cambridge (West Cambridge, Conduit Head Road and Storey's Way).	Regional	Commonplace at the local level	High	Not substitutable	The proposed route would pass directly adjacent to the Madingley Wood ancient and semi-natural woodland (which is also an SSSI) with a potential for loss of edge vegetation and trees outside the SSSI within the road corridor, encroach upon and alter the access arrangements to, the Grade I Registered Park and Garden of the American Military. There would also potentially be a loss of trees on both sides of the A1303 moving towards the M11 (opposite Cambridge Road to Coton). The scheme potentially affects the distant setting of the Coton Conservation area. The conservation areas on the western edge of Cambridge, Conduit Road and Storeys Way, are more vulnerable to impact from the proposal. The proposed route runs along the entire southern boundary of the Conduit Head area, may cause damage to some of the larger trees along this southern fringe and would affect the setting for the area. The proposal is slightly further away from the Storeys Way area and so has little chance of direct impact but the possibility remains that the proposal may affect it's setting
	Registered Parks and Gardens within the area include the Grade I American Military Cemetery and Grade II Madingley Hall. Coton Country Park is located south of Coton and west of the M11, and is "managed to enhance the local landscape and benefit wildlife, it's a great place to experience the changing seasons with wildlife habitats, a hilltop picnic area, panoramic views, and routes for walkers, cyclists, runners, disabled people and horse riders that link to adjacent public footpaths and bridleways." (www.cambridgepf.org). From several locations, including Red Meadow Hill and from/around the M11 corridor, there are panoramic views east, towards the historic city skyline. The University Library, Addenbrooke's chimney and various church spires are important landmarks of Cambridge. National Cycle Routes 11, 51 and Regional Cycle Route 24 pass north-south through the west of the area.					The proposed Park & Ride facility is not located within the boundary or setting of any conservation areas and is not directly adjacent to any notable landscape features. The loss of vegetation and increase in prominence of the A1303 road corridor would have a negative impact on the setting of these features, with the degree and duration of negative impact dependent upon the scope of mitigation/replacement planting which could be achieved along the route. Although the Park & Ride facility would have minimal impact on the cultural aspect, the proposal's route directly adjacent to an Ancient Woodland low substitutability means that due to the possibility of adverse effects upon this feature, a Minor Adverse to Moderate Adverse impact is assessed.
Landcover	The landcover is primarily rural with the exception of Cambridge to the east, Camboorne in the west and rural settlements within the wider landscape. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing.	Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	There could be some impact on TPO trees on Madingley Road east of the M11 due to works impacting the root bowl of the trees.
	There are a series of traditional orchards throughout the area which now account for 20% of the amount present in 1950. Losses are due to development, neglect and land use change. Small woodland blocks are notable features within the wider landscape, as part of historic parkland or within the wider agricultural landscape. Within Cambridge, mature trees are a notable feature of the environment and there are a large number of Tree Preservation Orders protecting them from development. Bourn Airport is a notable land-use feature between Upper Camboorne and Caldecote. Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS/6 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area. Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW 1 of Proposed Submission SC Local Plan).					The proposed Park & Ride facility would result in a change in landcover from an arable field to a hard-surfaced urban feature. A well-designed proposal could increase the vegetation coverage and biodiversity value of the site through planting proposals and retention of existing vegetation, where possible. However, outside of these localised effects, the impact on landcover would be limited so overall this proposal would result in a Minor Adverse impact.
Summary of character	The study area is located within National Character Area 88: Bedfordshire and Cambridgeshire Claylands and the Cambridge landscape character area West Cambridge Claylands. It can be characterised by the rural landscape containing smaller settlements, main road corridors and the number of historic features within the area such as Registered Parks and Gardens, Listed Buildings and Scheduled Monuments.	Regional	A combination of scarce and commonplace features at the local level	Medium	Generally not substitutable	The widening of the existing road corridor and in most cases the impacts would be small scale and localised. The proposed Park & Ride facility would result in small scale, localised impacts on the overall landscape character but there is considerable scope to mitigate these and to integrate the proposal into the landscape during the detailed design stage. The key issues resulting from this proposal are the possibility for adverse effects on a Grade I Park and Garden, the scale of vegetation removal required along the route and potential or otherwise to be able to replace or mitigate these removals. Overall, the magnitude of impact is assessed to be Minor Adverse to Moderate Adverse.

Reference Sources

The following sources have been used in the preparation of this West TAG worksheet.

- DfT TAG Unit A3, December 2015 (www.gov.uk/transport-analysis-guidance-webtag)
- Drawings 5020059_HW_FS_110 to 5020059_HW_FS_160 issued 12th April 2018
- A428 Camboorne to Cambridge Better Bus Journey: Landscape and Planning Appraisal, Atkins, January 2017.

Step 5 - Summary Assessment Score

Moderate adverse

Qualitative Comments

On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Minor Adverse to Moderate Adverse impact. This is to identify that the proposal:

- does not quite fit the landform and scale of the landscape (Minor Adverse)
- although not very visually intrusive, will impact on certain views into and across the area (Minor Adverse)
- cannot be completely integrated because of the nature of the scheme itself or the character of the landscape through which it passes (Minor Adverse)
- will have an adverse impact on a landscape of recognised quality or on vulnerable and important characteristics or elements (Moderate Adverse)
- in conflict with local and national policies to protect open land and nationally recognised countryside (Moderate Adverse)

Features	Step 2	Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Do Something 1a Impact
Pattern	<p>The area is part of the rural lowland mosaic and West Cambridge Claylands. Fields tend to be of medium size, although generally smaller around the rural settlements, and the pattern is post Enclosure. Fields are generally bounded by either open ditches or sparse closely trimmed hedgerows (with denser more intact hedgerows generally located closer towards the city of Cambridge), both containing a variable number and quality of hedger trees.</p> <p>The local road network of rural lanes integrates well with the field pattern but the larger corridors of the A428, A1303, M11 and A14 transect the field pattern with their linear form. The topography of the area is generally low-lying to the west within and around Cambridge, rising west of Coton towards Cambourne. The Bourn Brook valley and Red Meadow Hill are notable topographic features.</p>	Local	Commonplace at the local level	Low	Not substitutable	<p>The proposed route, a dedicated bus link, would transect the agricultural landscape and associated field boundaries south of St Neots Road, running broadly parallel to it, from Madingley Mulch Roundabout to the intersection with Cambridge Road. The proposal then runs along the southern edge of a traditional orchard, replacing an existing field boundary. The proposal would then cross the M11, following an existing field boundary east before diverting southeast and once more bisecting an agricultural field before linking in to an existing track and intersecting Grange Road on the western edge of Cambridge.</p> <p>The proposed Park & Ride facility adjacent to Madingley Mulch Roundabout would occupy part of two fields. Loss of existing hedgerow will be relatively limited but the facility's positioning will mean the addition of an incongruous element within the pattern of the immediate landscape.</p> <p>This route follows the existing field patterns in part but does transect agricultural land at several points. The main alterations to the landscape pattern would be through the loss of vegetation where the route cuts through existing boundaries and the transactions of several agricultural fields. There is the potential to replace some of this vegetation in the more rural areas but this will be limited in other areas. The adjustment of some field patterns would be permanent.</p> <p>Overall this would result in a Moderate Adverse magnitude of impact to the landscape pattern, depending on the amount, location and quality of the vegetation lost and its substitutability.</p>
	<p>The CPRE tranquillity map identifies the broad range of tranquillity across the study area (assessed in 2007). Within the study area there is a noticeable decrease in tranquillity to the west in and around Cambridge. Other less tranquil places include alongside the major road corridors of the A428, M11 and A14 and within smaller rural settlements.</p> <p>Notable trends from the 1960s to 2007 are light pollution resulting from intensive agriculture, growth of settlements and road infrastructure improvements, particularly apparent in the low-lying areas.</p> <p>Areas that a relatively tranquil within the local context include the fields west of Grange Road, Coton Countryside Reserve and the American Military Cemetery.</p>	Local	Commonplace at the local level	Medium	Not substitutable	<p>The proposed route of the bus corridor heading east from the roundabout would mean that views of the corridor itself would be restricted but fleeting views of the buses would be available, from the surrounding countryside and nearby bridleway, whilst they move through the landscape. The tranquillity of these sections of countryside would also be impacted due to the presence of constructed and mechanised intrusions into what is currently open fields.</p> <p>The proposed Park & Ride facility would result in an increase in traffic movements, lighting and visual intrusion adjacent to Madingley Mulch Roundabout. There would also be a reduction in the tranquillity of the landscape to the east, west and south of the facility. However, this change is limited by the presence of an existing concrete depot and communications mast in the direct vicinity.</p> <p>These changes would result in visual intrusion, with the degree and duration of negative impact upon tranquillity dependant on the scope of mitigation/replacement planting which could be achieved along the route and surrounding the Park & Ride facility. However, given that the nature of the area itself is of reduced tranquillity already, especially west of the M11, a Minor Adverse to Moderate Adverse impact has been assessed.</p>
Cultural	<p>Recreation is a significant ecosystem service in this National Character Area. It is generally low key, close to the main urban populations and associated with the river valleys, existing sites and restored post industrial landscapes. There is an extensive network of public rights of way and bridleways through the area.</p> <p>There are a number of listed buildings and scheduled monuments within the wider landscape and conservation areas covering rural settlements including Hardwick, Coton, Madingley, and the west of Cambridge (West Cambridge, Conduit Head Road and Storey's Way).</p> <p>Registered Parks and Gardens within the area include the Grade I American Military Cemetery and Grade II Madingley Hall. Coton Country Park is located south of Coton and west of the M11, and is "managed to enhance the local landscape and benefit wildlife, it's a great place to experience the changing seasons with wildlife habitats, a hilltop picnic area, panoramic views, and routes for walkers, cyclists, runners, disabled people and horse riders that link to adjacent public footpaths and bridleways." (www.cambridgepf.org).</p> <p>From several locations, including Red Meadow Hill and from/around the M11 corridor, there are panoramic views east, towards the historic city skyline. The University Library, Addenbrooke's chimney and various church spires are important landmarks of Cambridge. National Cycle Routes 11, 51 and Regional Cycle Route 24 pass north-south through the west of the area.</p>	Regional	Commonplace at the local level	High	Not substitutable	<p>The proposed route would pass within 50m of the northern edge of the Coton Conservation area, causing a loss of vegetation that would have a negative impact on its setting, with the degree and duration of negative impact dependent upon the scope of mitigation/replacement planting which could be achieved along the route. The proposal also runs along the southern edge of a traditional orchard, removing existing vegetation and altering its setting. At the eastern end of the route, the bus corridor would run directly adjacent to the West Cambridge Conservation Area, south of a row of houses and campus buildings and within the route of an existing track. The proposal would lead to an increase of traffic movements through the area and adversely affect the setting of, and views from, the gardens of the houses.</p> <p>The proposed Park & Ride facility is not located within any conservation areas and is not directly adjacent to any notable landscape features.</p> <p>Other features of note, such as Madingley Wood ancient and semi-natural woodland (which is also an SSSI) or the Grade I Registered Park and Garden of the American Military Cemetery, are unlikely to be affected due to the nature and scale of the proposal.</p> <p>Although the Park & Ride facility would have minimal impact on the cultural aspect, the proposal will directly affect the traditional orchard and West Cambridge Conservation Area and, to a lesser extent, indirectly affect Coton Conservation area and so a Moderate Adverse Impact is assessed.</p>
	<p>The landcover is primarily rural with the exception of Cambridge to the east, Cambourne in the west and rural settlements within the wider landscape. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing.</p> <p>There are a series of traditional orchards throughout the area which now account for 20% of the amount present in 1950. Losses are due to development, neglect and land use change. Small woodland blocks are notable features within the wider landscape, as part of historic parkland or within the wider agricultural landscape. Within Cambridge, mature trees are a notable feature of the environment and there are a large number of Tree Preservation Orders protecting them from development. Bourn Airport is a notable land-use feature between Upper Cambourne and Caldecote.</p> <p>Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS16 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area.</p> <p>Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW1 of Proposed Submission SC Local Plan).</p>	Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	<p>At the western end of the proposed route it intersects with large group of trees that are subject to a TPO around the northern and western side of the field where the Water Works P&R would be constructed. The proposed scheme would cause some of the trees to be removed for the entrance and exit roads from the P&R that would see a localised change to the tree cover. The proposal would also result in the loss of some narrow sections of agricultural land as well as existing hedgerows and the southern edge of a traditional orchard north of Coton.</p> <p>At the eastern end of the route on the Rifle Range Road there are three TPOs trees that will need special design messages to minimise impacts on their root bowls but there could still some Minor impact on the trees as they could have to be pruned for operational use of the busway.</p> <p>The proposed Park & Ride facility would result in a change in landcover from part wooded and grassland and part arable field to a hard-surfaced urban feature. A well-designed proposal could increase the vegetation coverage and biodiversity value of the site through planting proposals and retention of existing vegetation, where possible in place of agricultural fields.</p> <p>However, outside of these localised effects, the impact on landcover would be limited so overall this proposal would result in a Minor Adverse impact.</p>
Summary of character	<p>The study area is located within National Character Area 88: Bedfordshire and Cambridgeshire Claylands and the Cambridge landscape character area West Cambridge Claylands.</p> <p>It can be characterised by the rural landscape containing smaller settlements, main road corridors and the number of historic features within the area such as Registered Parks and Gardens, Listed Buildings and Scheduled Monuments.</p>	Regional	A combination of scarce and commonplace features at the local level	Medium	Generally not substitutable	<p>The proposed route and the Park & Ride facility would result in small scale, localised impacts on the overall landscape character but there is considerable scope to mitigate these and to integrate the proposal into the landscape during the detailed design stage.</p> <p>The key issues resulting from this proposal are the possibility for adverse effects on the Conservations Area at Coton and the nearby traditional orchard as well as the segmentation of the strongly defined agricultural field pattern. Overall, the magnitude of impact is assessed to be Minor Adverse to Moderate Adverse.</p>

Reference Sources

The following sources have been used in the preparation of this WebTAG worksheet:

- DfT TAG Unit A3, December 2015 (www.gov.uk/transport-analysis-guidance-webtag)
- Drawings 5020059_HW_FS_110 to 5020059_HW_FS_160 issued 12th April 2018
- A428 Cambridge to Cambourne Better Bus Journey: Landscape and Planning Appraisal Atkins January 2017

Step 5 - Summary Assessment Score

Minor Adverse to Moderate Adverse

Qualitative Comments

On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Minor Adverse to Moderate Adverse impact. This is to identify that the proposal:

- at odds with the landscape, or at odds with the local pattern and landform (Moderate Adverse)
- although not very visually intrusive, will impact on certain views into and across the area (Minor Adverse)
- cannot be completely integrated because of the nature of the scheme itself or the character of the landscape through which it passes (Minor Adverse)
- affects an area of recognised landscape quality (Minor Adverse)
- in conflict with local and national policies to protect open land and nationally recognised countryside (Moderate Adverse)

TAG Landscape Impacts Worksheet (Phase 1)

Do Something 1b

Features	Step 2	Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Do Something 1b Impact
Pattern	<p>The area is part of the rural lowland mosaic and West Cambridge Claylands. Fields tend to be of medium size, although generally smaller around the rural settlements, and the pattern is post Enclosure. Fields are generally bounded by either open ditches or sparse closely trimmed hedgerows (with denser more intact hedgerows generally located closer towards the city of Cambridge), both containing a variable number and quality of hedger trees.</p> <p>The local road network of rural lanes integrates well with the field pattern but the larger corridors of the A428, A1303, M11 and A14 transect the field pattern with their linear form. The topography of the area is generally low-lying to the west within and around Cambridge, rising west of Coton towards Cambourne. The Bourn Brook valley and Red Meadow Hill are notable topographic features.</p>	Local	Commonplace at the local level	Low	Not substitutable	<p>The proposed route, a dedicated bus link, would transect the agricultural landscape and associated field boundaries south of St Neots Road, running broadly parallel to it, from Madingley Mulch Roundabout to the intersection with Cambridge Road. The proposal then runs along the southern edge of a traditional orchard, replacing an existing field boundary. The proposal would then cross the M11, following an existing field boundary east before diverting southeast and once more bisecting an agricultural field before linking in to an existing track and intersecting Grange Road on the western edge of Cambridge.</p> <p>The proposed Park & Ride facility adjacent to Scotland Farm would occupy part of a single field. Loss of existing hedgerow will be minimal but the facility's positioning will mean the addition of a slightly incongruous element within the pattern of the immediate landscape.</p> <p>This route follows the existing field patterns in part but does transect agricultural land at several points. The main alterations to the landscape pattern would be through the loss of vegetation where the route cuts through existing boundaries and the transections of several agricultural fields. There is the potential to replace some of this vegetation in the more rural areas but this will be limited in other areas. The adjustment of some field patterns would be permanent.</p> <p>The Park & Ride facility would constitute development set back from the road, protruding into the agricultural field and not set within existing field patterns, a typology not generally found within the local area.</p> <p>Overall this would result in a Moderate Adverse magnitude of impact to the landscape pattern, depending on the amount, location and quality of the vegetation lost and its substitutability.</p>
	<p>The CPRE tranquillity map identifies the broad range of tranquillity across the study area (assessed in 2007). Within the study area there is a noticeable decrease in tranquillity to the west in and around Cambridge. Other less tranquil places include alongside the major road corridors of the A428, M11 and A14 and within smaller rural settlements.</p> <p>Notable trends from the 1960s to 2007 are light pollution resulting from intensive agriculture, growth of settlements and road infrastructure improvements, particularly apparent in the low-lying areas.</p> <p>Areas that a relatively tranquil within the local context include the fields west of Grange Road, Coton Countryside Reserve and the American Military Cemetery.</p>	Local	Commonplace at the local level	Medium	Not substitutable	<p>The proposed route of the bus corridor heading east from the roundabout would mean that views of the corridor itself would be restricted but fleeting views of the buses would be available, from the surrounding countryside and nearby bridleway, whilst they move through the landscape. The tranquillity of these sections of countryside would also be impacted due to the presence of constructed and mechanised intrusions on what is currently open fields.</p> <p>The proposed Park & Ride facility would result in an increase in traffic movements, lighting and visual intrusion adjacent to the A428-Scotland Road junction and Scotland road. There would also be a reduction in the tranquillity of the landscape to the north and east of the facility. However, this change is limited by the presence of the A428 and an existing industrial estate in the vicinity.</p> <p>These changes would result in visual intrusion, with the degree and duration of negative impact upon tranquillity dependant on the scope of mitigation/replacement planting which could be achieved along the route. However, given that the nature of the area itself is of reduced tranquillity already, especially west of the M11, a Minor Adverse to Moderate Adverse impact has been assessed.</p>
Cultural	<p>Recreation is a significant ecosystem service in this National Character Area. It is generally low key, close to the main urban populations and associated with the river valleys, existing sites and restored post industrial landscapes. There is an extensive network of public rights of way and bridleways through the area.</p> <p>There are a number of listed buildings and scheduled monuments within the wider landscape and conservation areas covering rural settlements including Hardwick, Coton, Madingley, and the west of Cambridge (West Cambridge, Conduit Head Road and Storey's Way).</p> <p>Registered Parks and Gardens within the area include the Grade I American Military Cemetery and Grade II Madingley Hall. Coton Country Park is located south of Coton and west of the M11, and is "managed to enhance the local landscape and benefit wildlife, it's a great place to experience the changing seasons with wildlife habitats, a hilltop picnic area, panoramic views, and routes for walkers, cyclists, runners, disabled people and horse riders that link to adjacent public footpaths and bridleways." (www.cambridgepf.org).</p> <p>From several locations, including Red Meadow Hill and from/around the M11 corridor, there are panoramic views east, towards the historic city skyline. The University Library, Addenbrooke's chimney and various church spires are important landmarks of Cambridge. National Cycle Routes 11, 51 and Regional Cycle Route 24 pass north-south through the west of the area.</p>	Regional	Commonplace at the local level	High	Not substitutable	<p>The proposed route would pass within 50m of the northern edge of the Coton Conservation area, causing a loss of vegetation that would have a negative impact on its setting, with the degree and duration of negative impact dependent upon the scope of mitigation/replacement planting which could be achieved along the route. The proposal also runs along the southern edge of a traditional orchard, removing existing vegetation and altering its setting. At the eastern end of the route, the bus corridor would run directly adjacent to the West Cambridge Conservation Area, south of a row of houses and campus buildings and within the route of an existing track. The proposal would lead to an increase of traffic movements through the area and adversely affect the setting of, and views from, the gardens of the houses.</p> <p>The proposed Park & Ride facility is not located within any conservation areas and is not directly adjacent to any notable landscape features.</p> <p>Other features of note, such as Madingley Wood ancient and semi-natural woodland (which is also an SSSI) or the Grade I Registered Park and Garden of the American Military Cemetery, are unlikely to be affected due to the nature and scale of the proposal.</p> <p>Although the Park & Ride facility would have minimal impact on the cultural aspect, the proposal will directly affect the traditional orchard and West Cambridge Conservation Area and, to a lesser extent, indirectly affect Coton Conservation area and so a Moderate Adverse impact is assessed.</p>
	<p>The landcover is primarily rural with the exception of Cambridge to the east, Cambourne in the west and rural settlements within the wider landscape. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing.</p> <p>There are a series of traditional orchards throughout the area which now account for 20% of the amount present in 1950. Losses are due to development, neglect and land use change. Small woodland blocks are notable features within the wider landscape, as part of historic parkland or within the wider agricultural landscape. Within Cambridge, mature trees are a notable feature of the environment and there are a large number of Tree Preservation Orders protecting them from development. Bourn Airport is a notable land-use feature between Upper Cambourne and Caldecote.</p> <p>Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS16 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area.</p> <p>Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW1 of Proposed Submission SC Local Plan).</p>	Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	<p>At the western end of the proposed route crosses St Neots Road, it intersects with large group of trees that are subject to a TPO. Their partial removal would see a change to the vegetative cover in the localised area. The proposal would also result in the loss of some narrow sections of agricultural land as well as existing hedgerows and the southern edge of a traditional orchard north of Coton.</p> <p>At the eastern end of the route on the Rifle Range Road there are three TPOs trees that will need special design messages to minimise impacts on their root bowls but there could still some Minor impact on the trees as they could have to be pruned for operational use of the busway.</p> <p>The proposed Park & Ride facility would result in a change in landcover from an arable field to a hard-surfaced urban feature. A well-designed proposal could increase the vegetation coverage and biodiversity value of the site through planting proposals and retention of existing vegetation, where possible in place of agricultural fields.</p> <p>However, outside of these localised effects, the impact on landcover would be limited so overall this proposal would result in a Minor Adverse impact.</p>
Summary of character	<p>The study area is located within National Character Area 68: Bedfordshire and Cambridgeshire Claylands and the Cambridge landscape character area West Cambridge Claylands.</p> <p>It can be characterised by the rural landscape containing smaller settlements, main road corridors and the number of historic features within the area such as Registered Parks and Gardens, Listed Buildings and Scheduled Monuments.</p>	Regional	A combination of scarce and commonplace features at the local level	Medium	Generally not substitutable	<p>The proposed route and the Park & Ride facility would result in small scale, localised impacts on the overall landscape character but there is considerable scope to mitigate these and to integrate the proposal into the landscape during future design stages.</p> <p>The key issues resulting from this proposal are the possibility for adverse effects on the Conservations Area at Coton and the nearby traditional orchard as well as the segmentation of the strongly defined agricultural field pattern. Overall, the magnitude of impact is assessed to be Minor Adverse to Moderate Adverse.</p>

Reference Sources

The following sources have been used in the preparation of this WebTAG worksheet:

- DfT TAG Unit A3, December 2015 (www.gov.uk/transport-analysis-guidance-webtag)
- Drawings 502059_HW_FS_110 to 502059_HW_FS_160 issued 12th April 2016
- A428 Cambourne to Cambridge Better Bus Journeys, Landscape and Planning Appraisal, Atkins, January 2017
- A428 Cambourne to Cambridge Better Bus Journeys, Green Lane Concept, Atkins and Strutt & Parker, August 2017

Step 5 - Summary Assessment Score

Minor Adverse to Moderate Adverse

Qualitative Comments

On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Minor Adverse to Moderate Adverse impact. This is to identify that the proposal:

- at odds with the landscape, or at odds with the local pattern and landform (Moderate Adverse)
- although not very visually intrusive, will impact on certain views into and across the area (Minor Adverse)
- cannot be completely integrated because of the nature of the scheme itself or the character of the landscape through which it passes (Minor Adverse)
- affects an area of recognised landscape quality (Minor Adverse)
- in conflict with local and national policies to protect open land and nationally recognised countryside (Moderate Adverse)

TAG Landscape Impacts Worksheet (Phase 1 + Phase 2)

Illustrative Comparator A

Features	Step 2	Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Illustrative Comparator A Impact
Pattern	<p>The area is part of the rural lowland mosaic and West Cambridge Claylands. Fields tend to be of medium size, although generally smaller around the rural settlements, and the pattern is post Enclosure. Fields are generally bounded by either open ditches or sparse closely trimmed hedgerows (with denser more intact hedgerows generally located closer towards the city of Cambridge), both containing a variable number and quality of hedger trees.</p> <p>The local road network of rural lanes integrates well with the field pattern but the larger corridors of the A428, A1303, M11 and A14 transect the field pattern with their linear form. The topography of the area is generally low-lying to the west within and around Cambridge, rising west of Coton towards Camboorne. The Bourn Brook valley and Red Meadow Hill are notable topographic features.</p>	Local	Commonplace at the local level	Low	Not substitutable	<p>The proposed route, commencing from the eastern edge of Upper Camboorne, would run east along the northern edge of the Bourn Airfield, parallel and in close proximity to the A428. The proposal maintains this proximity to the existing road corridor, continuing along the northern edge of Hardwick within the highway corridor up to the Madingley Interchange. From the Park & Ride facility at Madingley Mulch roundabout, a dedicated bus link would transect the agricultural landscape and associated field boundaries south of St Neots Road, running broadly parallel to it, from Madingley Mulch Roundabout to the intersection with Cambridge Road. The proposal then runs along the southern edge of a traditional orchard, replacing an existing field boundary. The proposal would then cross the M11, following an existing field boundary east before diverting southeast and once more bisecting an agricultural field before linking in to an existing track and intersecting Grange Road on the western edge of Cambridge.</p> <p>The proposed Park & Ride facility adjacent to Madingley Mulch Roundabout would occupy part of two fields. Loss of existing hedgerow will be relatively limited but the facility's positioning will mean the addition of an incongruous element within the pattern of the immediate landscape.</p> <p>This route follows the existing field patterns and runs adjacent to the existing road corridor for the length of route west of Long Road but does transect agricultural land at several points further east. The main alterations to the landscape pattern would be through the loss of vegetation where the route cuts through existing boundaries and the transactions of several agricultural fields. There is the potential to replace some of this vegetation in the more rural areas but this will be limited in other areas. The adjustment of some field patterns would be permanent.</p> <p>The Park & Ride facility would constitute development set back from the road, protruding into the agricultural field and not set within existing field patterns, a typology not generally found within the local area.</p> <p>Overall this would result in a Moderate Adverse magnitude of impact to the landscape pattern, depending on the amount, location and quality of the vegetation lost and its substitutability.</p>
	<p>The CPRE tranquillity map identifies the broad range of tranquillity across the study area (assessed in 2007). Within the study area there is a noticeable decrease in tranquillity to the west in and around Cambridge. Other less tranquil places include alongside the major road corridors of the A428, M11 and A14 and within smaller rural settlements.</p> <p>Notable trends from the 1960s to 2007 are light pollution resulting from intensive agriculture, growth of settlements and road infrastructure improvements, particularly apparent in the low-lying areas.</p> <p>Areas that a relatively tranquil within the local context include the fields west of Grange Road, Coton Countryside Reserve and the American Military Cemetery.</p>	Local	Commonplace at the local level	Medium	Not substitutable	<p>The proposed route of the bus corridor west of Madingley Mulch Roundabout means that it ties into the existing road corridor quite closely, reducing tranquillity by a negligible amount. As the proposal continues east from the roundabout, views of the corridor itself would be restricted but fleeting views of the buses would be available, from the surrounding countryside and nearby brideway, whilst they move through the landscape. The tranquillity of these sections of countryside would also be impacted due to the presence of constructed and mechanised intrusions into what is currently open fields.</p> <p>The proposed Park & Ride facility would result in an increase in traffic movements, lighting and visual intrusion adjacent to Madingley Mulch Roundabout. There would also be a reduction in the tranquillity of the landscape to the east, west and south of the facility. However, this change is limited by the presence of an existing concrete depot and communications mast in the direct vicinity.</p> <p>These changes would result in visual intrusion, with the degree and duration of negative impact upon tranquillity dependant on the scope of mitigation/replacement planting which could be achieved along the route and surrounding the Park & Ride facility. However, given that the nature of the area itself is of reduced tranquillity already, especially adjacent to the A248 and west of the M11, a Minor Adverse to Moderate Adverse impact has been assessed.</p>
Cultural	<p>Recreation is a significant ecosystem service in this National Character Area. It is generally low key, close to the main urban populations and associated with the river valleys, existing sites and restored post industrial landscapes. There is an extensive network of public rights of way and bridleways through the area.</p> <p>There are a number of listed buildings and scheduled monuments within the wider landscape and conservation areas covering rural settlements including Hardwick, Coton, Madingley, and the west of Cambridge (West Cambridge, Conduit Head Road and Storey's Way).</p> <p>Registered Parks and Gardens within the area include the Grade I American Military Cemetery and Grade II Madingley Hall. Coton Country Park is located south of Coton and west of the M11, and is "managed to enhance the local landscape and benefit wildlife, it's a great place to experience the changing seasons with wildlife habitats, a hilltop picnic area, panoramic views, and routes for walkers, cyclists, runners, disabled people and horse riders that link to adjacent public footpaths and bridleways." (www.cambridgepf.org).</p> <p>From several locations, including Red Meadow Hill and from/around the M11 corridor, there are panoramic views east, towards the historic city skyline. The University Library, Addenbrooke's chimney and various church spires are important landmarks of Cambridge. National Cycle Routes 11, 51 and Regional Cycle Route 24 pass north-south through the west of the area.</p>	Regional	Commonplace at the local level	High	Not substitutable	<p>The section of the route west of the Scotland Road - A428 junction is not located within any conservation areas and is not directly adjacent to any noteworthy landscape features.</p> <p>The route then crosses Neots Road where it intersects with large group of trees immediately east of the junction of Long Road and Neots Road that are subject to a TPO. Their partial removal would see the a valuable landscape feature negatively impacted, both physically and in setting.</p> <p>As the route progresses east it would pass within 50m of the northern edge of the Coton Conservation area, causing a loss of vegetation that would have a negative impact on its setting, with the degree and duration of negative impact dependent upon the scope of mitigation/replacement planting which could be achieved along the route. The proposal also runs along the southern edge of a traditional orchard, removing existing vegetation and altering its setting. At the eastern end of the route, the bus corridor would run directly adjacent to the West Cambridge Conservation Area, south of a row of houses and campus buildings and within the route of an existing track. The proposal would lead to an increase of traffic movements through the area and adversely affect the setting of, and views from, the gardens of the houses.</p> <p>The proposed Park & Ride facility is not located within any conservation areas and is not directly adjacent to any noteworthy landscape features.</p> <p>Other features of note, such as Madingley Wood ancient and semi-natural woodland (which is also an SSSI) or the Grade I Registered Park and Garden of the American Military Cemetery, are unlikely to be affected due to the nature and scale of the proposal.</p> <p>Although the Park & Ride facility would have minimal impact on the cultural aspect, the proposal will directly affect the traditional orchard and West Cambridge Conservation Area and, to a lesser extent, indirectly affect Coton Conservation area and so a Moderate Adverse impact is assessed.</p>
	<p>The landcover is primarily rural with the exception of Cambridge to the east, Camboorne in the west and rural settlements within the wider landscape. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing.</p> <p>There are a series of traditional orchards throughout the area which now account for 20% of the amount present in 1950. Losses are due to development, neglect and land use change. Small woodland blocks are notable features within the wider landscape, as part of historic parkland or within the wider agricultural landscape. Within Cambridge, mature trees are a notable feature of the environment and there are a large number of Tree Preservation Orders protecting them from development. Bourn Airport is a notable land-use feature between Upper Camboorne and Caldecote.</p> <p>Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS16 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area.</p> <p>Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW1 of Proposed Submission SC Local Plan).</p>	Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	<p>Close to where the proposed route crosses St Neots Road, it intersects with large group of trees that are subject to a TPO. Their partial removal would see a change to the vegetative cover in the localised area. The proposal would also result in the loss of some narrow sections of agricultural land as well as existing hedgerows and the southern edge of a traditional orchard north of Coton.</p> <p>At the eastern end of the route on the Rifle Range Road there are three TPOs trees that will need special design messages to minimise impacts on their root bowls but there could still some Minor impact on the trees as they could have to be pruned for operational use of the busway.</p> <p>The proposed Park & Ride facility would result in a change in landcover from an arable field to a hard-surfaced urban feature. A well-designed proposal could increase the vegetation coverage and biodiversity value of the site through planting proposals and retention of existing vegetation, where possible in place of agricultural fields.</p> <p>However, outside of these localised effects, the impact on landcover would be limited so overall this proposal would result in a Minor Adverse impact.</p>
Summary of character	<p>The study area is located within National Character Area 88: Bedfordshire and Cambridgeshire Claylands and the Cambridge landscape character area West Cambridge Claylands.</p> <p>It can be characterised by the rural landscape containing smaller settlements, main road corridors and the number of historic features within the area such as Registered Parks and Gardens, Listed Buildings and Scheduled Monuments.</p>	Regional	A combination of scarce and commonplace features at the local level	Medium	Generally not substitutable	<p>The proposed route and the Park & Ride facility would result in small scale, localised impacts on the overall landscape character but there is considerable scope to mitigate these and to integrate the proposal into the landscape during future design stages.</p> <p>The key issues resulting from this proposal are the possibility for adverse effects on the Conservations Area at Coton and the nearby traditional orchard as well as the segmentation of the strongly defined agricultural field pattern. Overall, the magnitude of impact is assessed to be Minor Adverse to Moderate Adverse.</p>

Reference Sources

The following sources have been used in the preparation of this TAG worksheet:

- DfT TAG Unit A3, December 2015 (www.gov.uk/transport-analysis-guidance-webtag)
- Drawings 5020059_HW_FS_110 to 5020059_HW_FS_160 issued 12th April 2018
- A428 Camboorne to Cambridge Better Bus Journey - Landscape and Planning Appraisal - Atkins - January 2017

Step 5 - Summary Assessment Score

Minor Adverse to Moderate Adverse

Qualitative Comments

On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Minor Adverse to Moderate Adverse impact. This is to identify that the proposal:

- at odds with the landscape, or at odds with the local pattern and landform (Moderate Adverse)
- although not very visually intrusive, will impact on certain views into and across the area (Minor Adverse)
- cannot be completely integrated because of the nature of the scheme itself or the character of the landscape through which it passes (Minor Adverse)
- affects an area of recognised landscape quality (Minor Adverse)
- in conflict with local and national policies to protect open land and nationally recognised countryside (Moderate Adverse)

TAG Landscape Impacts Worksheet (Phase 1 + Phase 2)

Illustrative Comparator B

Features	Step 2	Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Illustrative Comparator B Impact
Pattern	<p>The area is part of the rural lowland mosaic and West Cambridge Claylands. Fields tend to be of medium size, although generally smaller around the rural settlements, and the pattern is post Enclosure. Fields are generally bounded by either open ditches or sparse closely trimmed hedgerows (with denser more intact hedgerows generally located closer towards the city of Cambridge), both containing a variable number and quality of hedger trees.</p> <p>The local road network of rural lanes integrates well with the field pattern but the larger corridors of the A428, A1303, M11 and A14 transect the field pattern with their linear form. The topography of the area is generally low-lying to the west within and around Cambridge, rising west of Coton towards Cambourne. The Bourn Brook valley and Red Meadow Hill are notable topographic features.</p>	Local	Commonplace at the local level	Low	Not substitutable	<p>The proposed route, commencing from the eastern edge of Upper Cambourne, would run east along the northern edge of the Bourn Airfield, parallel and in close proximity to the A428. The proposal maintains this proximity to the existing road corridor, continuing along the northern edge of Hardwick within the highway corridor up to the Madingley Interchange. From Madingley Mulch roundabout, a dedicated bus link would transect the agricultural landscape and associated field boundaries south of St Neots Road, running broadly parallel to it, from Madingley Mulch Roundabout to the intersection with Cambridge Road. The proposal then runs along the southern edge of a traditional orchard, replacing an existing field boundary. The proposal would then cross the M11, following an existing field boundary east before diverting southeast and once more bisecting an agricultural field before linking in to an existing track and intersecting Grange Road on the western edge of Cambridge</p> <p>The proposed Park & Ride facility adjacent to Scotland Farm would occupy part of a single field. Loss of existing hedgerow will be minimal but the facility's positioning will mean the addition of a slightly incongruous element within the pattern of the immediate landscape.</p> <p>This route follows the existing field patterns and runs adjacent to the existing road corridor for the length of route west of Long Road but does transect agricultural land at several points further east. The main alterations to the landscape pattern would be through the loss of vegetation where the route cuts through existing boundaries and the transections of several agricultural fields. There is the potential to replace some of this vegetation in the more rural areas but this will be limited in other areas. The adjustment of some field patterns would be permanent.</p> <p>The Park & Ride facility would be constructed directly adjacent to the A428, Scotland road and the junction of these two roads within the corner of an irregularly shaped field, limiting its intrusion into the broader agricultural field pattern.</p> <p>Overall this would result in a Moderate Adverse magnitude of impact to the landscape pattern, depending on the amount, location and quality of the vegetation lost and its substitutability.</p>
	<p>The CPRE tranquillity map identifies the broad range of tranquillity across the study area (assessed in 2007). Within the study area there is a noticeable decrease in tranquillity to the west in and around Cambridge. Other less tranquil places include alongside the major road corridors of the A428, M11 and A14 and within smaller rural settlements.</p> <p>Notable trends from the 1960s to 2007 are light pollution resulting from intensive agriculture, growth of settlements and road infrastructure improvements, particularly apparent in the low-lying areas.</p> <p>Areas that a relatively tranquil within the local context include the fields west of Grange Road, Coton Countryside Reserve and the American Military Cemetery.</p>	Local	Commonplace at the local level	Medium	Not substitutable	<p>The proposed route of the bus corridor west of Madingley Mulch Roundabout means that it ties into the existing road corridor quite closely, reducing tranquillity by a negligible amount. As the proposal continues east from the roundabout, views of the corridor itself would be restricted but fleeting views of the buses would be available, from the surrounding countryside and nearby bridleway, whilst they move through the landscape. The tranquillity of these sections of countryside would also be impacted due to the presence of constructed and mechanised intrusions into what is currently open fields.</p> <p>The proposed Park & Ride facility would result in an increase in traffic movements, lighting and visual intrusion adjacent to the A428-Scotland Road junction and Scotland road. There would also be a reduction in the tranquillity of the landscape to the north and east of the facility. However, this change is limited by the presence of the A428 and an existing industrial estate in the vicinity.</p> <p>These changes would result in visual intrusion, with the degree and duration of negative impact upon tranquillity dependant on the scope of mitigation/replacement planting which could be achieved along the route and surrounding the Park & Ride facility. However, given that the nature of the area itself is of reduced tranquillity already, especially adjacent to the A248 and west of the M11, a Minor Adverse to Moderate Adverse impact has been assessed.</p>
Cultural	<p>Recreation is a significant ecosystem service in this National Character Area. It is generally low key, close to the main urban populations and associated with the river valleys, existing sites and restored post industrial landscapes. There is an extensive network of public rights of way and bridleways through the area.</p> <p>There are a number of listed buildings and scheduled monuments within the wider landscape and conservation areas covering rural settlements including Hardwick, Coton, Madingley, and the west of Cambridge (West Cambridge, Conduit Head Road and Storey's Way).</p> <p>Registered Parks and Gardens within the area include the Grade I American Military Cemetery and Grade II Madingley Hall. Coton Country Park is located south of Coton and west of the M11, and is "managed to enhance the local landscape and benefit wildlife, it's a great place to experience the changing seasons with wildlife habitats, a hilltop picnic area, panoramic views, and routes for walkers, cyclists, runners, disabled people and horse riders that link to adjacent public footpaths and bridleways." (www.cambridgegpf.org).</p> <p>From several locations, including Red Meadow Hill and from/around the M11 corridor, there are panoramic views east, towards the historic city skyline. The University Library, Addenbrooke's chimney and various church spires are important landmarks of Cambridge. National Cycle Routes 11, 51 and Regional Cycle Route 24 pass north-south through the west of the area.</p>	Regional	Commonplace at the local level	High	Not substitutable	<p>The section of the route west of the Scotland Road - A428 junction is not located within any conservation areas and is not directly adjacent to any noteworthy landscape features.</p> <p>The route then crosses Neots Road where it intersects with large group of trees immediately east of the junction of Long Road and Neots Road that are subject to a TPO. Their partial removal would see the a valuable landscape feature negatively impacted, both physically and in setting.</p> <p>As the route progresses east it would pass within 50m of the northern edge of the Coton Conservation area, causing a loss of vegetation that would have a negative impact on its setting, with the degree and duration of negative impact dependent upon the scope of mitigation/replacement planting which could be achieved along the route. The proposal also runs along the southern edge of a traditional orchard, removing existing vegetation and altering its setting. At the eastern end of the route, the bus corridor would run directly adjacent to the West Cambridge Conservation Area, south of a row of houses and campus buildings and within the route of an existing track. The proposal would lead to an increase of traffic movements through the area and adversely affect the setting of, and views from, the gardens of the houses.</p> <p>The proposed Park & Ride facility is not located within any conservation areas and is not directly adjacent to any noteworthy landscape features.</p> <p>Other features of note, such as Madingley Wood ancient and semi-natural woodland (which is also an SSSI) or the Grade I Registered Park and Garden of the American Military Cemetery, are unlikely to be affected due to the nature and scale of the proposal.</p> <p>Although the Park & Ride facility would have minimal impact on the cultural aspect, the proposal will directly affect the traditional orchard and West Cambridge Conservation Area and, to a lesser extent, indirectly affect Coton Conservation area and so a Moderate Adverse impact is assessed.</p>
	<p>The landcover is primarily rural with the exception of Cambridge to the east, Cambourne in the west and rural settlements within the wider landscape. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing.</p> <p>There are a series of traditional orchards throughout the area which now account for 20% of the amount present in 1950. Losses are due to development, neglect and land use change. Small woodland blocks are notable features within the wider landscape, as part of historic parkland or within the wider agricultural landscape. Within Cambridge, mature trees are a notable feature of the environment and there are a large number of Tree Preservation Orders protecting them from development. Bourn Airport is a notable land-use feature between Upper Cambourne and Caldecote.</p> <p>Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS6 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area.</p> <p>Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW1 of Proposed Submission SC Local Plan).</p>	Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	<p>Close to where the proposed route crosses St Neots Road, it intersects with large group of trees that are subject to a TPO. Their partial removal would see a change to the vegetative cover in the localised area. The proposal would also result in the loss of some narrow sections of agricultural land as well as existing hedgerows and the southern edge of a traditional orchard north of Coton.</p> <p>At the eastern end of the route on the Rifle Range Road there are three TPOs trees that will need special design messages to minimise impacts on their root bowls but there could still some Minor impact on the trees as they could have to be pruned for operational use of the busway.</p> <p>The proposed Park & Ride facility would result in a change in landcover from an arable field to a hard-surfaced urban feature. A well-designed proposal could increase the vegetation coverage and biodiversity value of the site through planting proposals and retention of existing vegetation, where possible in place of agricultural fields.</p> <p>However, outside of these localised effects, the impact on landcover would be limited so overall this proposal would result in a Minor Adverse impact.</p>
Summary of character	<p>The study area is located within National Character Area 68: Bedfordshire and Cambridgeshire Claylands and the Cambridge landscape character area West Cambridge Claylands.</p> <p>It can be characterised by the rural landscape containing smaller settlements, main road corridors and the number of historic features within the area such as Registered Parks and Gardens, Listed Buildings and Scheduled Monuments.</p>	Regional	A combination of scarce and commonplace features at the local level	Medium	Generally not substitutable	<p>The proposed route and the Park & Ride facility would result in small scale, localised impacts on the overall landscape character but there is considerable scope to mitigate these and to integrate the proposal into the landscape during future design stages.</p> <p>The key issues resulting from this proposal are the possibility for adverse effects on the Conservation Area at Coton and the nearby traditional orchard as well as the segmentation of the strongly defined agricultural field pattern. Overall, the magnitude of impact is assessed to be Minor Adverse to Moderate Adverse.</p>

Reference Sources

The following sources have been used in the preparation of this WebTAG worksheet:

- DfT TAG Unit A3, December 2015 (www.gov.uk/transport-analysis-guidance-webtag)
- Drawings 5020059_HW_FS_110 to 5020059_HW_FS_160 issued 12th April 2018
- A428 Cambourne to Cambridge Better Bus Journeys, Landscape and Planning Appraisal, Atkins, January 2017
- A428 Cambourne to Cambridge Better Bus Journeys, Green Lane Concept, Atkins and Strutt & Parker, August 2017

Step 5 - Summary Assessment Score

Minor Adverse to Moderate Adverse

Qualitative Comments

On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Minor Adverse to Moderate Adverse impact. This is to identify that the proposal:

- at odds with the landscape, or at odds with the local pattern and landform (Moderate Adverse)
- although not very visually intrusive, will impact on certain views into and across the area (Minor Adverse)
- cannot be completely integrated because of the nature of the scheme itself or the character of the landscape through which it passes (Minor Adverse)
- affects an area of recognised landscape quality (Minor Adverse)
- in conflict with local and national policies to protect open land and nationally recognised countryside (Moderate Adverse)

TAG Townscape Impacts Worksheet (Phase 1)

Do Minimum

Features	Step 2	Step 3					Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Changes in Without-scheme case	Do Minimum Impact
Layout	<p>This worksheet includes the stretch of the route between Grange Road and the M11. The stretch of the route between the M11 and the Madingley Mulch roundabout is assessed on the landscape impacts worksheet.</p> <p>The Scheme passes through West Cambridge, an area largely laid out in the late 19th and early 20th centuries for housing. More recently, Cambridge University has developed the areas north and south of the Madingley Road for housing and research facilities. The A1303 Madingley Road, between two and four lanes wide, runs through the area. There are wide junctions at the entrance to Edington, a new suburb north of the Madingley Road, and at the entrance to the West Cambridge site, south of the road. The West Cambridge site is laid out according to a landscape masterplan with housing and large-scale laboratories and research building. Parking is at surface level and the connecting roads are tree-lined. South of the West Cambridge site, the layout changes, with streets on a rectilinear grid, many ending in cul-de-sac or dead ends. The mainly detached houses are in substantial gardens with mature vegetation. Bin Brook runs through the grounds of Robinson College. Cycle and pedestrian connectivity is good, with cycle routes along Grange Road and</p>	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	<p>The proposed route option would constitute the widening of the existing road corridor, on the northern and southern sides, from Madingley Mulch roundabout heading east to Cambridge. The proposal also allows for the use of the existing Madingley Park & Ride facility.</p> <p>This route would not pass through or directly adjacent to any areas of townscape.</p> <p>Overall this would result in a Neutral magnitude of impact to be assessed</p>
Density and mix	Development in West Cambridge is low density with housing, student accommodation and educational buildings in spacious gardens or grounds and substantial areas of land in use as sports fields. The predominant land uses are residential and educational. Robinson College occupies a large area between Adams Road and Herschel Road. Other educational uses include the West Cambridge site, Churchill College, St John's College School and King's College School. Building types include flats, houses, educational buildings and sports pavilions. Parking is on mainly on-street, with small-scale parking areas around sporting and educational uses.	Local	Commonplace at the local level	Low	=Option 1!G5	Negligible	<p>This route would not pass through or directly adjacent to any areas of townscape.</p> <p>Overall this would result in a Neutral magnitude of impact to be assessed.</p>
Scale	On Grange Road, houses are generally detached, mostly three-storey including rooms in the attic and of a generous size. They sit in large, well-vegetated gardens. Further west, houses are smaller and semi-detached with smaller gardens. Streets are mainly narrow, with room for parking on one or both sides of the road. The educational buildings are higher than the housing, with typically three or four storeys. They occupy relatively large blocks of land with substantial grounds. There are many mature trees in the area restricting views and vistas to the sports fields, where the landscape is more open.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	<p>This route would not pass through or directly adjacent to any areas of townscape.</p> <p>Overall this would result in a Neutral magnitude of impact to be assessed.</p>
Appearance	There are several buildings of high architectural quality and interesting the area, especially along Grange Road, with large detached houses in the Arts and Crafts or Queen Anne Revival style. Building materials include brick, stone, render and tile. Other buildings which contribute to the attractive appearance from the post-war period include the red-brick Robinson College and the yellow-brick and metal clad Department of Applied Mathematics. Grange Road is relatively busy during working hours, but many of the streets to the east and west of the road are quiet. The many cul-de-sacs and traffic management measures prevent the area from being used for short cuts. Street trees and garden vegetation give the area a verdant character and provide valuable shade in summer.	Local	Commonplace at the local level	Medium	Some opportunity for substitution	Negligible	<p>This route would not pass through or directly adjacent to any areas of townscape.</p> <p>Overall this would result in a Neutral magnitude of impact to be assessed.</p>
Human interaction	The residents in the area include many university students and teachers who live in university and college flats and shared houses. Many of these residents live in the area for a temporary period, moving on after two or three years, but there are also permanent residents. Cyclists and pedestrians use the quiet back streets east and west of Grange Road to reach the West Cambridge site, Robinson College, the Department of Applied Mathematics, the University Library and the various sports grounds in the area. The footways are relatively narrow, but parked cars provide a barrier between the road and pedestrians.	Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	<p>This route would serve to improve linkages between Cambourne, Cambridge and the settlements in between through the creation of improved public transportation options in the area. Through facilitating this movement of people, the quality and opportunities of human interaction would be increased</p> <p>Overall this would result in a Moderate Beneficial magnitude of impact to be assessed.</p>
Cultural	<p>The study area includes part of the West Cambridge Conservation Area, the Conduit Head Conservation Area and the Storeys Way Conservation Area.</p> <p>The character of the Storey's Way Conservation Area is derived from the fine detached family houses in spacious gardens with mature planting. The area includes part of the grounds of Fitzwilliam and Churchill Colleges. The area includes seven listed buildings and eight buildings of local interest. The topography of the area is comparatively flat. The streets are tree-lined and the gardens well planted, giving the area a secluded, verdant quality.</p> <p>The Conduit Head Conservation Area comprises a 20th century residential development, built between 1914 and the 1990s. The buildings are generally large, detached properties, set in sizeable, mature gardens. The area was developed in a piecemeal fashion, in a variety of different architectural styles. The area includes five listed buildings and two buildings identified as buildings of local interest. The conservation area retains a substantial amount of mature vegetation. This, coupled with the quiet nature of the road, which is a cul-de-sac, provides a sense of seclusion in the area. There are few long views and the majority of buildings are screened from the road.</p> <p>The West Cambridge Conservation Area was designated in 1972 and extended in 1984 and 2011. Due to its size, the conservation area has been split into seven character areas. The scheme will run through the Grange Road Character Area as identified in the West Cambridge Conservation Area Appraisal (Cambridge City Council, May 2011). The appraisal describes the Grange Road area as retaining a domestic scale with a small area of 'wild' woodland at the junction of Bin Brook and Grange Road (Cobbett's Corner). There are many listed buildings in the area as well as non-listed buildings of architectural interest dating from the late 19th century to the present day. There are few long views due to the screening effects of the abundant vegetation of the area, apart from the sports fields where there are more open views. Trees line most of the streets, giving the area a verdant character.</p> <p>The grade II* listed Schlumberger Gould Research Centre is outside the West Cambridge Conservation Area and close to the West Cambridge site and the M11 Junction 13.</p>	Regional	Some scarce features at the local level	High	Not substitutable	Negligible	<p>The proposed route would not pass through or directly adjacent to any townscape designations. However, it does pass close to the Coton Conservation Area and may potentially affect it's setting.</p> <p>The loss of vegetation and increase in prominence of the A1303 road corridor would may have a negative impact on the setting of these features, with the degree and duration of negative impact dependent upon the scope of mitigation/replacement planting which could be achieved along the route.</p> <p>The proposal's route near to a conservation area means that due to the possibility of adverse effects upon this feature, a Minor Adverse impact is assessed.</p>
Land use	<p>The land use is mixed within Cambridge between residential and University of Cambridge to the and rural settlements, such as Coton, Hardwick and Madingley set within the wider landscape between Cambridge and Cambourne. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing.</p> <p>Western Cambridge is heavily influenced by the University campus, with a series of playing and sports fields interspersed with a series of University buildings such as student campus and faculty buildings.</p> <p>Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS/6 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area.</p> <p>Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW1 of Proposed Submission SC Local Plan).</p>	Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	<p>This route would not pass through or directly adjacent to any areas of townscape. However, the proposal would serve to link existing settlements as well as providing the opportunity to link future developments in the area in a sustainable fashion.</p> <p>Overall this would result in a Minor Beneficial magnitude of impact to be assessed.</p>

Summary of character	The area described on this townscape worksheet is suburban: a large proportion of the area is residential or in use as sports grounds. Less typical of the suburban area are the many educational buildings, including Robinson College and the Department of Applied Mathematics. The area is verdant, with tree-lined streets and well-vegetated, spacious gardens and grounds. There are many buildings of high architectural importance, which contribute to the special character of West Cambridge and the conservation area.	Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	The proposal would result in the widening of the existing road corridor and in most cases the impacts upon the townscape would be neutral. The key issues resulting from this proposal is the possibility for some adverse effects on the Coton Conservation Area due to the scale of vegetation removal required along the route and potential or otherwise to be able to replace or mitigate these removals. This is balanced by the positive effects from improved connectivity between Cambourne and Cambridge. Overall, the magnitude of impact is assessed to be Minor Beneficial.
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Reference Sources

DfT TAG Unit A3, December 2015 (www.gov.uk/transport-analysis-guidance-webtag)

Step 5 - Summary Assessment Score

Minor Beneficial

Qualitative Comments

On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Minor Beneficial impact. This is to identify that the proposal:

- it fits very well with the layout, mix, scale, appearance, human interaction and cultural aspects of the townscape (Moderate Beneficial)
- affects an area of recognised townscape quality (Minor Adverse)

TAG Townscape Impacts Worksheet (Phase 1)

Low Cost a

Features	Step 2		Step 3				Step 4	
	Description		Scale it matters	Rarity	Importance	Substitutability	Changes in without-scheme case	Low Cost a Impact
Layout	This worksheet includes the stretch of the route between Grange Road and the M11. The stretch of the route between the M11 and the Madingley Mulch roundabout is assessed on the landscape impacts worksheet.		Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	The option would make minor changes to the existing A1303 road layout at Junction 13 of the M11 which would not affect the overall layout of the townscape. This option would result in a neutral impact.
	The Scheme passes through West Cambridge, an area largely laid out in the late 19th and early 20th centuries for housing. More recently, Cambridge University has developed the areas north and south of the Madingley Road for housing and research facilities. The A1303 Madingley Road, between two and four lanes wide, runs through the area. There are wide junctions at the entrance to Eddington, a new suburb north of the Madingley Road, and at the entrance to the West Cambridge site, south of the road. The West Cambridge site is laid out according to a landscape masterplan with housing and large-scale laboratories and research building. Parking is at surface level and the connecting roads are tree-lined. South of the West Cambridge site, the layout changes, with streets on a rectilinear grid, many ending in cul-de-sac or dead ends. The mainly detached houses are in substantial gardens with mature vegetation. Bin Brook runs through the grounds of Robinson College. Cycle and pedestrian connectivity is good, with cycle routes along Grange Road and Madingley Road and a combination of traffic-free and quiet roads linking the city centre with the West Cambridge and the Coton.							
Density and mix	Development in West Cambridge is low density with housing, student accommodation and educational buildings in spacious gardens or grounds and substantial areas of land in use as sports fields. The predominant land uses are residential and educational. Robinson College occupies a large area between Adams Road and Herschel Road. Other educational uses include the West Cambridge site, Churchill College, St John's College School and King's College School. Building types include flats, houses, educational buildings and sports pavilions. Parking is on mainly on-street, with small-scale parking areas around sporting and educational uses.		Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	The minor changes to the existing A1303 road layout at Junction 13 would not change the overall density or mix of the townscape. This option would result in a neutral impact.
Scale	On Grange Road, houses are generally detached, mostly three-storey including rooms in the attic and of a generous size. They sit in large, well-vegetated gardens. Further west, houses are smaller and semi-detached with smaller gardens. Streets are mainly narrow, with room for parking on one or both sides of the road, the educational buildings are higher than the housing, with typically three or four storeys. They occupy relatively large blocks of land with substantial grounds. There are many mature trees in the area restricting views and vistas to the sports fields, where the landscape is more open.		Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	The minor changes to the existing A1303 road layout at Junction 13 would not change the overall scale of the townscape. This would result in a neutral impact.
Appearance	There are several buildings of high architectural quality and interesting the area, especially along Grange Road, with large detached houses in the Arts and Crafts or Queen Anne Revival style. Building materials include brick, stone, render and tile. Other buildings which contribute to the attractive appearance from the post-war period include the red-brick Robinson College and the yellow-brick and metal clad Department of Applied Mathematics. Grange Road is relatively busy during working hours, but many of the streets to the east and west of the road are quiet. The many cul-de-sacs and traffic management measures prevent the area from being used for short cuts. Street trees and garden vegetation give the area a verdant character and provide valuable shade in summer. .		Local	Commonplace at the local level	Medium	Some opportunity for substitution	Negligible	The minor changes to the existing road layout would not change the overall appearance of the townscape. This would result in a neutral impact.
Human interaction	The residents in the area include many university students and teachers who live in university and college flats and shared houses. Many of these residents live in the area for a temporary period, moving on after two or three years, but there are also permanent residents. Cyclists and pedestrians use the quiet back streets east and west of Grange Road to reach the West Cambridge site, Robinson College, the Department of Applied Mathematics, the University Library and the various sports grounds in the area. The footways are relatively narrow, but parked cars provide a barrier between the road and pedestrians.		Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	The new pedestrian/cycle bridge over the M11 would improve connectivity for pedestrians and cyclists between West Cambridge and the countryside to the west. This would result in a Minor beneficial impact.
Cultural	The study area includes part of the West Cambridge Conservation Area, the Conduit Head Conservation Area and the Storeys Way Conservation Area. The character of the Storey's Way Conservation Area is derived from the fine detached family houses in spacious gardens with mature planting. The area includes part of the grounds of Fitzwilliam and Churchill Colleges. The area includes seven listed buildings and eight buildings of local interest. The topography of the area is comparatively flat. The streets are tree-lined and the gardens well planted, giving the area a secluded, verdant quality. The Conduit Head Conservation Area comprises a 20th century residential development, built between 1914 and the 1990s. The buildings are generally large, detached properties, set in sizeable, mature gardens. The area was developed in a piecemeal fashion, in a variety of different architectural styles. The area includes five listed buildings and two buildings identified as buildings of local interest. The conservation area retains a substantial amount of mature vegetation. This, coupled with the quiet nature of the road, which is a cul-de-sac, provides a sense of seclusion in the area. There are few long views and the majority of buildings are screened from the road. The West Cambridge Conservation Area was designated in 1972 and extended in 1984 and 2011. Due to its size, the conservation area has been split into seven character areas. The scheme will run through the Grange Road Character Area as identified in the West Cambridge Conservation Area Appraisal (Cambridge City Council, May 2011). The appraisal describes the Grange Road area as retaining a domestic scale with a small area of 'wild' woodland at the junction of Bin Brook and Grange Road (Cobbett's Corner). There are many listed buildings in the area as well as non-listed buildings of architectural interest dating from the late 19th century to the present day. There are few long views due to the screening effects of the abundant vegetation of the area, apart from the sports fields where there are more open views. Trees line most of the streets, giving the area a verdant character. The grade II* listed Schlumberger Gould Research Centre is outside the West Cambridge Conservation Area and close to the West Cambridge site and the M11 Junction 13.		Regional	Some scarce features at the local level	High	Not substitutable	Negligible	The changes to the existing A1303 road layout at Junction 13 will not affect any conservation areas. It could slightly affect the setting of the listed Schlumberger Gould Research Centre. This would result in a Minor adverse impact.
Land use	The land use is mixed within Cambridge between residential and University of Cambridge to the and rural settlements, such as Coton, Hardwick and Madingley set within the wider landscape between Cambridge and Cambourne. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing. Western Cambridge is heavily influenced by the University campus, with a series of playing and sports fields interspersed with a series of University buildings such as student campus and faculty buildings. Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS/6 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area. Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW1 of Proposed Submission SC Local Plan).		Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	This route would not pass through or directly adjacent to any areas of townscape. However, the proposal would serve to link existing settlements as well as providing the opportunity to link future developments in the area in a sustainable fashion. Overall this would result in a Minor Beneficial magnitude of impact to be assessed.

Summary of character	The area described on this townscape worksheet is suburban: a large proportion of the area is residential or in use as sports grounds. Less typical of the suburban area are the many educational buildings, including Robinson College and the Department of Applied Mathematics. The area is verdant, with tree-lined streets and well-vegetated, spacious gardens and grounds. There are many buildings of high architectural importance, which contribute to the special character of West Cambridge and the conservation area.	Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	The proposal would result in the widening of the existing road corridor and in most cases the impacts upon the townscape would be neutral. The key issues resulting from this proposal is the possibility for some adverse effects on the Coton Conservation Area due to the scale of vegetation removal required along the route and potential or otherwise to be able to replace or mitigate these removals. This is balanced by the positive effects from improved connectivity between Cambourne and Cambridge. Overall, the magnitude of impact is assessed to be Minor Beneficial.
Reference Sources							
The following sources have been used in the preparation of this WebTAG worksheet:							
Step 5 - Summary Assessment Score							
Minor Beneficial							
Qualitative Comments							
On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Minor Beneficial impact. This is to identify that the proposal:							

TAG Townscape Impacts Worksheet (Phase 1)

Low Cost b

Step 2		Step 3					Step 4
Features	Description	Scale it matters	Rarity	Importance	Substitutability	Changes in Without-scheme case	Low Cost b Impact
Layout	This worksheet includes the stretch of the route between Grange Road and the M11. The stretch of the route between the M11 and the Madingley Mulch roundabout is assessed on the landscape impacts worksheet.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	The proposed route option would constitute the widening of the existing road corridor, on the northern and southern sides, from Madingley Mulch roundabout heading east to Cambridge.
	The Scheme passes through West Cambridge, an area largely laid out in the late 19th and early 20th centuries for housing. More recently, Cambridge University has developed the areas north and south of the Madingley Road for housing and research facilities. The A1303 Madingley Road, between two and four lanes wide, runs through the area. There are wide junctions at the entrance to Eddington, a new suburb north of the Madingley Road, and at the entrance to the West Cambridge site, south of the road. The West Cambridge site is laid out according to a landscape masterplan with housing and large-scale laboratories and research building. Parking is at surface level and the connecting roads are tree-lined. South of the West Cambridge site, the layout changes, with streets on a rectilinear grid, many ending in cul-de-sac or dead ends. The mainly detached houses are in substantial gardens with mature vegetation. Bin Brook runs through the grounds of Robinson College. Cycle and pedestrian connectivity is good, with cycle routes along Grange Road and Madingley Road.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	This route would not pass through, or directly adjacent to, any areas of townscape aside from the most eastern end. The proposed Park & Ride facility adjacent to Scotland Farm is not within or directly adjacent to any areas of townscape. Overall this would result in a Neutral magnitude of impact to be assessed.
Density and mix	Development in West Cambridge is low density with housing, student accommodation and educational buildings in spacious gardens or grounds and substantial areas of land in use as sports fields. The predominant land uses are residential and educational. Robinson College occupies a large area between Adams Road and Herschel Road. Other educational uses include the West Cambridge site, Churchill College, St John's College School and King's College School. Building types include flats, houses, educational buildings and sports pavilions. Parking is on mainly on-street, with small-scale parking areas around sporting and educational uses.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	This route would not pass through or directly adjacent to any areas of townscape. Overall this would result in a Neutral magnitude of impact to be assessed.
Scale	On Grange Road, houses are generally detached, mostly three-storey including rooms in the attic and of a generous size. They sit in large, well-vegetated gardens. Further west, houses are smaller and semi-detached with smaller gardens. Streets are mainly narrow, with room for parking on one or both sides of the road. The educational buildings are higher than the housing, with typically three or four storeys. They occupy relatively large blocks of land with substantial grounds. There are many mature trees in the area restricting views and vistas to the sports fields, where the landscape is more open.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	This route would not pass through or directly adjacent to any areas of townscape. Overall this would result in a Neutral magnitude of impact to be assessed.
Appearance	There are several buildings of high architectural quality and interesting the area, especially along Grange Road, with large detached houses in the Arts and Crafts or Queen Anne Revival style. Building materials include brick, stone, render and tile. Other buildings which contribute to the attractive appearance from the post-war period include the red-brick Robinson College and the yellow-brick and metal clad Department of Applied Mathematics. Grange Road is relatively busy during working hours, but many of the streets to the east and west of the road are quiet. The many cul-de-sacs and traffic management measures prevent the area from being used for short cuts. Street trees and garden vegetation give the area a verdant character and provide valuable shade in summer. .	Local	Commonplace at the local level	Medium	Some opportunity for substitution	Negligible	This route would not pass through or directly adjacent to any areas of townscape. Overall this would result in a Neutral magnitude of impact to be assessed.
Human interaction	The residents in the area include many university students and teachers who live in university and college flats and shared houses. Many of these residents live in the area for a temporary period, moving on after two or three years, but there are also permanent residents. Cyclists and pedestrians use the quiet back streets east and west of Grange Road to reach the West Cambridge site, Robinson College, the Department of Applied Mathematics, the University Library and the various sports grounds in the area. The footways are relatively narrow, but parked cars provide a barrier between the road and pedestrians.	Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	This route would serve to improve linkages between Cambourne, Cambridge and the settlements in between through the creation of improved public transportation options in the area. Through facilitating this movement of people, the quality and opportunities of human interaction would be increased Overall this would result in a Moderate Beneficial magnitude of impact to be assessed.
Cultural	The study area includes part of the West Cambridge Conservation Area, the Conduit Head Conservation Area and the Storeys Way Conservation Area. The character of the Storey's Way Conservation Area is derived from the fine detached family houses in spacious gardens with mature planting. The area includes part of the grounds of Fitzwilliam and Churchill Colleges. The area includes seven listed buildings and eight buildings of local interest. The topography of the area is comparatively flat. The streets are tree-lined and the gardens well planted, giving the area a secluded, verdant quality. The Conduit Head Conservation Area comprises a 20th century residential development, built between 1914 and the 1990s. The buildings are generally large, detached properties, set in sizeable, mature gardens. The area was developed in a piecemeal fashion, in a variety of different architectural styles. The area includes five listed buildings and two buildings identified as buildings of local interest. The conservation area retains a substantial amount of mature vegetation. This, coupled with the quiet nature of the road, which is a cul-de-sac, provides a sense of seclusion in the area. There are few long views and the majority of buildings are screened from the road. The West Cambridge Conservation Area was designated in 1972 and extended in 1984 and 2011. Due to its size, the conservation area has been split into seven character areas. The scheme will run through the Grange Road Character Area as identified in the West Cambridge Conservation Area Appraisal (Cambridge City Council, May 2011). The appraisal describes the Grange Road area as retaining a domestic scale with a small area of 'wild' woodland at the junction of Bin Brook and Grange Road (Cobbett's Corner). There are many listed buildings in the area as well as non-listed buildings of architectural interest dating from the late 19th century to the present day. There are few long views due to the screening effects of the abundant vegetation of the area, apart from the sports fields where there are more open views. Trees line most of the streets, giving the area a verdant character. The grade II* listed Schlumberger Gould Research Centre is outside the West Cambridge Conservation Area and close to the West Cambridge site and the M11 Junction 13.	Regional	Some scarce features at the local level	High	Not substitutable	Negligible	The proposed route would not pass through or directly adjacent to any townscape designations. However, it does pass close to the Coton Conservation Area and may potentially affect it's setting. The loss of vegetation and increase in prominence of the A1303 road corridor would may have a negative impact on the setting of these features, with the degree and duration of negative impact dependent upon the scope of mitigation/replacement planting which could be achieved along the route. The proposal's route near to a conservation area means that due to the possibility of adverse effects upon this feature, a Minor Adverse impact is assessed.
Land use	The land use is mixed within Cambridge between residential and University of Cambridge to the and rural settlements, such as Coton, Hardwick and Madingley set within the wider landscape between Cambridge and Cambourne. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing. Western Cambridge is heavily influenced by the University campus, with a series of playing and sports fields interspersed with a series of University buildings such as student campus and faculty buildings. Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS/6 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area. Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW1 of Proposed Submission SC Local Plan).	Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	This route would not pass through or directly adjacent to any areas of townscape. However, the proposal would serve to link existing settlements as well as providing the opportunity to link future developments in the area in a sustainable fashion. Overall this would result in a Minor Beneficial magnitude of impact to be assessed.

Summary of character	The area described on this townscape worksheet is suburban: a large proportion of the area is residential or in use as sports grounds. Less typical of the suburban area are the many educational buildings, including Robinson College and the Department of Applied Mathematics. The area is verdant, with tree-lined streets and well-vegetated, spacious gardens and grounds. There are many buildings of high architectural importance, which contribute to the special character of West Cambridge and the conservation area.	Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	The proposal would result in the widening of the existing road corridor and in most cases the impacts upon the townscape would be neutral. The key issues resulting from this proposal is the possibility for some adverse effects on the Coton Conservation Area due to the scale of vegetation removal required along the route and potential or otherwise to be able to replace or mitigate these removals. This is balanced by the positive effects from improved connectivity between Cambourne and Cambridge. Overall, the magnitude of impact is assessed to be Minor Beneficial.
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Reference Sources

DfT TAG Unit A3, December 2015 (www.gov.uk/transport-analysis-guidance-webtag)

Step 5 - Summary Assessment Score

Minor Beneficial

Qualitative Comments

On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Minor Beneficial impact. This is to identify that the proposal:

- it fits well with the layout, mix, scale, appearance, human interaction and cultural aspects of the townscape (Minor Beneficial)
- incorporates environmental design measures for mitigation to ensure they will blend in well with surrounding landscape (Minor Beneficial)
- avoids being visually intrusive nor have an adverse effect on the current level of tranquillity (where these exist) of the townscape through which the scheme passes (Neutral)
- affects an area of recognised townscape quality (Minor Adverse)
- avoids conflict with government policy towards enhancing urban environments (Neutral)

TAG Townscape Impacts Worksheet (Phase 1)

Do Something 1a

Step 2		Step 3					Step 4
Features	Description	Scale it matters	Rarity	Importance	Substitutability	Changes in Without-scheme case	Do Something 1a Impact
Layout	This worksheet includes the stretch of the route between Grange Road and the M11. The stretch of the route between the M11 and the Madingley Mulch roundabout is assessed on the landscape impacts worksheet.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	The proposed route, a dedicated bus link, would cross the agricultural land south of St Neots Road, running broadly parallel to it, from Madingley Mulch Roundabout to the intersection with Cambridge Road. The proposal then runs along the southern edge of a traditional orchard and in close proximity to Coton, replacing an existing field boundary. The proposal would then cross the M11, and continue through the University of Cambridge campus before crossing the northern half of an agricultural field, following the route of a short section of shared footway/cycleway towards Wilberforce Road then using Adams Road to join Grange Road on the western edge of Cambridge.
	The Scheme passes through West Cambridge, an area largely laid out in the late 19th and early 20th centuries for housing. More recently, Cambridge University has developed the areas north and south of the Madingley Road for housing and research facilities. The A1303 Madingley Road, between two and four lanes wide, runs through the area. There are wide junctions at the entrance to Eddington, a new suburb north of the Madingley Road, and at the entrance to the West Cambridge site, south of the road. The West Cambridge site is laid out according to a landscape masterplan with housing and large-scale laboratories and research building. Parking is at surface level and the connecting roads are tree-lined. South of the West Cambridge site, the layout changes, with streets on a rectilinear grid, many ending in cul-de-sac or dead ends. The mainly detached houses are in substantial gardens with mature vegetation. Bin Brook runs through the grounds of Robinson College. Cycle and pedestrian connectivity is good, with cycle routes along Grange Road and Madingley Road and a combination of traffic-free and quiet roads linking the city centre with the West Cambridge and the Coton.						The length of the route adjacent to the West Cambridge and along Adams Road townscape is short, relative to its overall length. The bus corridor would not adversely affect the layout of the buildings or pattern of existing townscape features. It would not adversely affect the layout of the buildings and may even be considered a key artery around which future development of the University campus could be developed. Overall this would result in a Minor Beneficial magnitude of impact.
Density and mix	Development in West Cambridge is low density with housing, student accommodation and educational buildings in spacious gardens or grounds and substantial areas of land in use as sports fields. The predominant land uses are residential and educational. Robinson College occupies a large area between Adams Road and Herschel Road. Other educational uses include the West Cambridge site, Churchill College, St John's College School and King's College School. Building types include flats, houses, educational buildings and sports pavilions. Parking is on mainly on-street, with small-scale parking areas around sporting and educational uses.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	The proposed route of the bus corridor as it enters the West Cambridge townscape fitting to the current density of that area and would reinforce existing building density and mix types within the University Campus. Overall this would result in a Minor Beneficial magnitude of impact.
Scale	On Grange Road, houses are generally detached, mostly three-storey including rooms in the attic and of a generous size. They sit in large, well-vegetated gardens. Further west, houses are smaller and semi-detached with smaller gardens. Streets are mainly narrow, with room for parking on one or both sides of the road. The educational buildings are higher than the housing, with typically three or four storeys. They occupy relatively large blocks of land with substantial grounds. There are many mature trees in the area restricting views and vistas to the sports fields, where the landscape is more open.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	The proposed route of the bus corridor as it enters the West Cambridge townscape is in scale with the current area and would not have any effect. Overall this would result in a <i>Neutral</i> magnitude of impact.
Appearance	There are several buildings of high architectural quality and interesting the area, especially along Grange Road, with large detached houses in the Arts and Crafts or Queen Anne Revival style. Building materials include brick, stone, render and tile. Other buildings which contribute to the attractive appearance from the post-war period include the red-brick Robinson College and the yellow-brick and metal clad Department of Applied Mathematics. Grange Road is relatively busy during working hours, but many of the streets to the east and west of the road are quiet. The many cul-de-sacs and traffic management measures prevent the area from being used for short cuts. Street trees and garden vegetation give the area a verdant character and provide valuable shade in summer. .	Local	Commonplace at the local level	Medium	Some opportunity for substitution	Negligible	Along Adams Road the removal of on-street parking would positively affect the setting of, and views from, the gardens and properties. Overall this would result in a Minor Beneficial magnitude of impact.
Human interaction	The residents in the area include many university students and teachers who live in university and college flats and shared houses. Many of these residents live in the area for a temporary period, moving on after two or three years, but there are also permanent residents. Cyclists and pedestrians use the quiet back streets east and west of Grange Road to reach the West Cambridge site, Robinson College, the Department of Applied Mathematics, the University Library and the various sports grounds in the area. The footways are relatively narrow, but parked cars provide a barrier between the road and pedestrians.	Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	This route would serve to improve linkages between Cambourne, Cambridge and the settlements in between through the creation of improved public transportation options in the area. In the West Cambridge area the proposal would serve to improve connectivity in and around the University campus and provide alternative safe routes of travel for off-peak hours. Through facilitating this movement of people, the quality and opportunities of human interaction would be increased Overall this would result in a <i>Moderate Beneficial</i> magnitude of impact.
Cultural	The study area includes part of the West Cambridge Conservation Area, the Conduit Head Conservation Area and the Storeys Way Conservation Area. The character of the Storey's Way Conservation Area is derived from the fine detached family houses in spacious gardens with mature planting. The area includes part of the grounds of Fitzwilliam and Churchill Colleges. The area includes seven listed buildings and eight buildings of local interest. The topography of the area is comparatively flat. The streets are tree-lined and the gardens well planted, giving the area a secluded, verdant quality. The Conduit Head Conservation Area comprises a 20th century residential development, built between 1914 and the 1990s. The buildings are generally large, detached properties, set in sizeable, mature gardens. The area was developed in a piecemeal fashion, in a variety of different architectural styles. The area includes five listed buildings and two buildings identified as buildings of local interest. The conservation area retains a substantial amount of mature vegetation. This, coupled with the quiet nature of the road, which is a cul-de-sac, provides a sense of seclusion in the area. There are few long views and the majority of buildings are screened from the road. The West Cambridge Conservation Area was designated in 1972 and extended in 1984 and 2011. Due to its size, the conservation area has been split into seven character areas. The scheme will run through the Grange Road Character Area as identified in the West Cambridge Conservation Area Appraisal (Cambridge City Council, May 2011). The appraisal describes the Grange Road area as retaining a domestic scale with a small area of 'wild' woodland at the junction of Bin Brook and Grange Road (Cobbett's Corner). There are many listed buildings in the area as well as non-listed buildings of architectural interest dating from the late 19th century to the present day. There are few long views due to the screening effects of the abundant vegetation of the area, apart from the sports fields where there are more open views. Trees line most of the streets, giving the area a verdant character. The grade II* listed Schlumberger Gould Research Centre is outside the West Cambridge Conservation Area and close to the West Cambridge site and the M11 Junction 13.	Regional	Some scarce features at the local level	High	Not substitutable	Negligible	The proposed route would enter the West Cambridge Conservation Area along Adams Road, with the area around Grange noted to contain a regimented grid of streets on north-south and east-west axis and, in parts, as retaining a domestic scale with a small area of 'wild' woodland - removal of on-street parking would be beneficial. As the route runs through the University campus, neither of these points are compromised, with route alignment reinforcing the east-west bias on circulation routes. The proposed route would also pass within 50m of the northern edge of the Coton Conservation area, causing a loss of vegetation that would have a negative impact on its setting, with the degree and duration of negative impact dependent upon the scope of mitigation/replacement planting which could be achieved along the route. The proposal will indirectly affect the Coton Conservation area and so a Minor Adverse impact is assessed.
Land use	The land use is mixed within Cambridge between residential and University of Cambridge to the and rural settlements, such as Coton, Hardwick and Madingley set within the wider landscape between Cambridge and Cambourne. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing. Western Cambridge is heavily influenced by the University campus, with a series of playing and sports fields interspersed with a series of University buildings such as student campus and faculty buildings. Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS/6 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area. Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW1 of Proposed Submission SC Local Plan).	Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	This proposal would serve to link existing settlements as well as providing the opportunity to link future developments in the area in a sustainable fashion. Overall this would result in a Minor Beneficial magnitude of impact.

Summary of character	The area described on this townscape worksheet is suburban: a large proportion of the area is residential or in use as sports grounds. Less typical of the suburban area are the many educational buildings, including Robinson College and the Department of Applied Mathematics. The area is verdant, with tree-lined streets and well-vegetated, spacious gardens and grounds. There are many buildings of high architectural importance, which contribute to the special character of West Cambridge and the conservation area.	Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	<p>The proposed Park & Ride facility would have no impact on townscape character. The proposed route would affect the townscape character of Coton but there is considerable scope to mitigate these and to integrate the proposal into the landscape during the detailed design stage.</p> <p>The key issues resulting from this proposal are the possibility for adverse effects on the Conservations Area at Coton, which is balanced out by beneficial effects to other features within local townscapes. Overall, the magnitude of impact is assessed to be Minor Beneficial.</p>
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Reference Sources

DfT TAG Unit A3, December 2015 (www.gov.uk/transport-analysis-guidance-webtag)

Step 5 - Summary Assessment Score

Minor Beneficial

Qualitative Comments

On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Neutral impact. This is to identify that the proposal:

- it fits well with the layout, mix, scale, appearance, human interaction and cultural aspects of the townscape (Minor Beneficial)
- incorporates environmental design measures for mitigation to ensure they will blend in well with surrounding landscape (Minor Beneficial)
- although not very visually intrusive, will impact on certain views into and across the area (Minor Adverse)
- affects an area of recognised townscape quality (Minor Adverse)
- avoids conflict with government policy towards enhancing urban environments (Neutral)

TAG Townscape Impacts Worksheet (Phase 1)

Do Something 1b

Step 2		Step 3					Step 4
Features	Description	Scale it matters	Rarity	Importance	Substitutability	Changes in Without-scheme case	Do Something 1b Impact
Layout	This worksheet includes the stretch of the route between Grange Road and the M11. The stretch of the route between the M11 and the Madingley Mulch roundabout is assessed on the landscape impacts worksheet.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	The proposed route, a dedicated bus link, would cross the agricultural land south of St Neots Road, running broadly parallel to it, from Madingley Mulch Roundabout to the intersection with Cambridge Road. The proposal then runs along the southern edge of a traditional orchard and in close proximity to Coton, replacing an existing field boundary. The proposal would then cross the M11, and continue through the University of Cambridge campus before following the route of a short section of shared footway/cycleway towards Wilberforce Road then using Adams Road to join Grange Road on the western edge of Cambridge.
	The Scheme passes through West Cambridge, an area largely laid out in the late 19th and early 20th centuries for housing. More recently, Cambridge University has developed the areas north and south of the Madingley Road for housing and research facilities. The A1303 Madingley Road, between two and four lanes wide, runs through the area. There are wide junctions at the entrance to Eddington, a new suburb north of the Madingley Road, and at the entrance to the West Cambridge site, south of the road. The West Cambridge site is laid out according to a landscape masterplan with housing and large-scale laboratories and research building. Parking is at surface level and the connecting roads are tree-lined. South of the West Cambridge site, the layout changes, with streets on a rectilinear grid, many ending in cul-de-sac or dead ends. The mainly detached houses are in substantial gardens with mature vegetation. Bin Brook runs through the grounds of Robinson College. Cycle and pedestrian connectivity is good, with cycle routes along Grange Road and Madingley Road and a combination of traffic-free and quiet roads linking the city centre with the West Cambridge and the Coton.						The length of the route adjacent to the West Cambridge and along Adams Road townscape is short, relative to its overall length. The bus corridor would not adversely affect the layout of the buildings or pattern of existing townscape features. It would not adversely affect the layout of the buildings and may even be considered a key artery around which future development of the University campus could be developed. Overall this would result in a Minor Beneficial magnitude of impact.
Density and mix	Development in West Cambridge is low density with housing, student accommodation and educational buildings in spacious gardens or grounds and substantial areas of land in use as sports fields. The predominant land uses are residential and educational. Robinson College occupies a large area between Adams Road and Herschel Road. Other educational uses include the West Cambridge site, Churchill College, St John's College School and King's College School. Building types include flats, houses, educational buildings and sports pavilions. Parking is on mainly on-street, with small-scale parking areas around sporting and educational uses.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	The proposed route of the bus corridor as it enters the West Cambridge townscape fitting to the current density of that area and would reinforce existing building density and mix types within the University Campus. Overall this would result in a Minor Beneficial magnitude of impact.
Scale	On Grange Road, houses are generally detached, mostly three-storey including rooms in the attic and of a generous size. They sit in large, well-vegetated gardens. Further west, houses are smaller and semi-detached with smaller gardens. Streets are mainly narrow, with room for parking on one or both sides of the road, the educational buildings are higher than the housing, with typically three or four storeys. They occupy relatively large blocks of land with substantial grounds. There are many mature trees in the area restricting views and vistas to the sports fields, where the landscape is more open.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	The proposed route of the bus corridor as it enters the West Cambridge townscape is in scale with the current area and would not have any effect. Overall this would result in a Neutral magnitude of impact.
Appearance	There are several buildings of high architectural quality and interesting the area, especially along Grange Road, with large detached houses in the Arts and Crafts or Queen Anne Revival style. Building materials include brick, stone, render and tile. Other buildings which contribute to the attractive appearance from the post-war period include the red-brick Robinson College and the yellow-brick and metal clad Department of Applied Mathematics. Grange Road is relatively busy during working hours, but many of the streets to the east and west of the road are quiet. The many cul-de-sacs and traffic management measures prevent the area from being used for short cuts. Street trees and garden vegetation give the area a verdant character and provide valuable shade in summer. .	Local	Commonplace at the local level	Medium	Some opportunity for substitution	Negligible	Along Adams Road the removal of on-street parking would positively affect the setting of, and views from, the gardens and properties. Overall this would result in a Minor Beneficial magnitude of impact.
Human interaction	The residents in the area include many university students and teachers who live in university and college flats and shared houses. Many of these residents live in the area for a temporary period, moving on after two or three years, but there are also permanent residents. Cyclists and pedestrians use the quiet back streets east and west of Grange Road to reach the West Cambridge site, Robinson College, the Department of Applied Mathematics, the University Library and the various sports grounds in the area. The footways are relatively narrow, but parked cars provide a barrier between the road and pedestrians.	Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	This route would serve to improve linkages between Cambourne, Cambridge and the settlements in between through the creation of improved public transportation options in the area. In the West Cambridge area the proposal would serve to improve connectivity in and around the University campus and provide alternative safe routes of travel for off-peak hours. Through facilitating this movement of people, the quality and opportunities of human interaction would be increased Overall this would result in a Moderate Beneficial magnitude of impact.
Cultural	The study area includes part of the West Cambridge Conservation Area, the Conduit Head Conservation Area and the Storeys Way Conservation Area. The character of the Storey's Way Conservation Area is derived from the fine detached family houses in spacious gardens with mature planting. The area includes part of the grounds of Fitzwilliam and Churchill Colleges. The area includes seven listed buildings and eight buildings of local interest. The topography of the area is comparatively flat. The streets are tree-lined and the gardens well planted, giving the area a secluded, verdant quality. The Conduit Head Conservation Area comprises a 20th century residential development, built between 1914 and the 1990s. The buildings are generally large, detached properties, set in sizeable, mature gardens. The area was developed in a piecemeal fashion, in a variety of different architectural styles. The area includes five listed buildings and two buildings identified as buildings of local interest. The conservation area retains a substantial amount of mature vegetation. This, coupled with the quiet nature of the road, which is a cul-de-sac, provides a sense of seclusion in the area. There are few long views and the majority of buildings are screened from the road. The West Cambridge Conservation Area was designated in 1972 and extended in 1984 and 2011. Due to its size, the conservation area has been split into seven character areas. The scheme will run through the Grange Road Character Area as identified in the West Cambridge Conservation Area Appraisal (Cambridge City Council, May 2011). The appraisal describes the Grange Road area as retaining a domestic scale with a small area of 'wild' woodland at the junction of Bin Brook and Grange Road (Cobbett's Corner). There are many listed buildings in the area as well as non-listed buildings of architectural interest dating from the late 19th century to the present day. There are few long views due to the screening effects of the abundant vegetation of the area, apart from the sports fields where there are more open views. Trees line most of the streets, giving the area a verdant character. The grade II* listed Schlumberger Gould Research Centre is outside the West Cambridge Conservation Area and close to the West Cambridge site and the M11 Junction 13.	Regional	Some scarce features at the local level	High	Not substitutable	Negligible	The proposed route would enter the West Cambridge Conservation Area along Adams Road, with the area around Grange noted to contain a regimented grid of streets on north-south and east-west axis and, in parts, as retaining a domestic scale with a small area of 'wild' woodland - removal of on-street parking would be beneficial. As the route runs through the University campus, neither of these points are compromised, with route alignment reinforcing the east-west bias on circulation routes. The proposed route would also pass within 50m of the northern edge of the Coton Conservation area, causing a loss of vegetation that would have a negative impact on its setting, with the degree and duration of negative impact dependent upon the scope of mitigation/replacement planting which could be achieved along the route. The proposal will indirectly affect the Coton Conservation area and so a Minor Adverse impact is assessed.

Land use	<p>The land use is mixed within Cambridge between residential and University of Cambridge to the and rural settlements, such as Coton, Hardwick and Madingley set within the wider landscape between Cambridge and Cambourne. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing.</p> <p>Western Cambridge is heavily influenced by the University campus, with a series of playing and sports fields interspersed with a series of University buildings such as student campus and faculty buildings.</p> <p>Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS/6 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area.</p> <p>Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW1 of Proposed Submission SC Local Plan).</p>	Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	<p>This proposal would serve to link existing settlements as well as providing the opportunity to link future developments in the area in a sustainable fashion.</p> <p>Overall this would result in a Minor Beneficial magnitude of impact.</p>
Summary of character	<p>The area described on this townscape worksheet is suburban: a large proportion of the area is residential or in use as sports grounds. Less typical of the suburban area are the many educational buildings, including Robinson College and the Department of Applied Mathematics. The area is verdant, with tree-lined streets and well-vegetated, spacious gardens and grounds. There are many buildings of high architectural importance, which contribute to the special character of West Cambridge and the conservation area.</p>	Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	<p>The proposed Park & Ride facility would have no impact on townscape character. The proposed route would affect the townscape character of Coton but there is considerable scope to mitigate these and to integrate the proposal into the landscape during the detailed design stage.</p> <p>The key issues resulting from this proposal are the possibility for adverse effects on the Conservations Area at Coton, which is balanced out by beneficial effects to other features within local townscapes. Overall, the magnitude of impact is assessed to be Minor Beneficial.</p>

Reference Sources

DfT TAG Unit A3, December 2015 (www.gov.uk/transport-analysis-guidance-webtag)

Step 5 - Summary Assessment Score

Minor Beneficial

Qualitative Comments

On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Neutral impact. This is to identify that the proposal:

- it fits well with the layout, mix, scale, appearance, human interaction and cultural aspects of the townscape (Minor Beneficial)
- incorporates environmental design measures for mitigation to ensure they will blend in well with surrounding landscape (Minor Beneficial)
- although not very visually intrusive, will impact on certain views into and across the area (Minor Adverse)
- affects an area of recognised townscape quality (Minor Adverse)
- avoids conflict with government policy towards enhancing urban environments (Neutral)

TAG Townscape Impacts Worksheet (Phase 1 + Phase 2)

Illustrative Comparator A

		Step 3					Step 4
Features	Description	Scale it matters	Rarity	Importance	Substitutability	Changes in Without-scheme case	Illustrative Comparator A Impact
Layout	This worksheet includes the stretch of the route between Grange Road and the M11. The stretch of the route between the M11 and the Madingley Mulch roundabout is assessed on the landscape impacts worksheet.	≈Option 1'D4	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	The proposed route, commencing from the eastern edge of Upper Cambourne, would run east along the northern edge of the Bourn Airfield, parallel and in close proximity to the A428. The proposal maintains this proximity to the existing road corridor, continuing along the northern edge of Hardwick within the highway corridor up to the Madingley Interchange. From the Park & Ride facility at Madingley Mulch roundabout, a dedicated bus link would cross the agricultural land south of St Neots Road, running broadly parallel to it, from Madingley Mulch Roundabout to the intersection with Cambridge Road. The proposal then runs along the southern edge of a traditional orchard and in close proximity to Coton, replacing an existing field boundary. The proposal would then cross the M11, and continue through the University of Cambridge campus before following the route of a short section of shared footway/cycleway towards Wilberforce Road then using Adams Road to join Grange Road on the western edge of Cambridge.
	The Scheme passes through West Cambridge, an area largely laid out in the late 19th and early 20th centuries for housing. More recently, Cambridge University has developed the areas north and south of the Madingley Road for housing and research facilities. The A1303 Madingley Road, between two and four lanes wide, runs through the area. There are wide junctions at the entrance to Eddington, a new suburb north of the Madingley Road, and at the entrance to the West Cambridge site, south of the road. The West Cambridge site is laid out according to a landscape masterplan with housing and large-scale laboratories and research building. Parking is at surface level and the connecting roads are tree-lined. South of the West Cambridge site, the layout changes, with streets on a rectilinear grid, many ending in cul-de-sac or dead ends. The mainly detached houses are in substantial gardens with mature vegetation. Bin Brook runs through the grounds of Robinson College. Cycle and pedestrian connectivity is good, with cycle routes along Grange Road and Madingley Road and a combination of traffic-free and quiet roads linking the city centre with the West Cambridge and the Coton.						The length of the route adjacent to the West Cambridge and along Adams Road townscape is short, relative to its overall length. The bus corridor would not adversely affect the layout of the buildings or pattern of existing townscape features. It would not adversely affect the layout of the buildings and may even be considered a key artery around which future development of the University campus could be developed. Hardwick is fully screened from the proposed route by an existing block of dense, well developed vegetation. The length of the route adjacent to the West Cambridge townscape is short, relative to its overall length. The bus corridor would not adversely affect the layout of the buildings and may even be considered a key artery around which future development of the University campus could be developed. Overall this would result in a Minor Beneficial magnitude of impact.
Density and mix	Development in West Cambridge is low density with housing, student accommodation and educational buildings in spacious gardens or grounds and substantial areas of land in use as sports fields. The predominant land uses are residential and educational. Robinson College occupies a large area between Adams Road and Herschel Road. Other educational uses include the West Cambridge site, Churchill College, St John's College School and King's College School. Building types include flats, houses, educational buildings and sports pavilions. Parking is on mainly on-street, with small-scale parking areas around sporting and educational uses.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	The proposed route of the bus corridor as it enters the West Cambridge townscape fitting to the current density of that area and would reinforce existing building density and mix types within the University Campus. Overall this would result in a Minor Beneficial magnitude of impact.
Scale	On Grange Road, houses are generally detached, mostly three-storey including rooms in the attic and of a generous size. They sit in large, well-vegetated gardens. Further west, houses are smaller and semi-detached with smaller gardens. Streets are mainly narrow, with room for parking on one or both sides of the road, the educational buildings are higher than the housing, with typically three or four storeys. They occupy relatively large blocks of land with substantial grounds. There are many mature trees in the area restricting views and vistas to the sports fields, where the landscape is more open.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	The proposed route of the bus corridor as it enters the West Cambridge townscape is in scale with the current area and would not have any effect. The proposal would not have any impact on the scale of Hardwick. Overall this would result in a Neutral magnitude of impact.
Appearance	There are several buildings of high architectural quality and interesting the area, especially along Grange Road, with large detached houses in the Arts and Crafts or Queen Anne Revival style. Building materials include brick, stone, render and tile. Other buildings which contribute to the attractive appearance from the post-war period include the red-brick Robinson College and the yellow-brick and metal clad Department of Applied Mathematics. Grange Road is relatively busy during working hours, but many of the streets to the east and west of the road are quiet. The many cul-de-sacs and traffic management measures prevent the area from being used for short cuts. Street trees and garden vegetation give the area a verdant character and provide valuable shade in summer. .	Local	Commonplace at the local level	Medium	Some opportunity for substitution	Negligible	Along Adams Road the removal of on-street parking would positively affect the setting of, and views from, the gardens and properties. The proposal would not have any impact on the townscape elements of Hardwick. Overall this would result in a Minor Beneficial magnitude of impact.
Human interaction	The residents in the area include many university students and teachers who live in university and college flats and shared houses. Many of these residents live in the area for a temporary period, moving on after two or three years, but there are also permanent residents. Cyclists and pedestrians use the quiet back streets east and west of Grange Road to reach the West Cambridge site, Robinson College, the Department of Applied Mathematics, the University Library and the various sports grounds in the area. The footways are relatively narrow, but parked cars provide a barrier between the road and pedestrians.	Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	This route would serve to improve linkages between Cambourne, Cambridge and the settlements in between through the creation of improved public transportation options in the area. In the West Cambridge area the proposal would serve to improve connectivity in and around the University campus and provide alternative safe routes of travel for off-peak hours. Through facilitating this movement of people, the quality and opportunities of human interaction would be increased Overall this would result in a Moderate Beneficial magnitude of impact.
Cultural	The study area includes part of the West Cambridge Conservation Area, the Conduit Head Conservation Area and the Storeys Way Conservation Area. The character of the Storey's Way Conservation Area is derived from the fine detached family houses in spacious gardens with mature planting. The area includes part of the grounds of Fitzwilliam and Churchill Colleges. The area includes seven listed buildings and eight buildings of local interest. The topography of the area is comparatively flat. The streets are tree-lined and the gardens well planted, giving the area a secluded, verdant quality. The Conduit Head Conservation Area comprises a 20th century residential development, built between 1914 and the 1990s. The buildings are generally large, detached properties, set in sizeable, mature gardens. The area was developed in a piecemeal fashion, in a variety of different architectural styles. The area includes five listed buildings and two buildings identified as buildings of local interest. The conservation area retains a substantial amount of mature vegetation. This, coupled with the quiet nature of the road, which is a cul-de-sac, provides a sense of seclusion in the area. There are few long views and the majority of buildings are screened from the road. The West Cambridge Conservation Area was designated in 1972 and extended in 1984 and 2011. Due to its size, the conservation area has been split into seven character areas. The scheme will run through the Grange Road Character Area as identified in the West Cambridge Conservation Area Appraisal (Cambridge City Council, May 2011). The appraisal describes the Grange Road area as retaining a domestic scale with a small area of 'wild' woodland at the junction of Bin Brook and Grange Road (Cobbett's Corner). There are many listed buildings in the area as well as non-listed buildings of architectural interest dating from the late 19th century to the present day. There are few long views due to the screening effects of the abundant vegetation of the area, apart from the sports fields where there are more open views. Trees line most of the streets, giving the area a verdant character. The grade II* listed Schlumberger Gould Research Centre is outside the West Cambridge Conservation Area and close to the West Cambridge site and the M11 Junction 13.	Regional	Some scarce features at the local level	High	Not substitutable	Negligible	The proposed route would enter the West Cambridge Conservation Area along Adams Road, with the area around Grange noted to contain a regimented grid of streets on north-south and east-west axis and, in parts, as retaining a domestic scale with a small area of 'wild' woodland - removal of on-street parking would be beneficial. As the route runs through the University campus, neither of these points are compromised, with route alignment reinforcing the east-west bias on circulation routes. The proposed route would also pass within 50m of the northern edge of the Coton Conservation area, causing a loss of vegetation that would have a negative impact on its setting, with the degree and duration of negative impact dependent upon the scope of mitigation/replacement planting which could be achieved along the route. The proposal will indirectly affect the Coton Conservation area and so a Minor Adverse impact is assessed.

Land use	<p>The land use is mixed within Cambridge between residential and University of Cambridge to the and rural settlements, such as Coton, Hardwick and Madingley set within the wider landscape between Cambridge and Cambourne. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing.</p> <p>Western Cambridge is heavily influenced by the University campus, with a series of playing and sports fields interspersed with a series of University buildings such as student campus and faculty buildings.</p> <p>Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS/6 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area.</p> <p>Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW1 of Proposed Submission SC Local Plan).</p>	Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	<p>This proposal would serve to link existing settlements as well as providing the opportunity to link future developments in the area in a sustainable fashion.</p> <p>Overall this would result in a Minor Beneficial magnitude of impact.</p>
Summary of character	<p>The area described on this townscape worksheet is suburban: a large proportion of the area is residential or in use as sports grounds. Less typical of the suburban area are the many educational buildings, including Robinson College and the Department of Applied Mathematics. The area is verdant, with tree-lined streets and well-vegetated, spacious gardens and grounds. There are many buildings of high architectural importance, which contribute to the special character of West Cambridge and the conservation area.</p>	Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	<p>The proposed Park & Ride facility would have no impact on townscape character. The proposed route would affect the townscape character of Coton but there is considerable scope to mitigate these and to integrate the proposal into the landscape during the detailed design stage.</p> <p>The key issues resulting from this proposal are the possibility for adverse effects on the Conservations Area at Coton, which is balanced out by beneficial effects to other features within local townscapes. Overall, the magnitude of impact is assessed to be Minor Beneficial.</p>

Reference Sources

DfT TAG Unit A3, December 2015 (www.gov.uk/transport-analysis-guidance-webtag)

Step 5 - Summary Assessment Score

Minor Beneficial

Qualitative Comments

<p>On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Neutral impact. This is to identify that the proposal:</p> <ul style="list-style-type: none">• it fits well with the layout, mix, scale, appearance, human interaction and cultural aspects of the townscape (Minor Beneficial)• incorporates environmental design measures for mitigation to ensure they will blend in well with surrounding landscape (Minor Beneficial)• although not very visually intrusive, will impact on certain views into and across the area (Minor Adverse)• affects an area of recognised townscape quality (Minor Adverse)• avoids conflict with government policy towards enhancing urban environments (Neutral)

TAG Townscape Impacts Worksheet (Phase 1 + Phase 2)

Illustrative Comparator B

Step 2		Step 3					Step 4
Features	Description	Scale it matters	Rarity	Importance	Substitutability	Changes in Without-scheme case	Illustrative Comparator B Impact
Layout	This worksheet includes the stretch of the route between Grange Road and the M11. The stretch of the route between the M11 and the Madingley Mulch roundabout is assessed on the landscape impacts worksheet.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	<p>The proposed route, commencing from the eastern edge of Upper Cambourne, would run east along the northern edge of the Bourn Airfield, parallel and in close proximity to the A428. The proposal maintains this proximity to the existing road corridor, continuing along the northern edge of Hardwick within the highway corridor up to the Madingley Interchange. From the Park & Ride facility at Madingley Mulch roundabout, a dedicated bus link would cross the agricultural land south of St Neots Road, running broadly parallel to it, from Madingley Mulch Roundabout to the intersection with Cambridge Road. The proposal then runs along the southern edge of a traditional orchard and in close proximity to Coton, replacing an existing field boundary. The proposal would then cross the M11, and continue through the University of Cambridge campus before following the route of a short section of shared footway/cycleway towards Wilberforce Road then using Adams Road to join Grange Road on the western edge of Cambridge.</p> <p>The length of the route adjacent to the West Cambridge and along Adams Road townscape is short, relative to its overall length. The bus corridor would not adversely affect the layout of the buildings or pattern of existing townscape features. It would not adversely affect the layout of the buildings and may even be considered a key artery around which future development of the University campus could be developed.</p> <p>Hardwick is fully screened from the proposed route by an existing block of dense, well developed vegetation. The length of the route adjacent to the West Cambridge townscape is short, relative to its overall length. The bus corridor would not adversely affect the layout of the buildings and may even be considered a key artery around which future development of the University campus could be developed.</p> <p>Overall this would result in a Minor Beneficial magnitude of impact.</p>
	The Scheme passes through West Cambridge, an area largely laid out in the late 19th and early 20th centuries for housing. More recently, Cambridge University has developed the areas north and south of the Madingley Road for housing and research facilities. The A1303 Madingley Road, between two and four lanes wide, runs through the area. There are wide junctions at the entrance to Eddington, a new suburb north of the Madingley Road, and at the entrance to the West Cambridge site, south of the road. The West Cambridge site is laid out according to a landscape masterplan with housing and large-scale laboratories and research building. Parking is at surface level and the connecting roads are tree-lined. South of the West Cambridge site, the layout changes, with streets on a rectilinear grid, many ending in cul-de-sac or dead ends. The mainly detached houses are in substantial gardens with mature vegetation. Bin Brook runs through the grounds of Robinson College. Cycle and pedestrian connectivity is good, with cycle routes along Grange Road and Madingley Road and a combination of traffic-free and quiet roads linking the city centre with the West Cambridge and the Coton.						
Density and mix	Development in West Cambridge is low density with housing, student accommodation and educational buildings in spacious gardens or grounds and substantial areas of land in use as sports fields. The predominant land uses are residential and educational. Robinson College occupies a large area between Adams Road and Herschel Road. Other educational uses include the West Cambridge site, Churchill College, St John's College School and King's College School. Building types include flats, houses, educational buildings and sports pavilions. Parking is on mainly on-street, with small-scale parking areas around sporting and educational uses.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	<p>The proposed route of the bus corridor as it enters the West Cambridge townscape fitting to the current density of that area and would reinforce existing building density and mix types within the University Campus.</p> <p>Overall this would result in a Minor Beneficial magnitude of impact.</p>
Scale	On Grange Road, houses are generally detached, mostly three-storey including rooms in the attic and of a generous size. They sit in large, well-vegetated gardens. Further west, houses are smaller and semi-detached with smaller gardens. Streets are mainly narrow, with room for parking on one or both sides of the road. The educational buildings are higher than the housing, with typically three or four storeys. They occupy relatively large blocks of land with substantial grounds. There are many mature trees in the area restricting views and vistas to the sports fields, where the landscape is more open.	Local	Commonplace at the local level	Low	Some opportunity for substitution	Negligible	<p>The proposed route of the bus corridor as it enters the West Cambridge townscape is in scale with the current area and would not have any effect. The proposal would not have any impact on the scale of Hardwick.</p> <p>Overall this would result in a Neutral magnitude of impact.</p>
Appearance	There are several buildings of high architectural quality and interesting the area, especially along Grange Road, with large detached houses in the Arts and Crafts or Queen Anne Revival style. Building materials include brick, stone, render and tile. Other buildings which contribute to the attractive appearance from the post-war period include the red-brick Robinson College and the yellow-brick and metal clad Department of Applied Mathematics. Grange Road is relatively busy during working hours, but many of the streets to the east and west of the road are quiet. The many cul-de-sacs and traffic management measures prevent the area from being used for short cuts. Street trees and garden vegetation give the area a verdant character and provide valuable shade in summer. .	Local	Commonplace at the local level	Medium	Some opportunity for substitution	Negligible	<p>Along Adams Road the removal of on-street parking would positively affect the setting of, and views from, the gardens and properties. The proposal would not have any impact on the townscape elements of Hardwick.</p> <p>Overall this would result in a Minor Beneficial magnitude of impact.</p>
Human interaction	The residents in the area include many university students and teachers who live in university and college flats and shared houses. Many of these residents live in the area for a temporary period, moving on after two or three years, but there are also permanent residents. Cyclists and pedestrians use the quiet back streets east and west of Grange Road to reach the West Cambridge site, Robinson College, the Department of Applied Mathematics, the University Library and the various sports grounds in the area. The footways are relatively narrow, but parked cars provide a barrier between the road and pedestrians. .	Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	<p>This route would serve to improve linkages between Cambourne, Cambridge and the settlements in between through the creation of improved public transportation options in the area. In the West Cambridge area the proposal would serve to improve connectivity in and around the University campus and provide alternative safe routes of travel for off-peak hours. Through facilitating this movement of people, the quality and opportunities of human interaction would be increased</p> <p>Overall this would result in a Moderate Beneficial magnitude of impact.</p>
Cultural	<p>The study area includes part of the West Cambridge Conservation Area, the Conduit Head Conservation Area and the Storeys Way Conservation Area.</p> <p>The character of the Storey's Way Conservation Area is derived from the fine detached family houses in spacious gardens with mature planting. The area includes part of the grounds of Fitzwilliam and Churchill Colleges. The area includes seven listed buildings and eight buildings of local interest. The topography of the area is comparatively flat. The streets are tree-lined and the gardens well planted, giving the area a secluded, verdant quality.</p> <p>The Conduit Head Conservation Area comprises a 20th century residential development, built between 1914 and the 1990s. The buildings are generally large, detached properties, set in sizeable, mature gardens. The area was developed in a piecemeal fashion, in a variety of different architectural styles. The area includes five listed buildings and two buildings identified as buildings of local interest. The conservation area retains a substantial amount of mature vegetation. This, coupled with the quiet nature of the road, which is a cul-de-sac, provides a sense of seclusion in the area. There are few long views and the majority of buildings are screened from the road.</p> <p>The West Cambridge Conservation Area was designated in 1972 and extended in 1984 and 2011. Due to its size, the conservation area has been split into seven character areas. The scheme will run through the Grange Road Character Area as identified in the West Cambridge Conservation Area Appraisal (Cambridge City Council, May 2011). The appraisal describes the Grange Road area as retaining a domestic scale with a small area of 'wild' woodland at the junction of Bin Brook and Grange Road (Cobbett's Corner). There are many listed buildings in the area as well as non-listed buildings of architectural interest dating from the late 19th century to the present day. There are few long views due to the screening effects of the abundant vegetation of the area, apart from the sports fields where there are more open views. Trees line most of the streets, giving the area a verdant character.</p> <p>The grade II* listed Schlumberger Gould Research Centre is outside the West Cambridge Conservation Area and close to the West Cambridge site and the M11 Junction 13.</p>	Regional	Some scarce features at the local level	High	Not substitutable	Negligible	<p>The proposed route would enter the West Cambridge Conservation Area along Adams Road, with the area around Grange noted to contain a regimented grid of streets on north-south and east-west axis and, in parts, as retaining a domestic scale with a small area of 'wild' woodland - removal of on-street parking would be beneficial. As the route runs through the University campus, neither of these points are compromised, with route alignment reinforcing the east-west bias on circulation routes.</p> <p>The proposed route would also pass within 50m of the northern edge of the Coton Conservation area, causing a loss of vegetation that would have a negative impact on its setting, with the degree and duration of negative impact dependent upon the scope of mitigation/replacement planting which could be achieved along the route.</p> <p>The proposal will indirectly affect the Coton Conservation area and so a Minor Adverse impact is assessed.</p>

Land use	<p>The land use is mixed within Cambridge between residential and University of Cambridge to the and rural settlements, such as Coton, Hardwick and Madingley set within the wider landscape between Cambridge and Cambourne. Farming is primarily arable in nature with a mix of other uses including sheep and cattle grazing.</p> <p>Western Cambridge is heavily influenced by the University campus, with a series of playing and sports fields interspersed with a series of University buildings such as student campus and faculty buildings.</p> <p>Future development to the west of the area is likely to include a new village at Bourn Airfield of approximately 3,500 dwellings (Policy SS/6 of Proposed Submission South Cambridgeshire Local Plan) which would change the land use within this area.</p> <p>Future development to the east of the area includes a new University quarter at North West Cambridge (south west of Huntingdon Road) which would include a mix of accommodation, academic facilities and public open space (Policy NW1 of Proposed Submission SC Local Plan).</p>	Regional	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	<p>This proposal would serve to link existing settlements as well as providing the opportunity to link future developments in the area in a sustainable fashion.</p> <p>Overall this would result in a Minor Beneficial magnitude of impact.</p>
Summary of character	<p>The area described on this townscape worksheet is suburban: a large proportion of the area is residential or in use as sports grounds. Less typical of the suburban area are the many educational buildings, including Robinson College and the Department of Applied Mathematics. The area is verdant, with tree-lined streets and well-vegetated, spacious gardens and grounds. There are many buildings of high architectural importance, which contribute to the special character of West Cambridge and the conservation area.</p>	Local	Some scarce features at the local level	Medium	Some opportunity for substitution	Negligible	<p>The proposed Park & Ride facility would have no impact on townscape character. The proposed route would affect the townscape character of Coton but there is considerable scope to mitigate these and to integrate the proposal into the landscape during the detailed design stage.</p> <p>The key issues resulting from this proposal are the possibility for adverse effects on the Conservations Area at Coton, which is balanced out by beneficial effects to other features within local townscapes. Overall, the magnitude of impact is assessed to be Minor Beneficial.</p>

Reference Sources

DfT TAG Unit A3, December 2015 (www.gov.uk/transport-analysis-guidance-webtag)

Step 5 - Summary Assessment Score

Minor Beneficial

Qualitative Comments

On the basis of the information available and the level of design and study available at this stage, the scheme is assessed to result in a Neutral impact. This is to identify that the proposal:

- it fits well with the layout, mix, scale, appearance, human interaction and cultural aspects of the townscape (Minor Beneficial)
- incorporates environmental design measures for mitigation to ensure they will blend in well with surrounding landscape (Minor Beneficial)
- although not very visually intrusive, will impact on certain views into and across the area (Minor Adverse)
- affects an area of recognised townscape quality (Minor Adverse)
- avoids conflict with government policy towards enhancing urban environments (Neutral)

TAG Landscape Impacts Worksheet - Phase 2 Option 1a (Waterworks Travel Hub and off route option)

Features	Step 2	Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	The study area covers a 3km wide corridor of land running between the new village of Cambourne and the A1303/St Neots Road roundabout. The area lies in the Western Claylands Landscape Character Area (LCA). The landscape is mainly rural and open, with a series of residential settlements to the south of the St Neots Road and A428. The field pattern tends to be large-scale and field boundaries are generally formed by hedgerows with hedgerow trees. The A428 dual carriageway runs east/west through the centre of the study area, severing the landscape north and south of the road. Woodland belts lining the A428 and associated slip roads and roundabouts reinforce the strong linear character of the road. The runways and adjoining open grassland areas of Bourne Airfield occupy a large area between Cambourne and Highfields Caldecote.	Local	Locally common	Local	The landscape pattern can be substituted or recreated	There would be a limited alteration to the pattern of the landscape due to the proposed scheme as it predominantly follows the line of the existing east-west road corridor. Loss of roadside vegetation along the A428 and St Neots Road will increase the openness of the landscape, especially north of Hardwick, where views of the A428 and the landscape beyond will be opened up. The bus way would be separated from dwellings on St Neots Road by a landscape strip, maintaining the existing width of the road. Mitigation planting along the route would restore boundary hedgerows and screening. Field patterns would be largely unaffected by the route because where it passes through agricultural land, it is close to existing field boundaries, though some hedgerow and hedgerow trees would be lost. The park and ride car park would be largely within the existing waterworks site, but it would extend into the adjacent agricultural field. It would be highly visible from the open landscape of the valley to the south and uncharacteristic of the existing landscape pattern. The impact would be moderate adverse due to the loss of boundary and screening vegetation north of Hardwick and at the waterworks site, the effective widening of the existing east-west road corridor and the loss of hedgerows and farmland.
Tranquillity	The tranquillity of the study area overall is medium. The A428, local roads at peak times and Cambourne generate noise and activity, but east and west of the road corridor tranquillity is higher. Noise mitigation barriers between the A428 and the St Neots Road are only partly effective and noise from the dual carriageway is noticeable. Planting screens vehicles using the A428 from properties along the St Neots Road. Cambourne, the smaller settlements and the A428 are lit at night. Whilst at the eastern end of the study area the backdrop of Cambridge contributes to skyglow. The farmland north and south of the A428 is relatively dark at night.	Local	Locally common	Local	Tranquillity cannot easily be recreated, however, mitigation can be used to reduce the effects of the proposed scheme on tranquillity.	Tranquillity would be reduced by the addition of buses and a new road through the study area, but in the context of the existing noise and activity generated by the A428, local roads and Cambourne, the difference would not be marked. Loss of vegetation between the A428 and the St Neots Road would open up views of passing traffic on the dual carriageway from properties on the St Neots Road. Noise barriers along parts of the route could reduce the existing noise generated by the A428 where it passes close to Hardwick and Highfields. Existing vegetation would screen much of the park and ride site on the waterworks site but vehicle movements would reduce tranquillity in the open landscape to the south. At night the car park would introduce additional lighting to the area, however, this would be seen in context with the already lit Madingley roundabout. The impact would be moderate adverse due to the removal of vegetation, opening up views of the A428 and the presence of new infrastructure.
Cultural	The Parish Church of St Mary (Grade II*) at the southern end of Hardwick and Madingley Hall (Grade II*) are the most notable listed building within the study area. A network of public rights of way (PRoW) and the Harcamlow and Wimpole Way long distance footpaths cross the landscape within the study area. East of Hardwick, between Long Road and Main Street, historic field patterns are largely unchanged from the boundaries on historic mapping from the 18th century. Some boundary hedgerows are intact, however a number are of poor quality or have been removed, with only hedgerow trees remaining.	Local	Locally common	Local	Cultural elements cannot easily be substituted.	The scheme will not affect the setting of the Parish Church of St Mary or Madingley Hall due to the screening effect of existing intervening vegetation. It would also not affect any areas of historic field pattern. It may be visible from PRoW near the A428, but it will be seen in context of the existing transport network. The impact would be negligible.
Landcover	The majority of land cover within the study area is medium to large fields in arable cultivation. These are generally defined by hedgerows. There are a few small woodland blocks within the study area, including the Bucket Hill Plantation and New Barns Plantations to the south east of Bourn Airfield. The Madingley Hall estate is located on the northern extents of the study area. It comprises mature woodlands, pasture, formal gardens and plantations. The A428 dual carriageway occupies a wide corridor through the centre of the study area. Roads, associated roundabouts and slip roads are generally defined on both sides by mature hedgerows and woodland planting. The settlement of Cambourne is located to the western end of the study area. It comprises housing, employment uses and substantial areas of open landscape. The location for the park and ride site is currently composed of grassland with a woodland belt along the northern boundary and blocks of planting along the southern boundary.	Local	Locally common	Local	Landcover can be recreated or substituted.	The route would be constructed close to the A428 for much of its extent, minimising the loss of farmland. The car park would result in the loss of part of the waterworks site and partial loss of a field south of the waterworks site. The agricultural use of the remaining field would be unaffected. Within the car park, arable land would be replaced by a road and car park with paving, lighting and moving vehicles. There would be a loss of mature woodland vegetation from the waterworks site and an additional loss of screening vegetation along the A428, St Neots Road. Mitigation planting along the route and around and within the car park would, in time, restore some of the woodland cover in the study area lost during construction. The impact would be moderate adverse to a loss of farmland and vegetation.

Summary of character	The proposed scheme is in the Western Claylands LCA. The landscape comprises large, relatively flat open agricultural fields, some bound by hedgerows. The landform is gently undulating and there are long views over the farmland from the southern part of the study area. Overall woodland cover is limited to a scattering of small to medium woodland blocks, but the character of the study area becomes more wooded at its eastern end. Cambourne is the most substantial settlement with small nucleated villages along the St Neots Road. The residential areas and associated transport infrastructure across the study area reduce overall tranquillity. Typical views are of a rural landscape, however there are detracting features of powerlines, street lighting and signage associated with roads.	Local	Locally common	Local	The landscape contains few features which cannot be substituted or recreated elsewhere.	There would be a loss of farmland, trees and screening vegetation as a result of the construction of the new park and ride site and the busway. The impacts of the new busway will be most noticeable where it passes along the A428 and St Neots Road, due to the loss of existing vegetation, which will open up views of the A428. The busway would be clearly visible from much of the St Neots Road, but it would be separated from the road by a landscape strip and the road itself would not be widened. The car park would be clearly visible from the open landscape to the south of the waterworks site. Mitigation planting would be incorporated into the scheme proposals to restore the existing screening vegetation and to integrate the busway and car park into the landscape. Tranquillity would be reduced with the addition of buses on the busway and noise, activity and additional lighting in the car park. The overall magnitude of impact would be moderate adverse.
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Reference Sources

Cambridge Landscape Character Assessment, Landscape Design Associates 2003, South Cambridgeshire Design Guide 2010

Step 5 - Summary Assessment Score

Option 1A would result in a Moderate Adverse (negative) effect due to the impact on St Neots Road and from the Waterworks site

Qualitative Comments

In conclusion option 1a would result in adverse impacts due to the introduction of a new park and ride site and busway between Cambourne and the park and ride site. The scheme would reduce tranquillity and would alter the pattern of the open rural landscape south of the waterworks site and the wooded road corridor along the St Neots Road. There would be a loss of mature trees and screening vegetation on the boundaries of the waterworks site and along the St Neots Road. Landscape mitigation planting would reduce the landscape and visual impacts of the proposed scheme over time.

TAG Landscape Impacts Worksheet - Phase 2 Option 1b (Scotland Farm Travel Hub - off route option)

Features	Step 2	Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	The study area covers a 3km wide corridor of land running between the new village of Cambourne and the A1303/St Neots Road roundabout. The area lies in the Western Claylands Landscape Character Area (LCA). The landscape is mainly rural and open, with a series of residential settlements to the south of the St Neots Road and A428. The field pattern tends to be large-scale and field boundaries are generally formed by hedgerows with hedgerow trees. The A428 dual carriageway runs east/west through the centre of the study area, severing the landscape north and south of the road. Woodland belts lining the A428 and associated slip roads and roundabouts reinforce the strong linear character of the road. The runways and adjoining open grassland areas of Bourne Airfield occupy a large area between Cambourne and Highfields Caldecote.	Local	Locally common	Local	The landscape pattern can be substituted or recreated	There would be a limited alteration to the pattern of the landscape due to the proposed scheme as it predominantly follows the line of the existing east-west road corridor. Loss of roadside vegetation along the A428 and St Neots Road would increase the openness of the landscape, especially north of Hardwick, where views of the A428 and the landscape beyond will be opened up. The bus way would be separated from dwellings on St Neots Road by a landscape strip, maintaining the existing width of the road. Mitigation planting along the route would restore boundary hedgerows and screening. Field patterns would be largely unaffected by the route because where it passes through agricultural land, it is close to existing field boundaries, though some hedgerow and hedgerow trees would be lost. The park and ride car park would be wholly within the large open field at Scotland Farm and little vegetation would be removed to construct it. The impact would be minor adverse due to the loss of boundary and screening vegetation north of Hardwick and the effective widening of the existing east-west road corridor.
Tranquillity	The tranquillity of the study area overall is medium. The A428, local roads at peak times and Cambourne generate noise and activity, but east and west of the road corridor tranquillity is higher. Noise mitigation barriers between the A428 and the St Neots Road are only partly effective and noise from the dual carriageway is noticeable. Planting screens vehicles using the A428 from properties along the St Neots Road. Cambourne, the smaller settlements and the A428 are lit at night. Whilst at the eastern end of the study area the backdrop of Cambridge contributes to skyglow. The farmland north and south of the A428 is relatively dark at night.	Local	Locally common	Local	Tranquillity cannot easily be recreated, however, mitigation can be used to reduce the effects of the proposed scheme on tranquillity.	Tranquillity would be reduced by the addition of buses and a new road through the study area, but in the context of the existing noise and activity generated by the A428, local roads and Cambourne, the difference would not be marked. Loss of vegetation between the A428 and the St Neots Road would open up views of passing traffic on the dual carriageway from properties on the St Neots Road. Noise barriers along parts of the route could reduce the existing noise generated by the A428 where it passes close to Hardwick and Highfields. Proposed mitigation would in time screen the buses from many dwellings on St Neots Road. Mitigation planting around the Scotland Farm park and ride site would screen vehicle movements from the surrounding landscape, through there would be oblique views from dwellings in Scotland Road. At night the car park would introduce additional lighting to the area, however, this would be seen in context of the already lit A428/Scotland Road junction. The impact would be minor adverse due to the removal of vegetation, opening up views of the A428 and the presence of new infrastructure.
Cultural	The Parish Church of St Mary (Grade II*) at the southern end of Hardwick and Madingley Hall (Grade II*) are the most notable listed building within the study area. A network of public rights of way (PRoW) and the Harcamlow and Wimpole Way long distance footpaths cross the landscape within the study area. East of Hardwick, between Long Road and Main Street, historic field patterns are largely unchanged from the boundaries on historic mapping from the 18th century. Some boundary hedgerows are intact, however a number are of poor quality or have been removed, with only hedgerow trees remaining.	Local	Locally common	Local	Cultural elements cannot easily be substituted.	The scheme would not affect the setting of the Parish Church of St Mary due to the screening effect of existing intervening vegetation. It would also not affect any areas of historic field pattern. It may be visible from PRoW near the A428, but it would be seen in context of the existing transport network. The impact would be negligible.
Landcover	The majority of land cover within the study area is medium to large fields in arable cultivation. These are generally defined by hedgerows. There are a few small woodland blocks within the study area, including the Bucket Hill Plantation and New Barns Plantations to the south east of Bourn Airfield. The Madingley Hall estate is located on the northern extents of the study area. It comprises mature woodlands, pasture, formal gardens and plantations. The A428 dual carriageway occupies a wide corridor through the centre of the study area. Roads, associated roundabouts and slip roads are generally defined on both sides by mature hedgerows and woodland planting. The settlement of Cambourne is located to the western end of the study area. It comprises housing, employment uses and substantial areas of open landscape. The location for the park and ride site currently occupies part of an existing arable field, with some maturing planting along the southern edge of the site.	Local	Locally common	Local	Landcover can be recreated or substituted.	The route would be constructed close to the A428 for much of its extent, minimising the loss of farmland. The car park would result in the loss of part of a large field, northeast of the A428/Scotland Road junction. The agricultural use of the remaining field would be unaffected. Within the car park, arable land would be replaced by a road and car park with paving, lighting and moving vehicles. Mitigation planting along the route and around and within the car park would, in time, restore some of the woodland cover in the study area lost during construction and introduce new woodland planting. The impact would be moderate adverse due to a loss of farmland and screening vegetation.
Summary of character	The proposed scheme is in the Western Claylands LCA. The landscape comprises large, relatively flat open agricultural fields, some bound by hedgerows. The landform is gently undulating and there are long views over the farmland from the southern part of the study area. Overall woodland cover is limited to a scattering of small to medium woodland blocks, but the character of the study area becomes more wooded at its eastern end. Cambourne is the most substantial settlement with small nucleated villages along the St Neots Road. The residential areas and associated transport infrastructure across the study area reduce overall tranquillity. Typical views are of a rural landscape, however there are detracting features of powerlines, street lighting and signage associated with roads.	Local	Locally common	Local	The landscape contains few features which cannot be substituted or recreated elsewhere.	There would be a loss of farmland, trees and screening vegetation as a result of the construction of the Proposed Scheme. The impacts of the new busway would be most noticeable where it passes along the A428 and St Neots Road, due to the removal of existing vegetation, which would open up views of the A428. The busway would be clearly visible from much of the St Neots Road, but it would be separated from the road by a landscape strip and the road itself would not be widened. The car park would be visible in oblique views from dwellings on Scotland Road. Mitigation planting would be incorporated into the scheme proposals to reinstate existing screening vegetation and to integrate the busway and car park into the landscape. Tranquillity would be reduced with the addition of buses on the busway and noise, activity and additional lighting in the car park. The overall impact would be minor adverse.

Reference Sources

Cambridge Landscape Character Assessment, Landscape Design Associates 2003, South Cambridgeshire Design Guide 2010

Step 5 - Summary Assessment Score

Option 1B would result in a Minor Adverse (negative) effect due to the impact on St Neots Road

Qualitative Comments

In conclusion option 1b would result in adverse impacts due to the introduction of a new park and ride site and busway between Cambourne and the A1303/St Neots Roundabout. The scheme would reduce tranquillity and would alter the pattern of the landscape along the wooded road corridor of the St Neots Road. There would be a loss of mature trees and screening vegetation along the St Neots Road. Landscape mitigation planting would reduce the landscape and visual impacts of the proposed scheme over time.

TAG Landscape Impacts Worksheet - Phase 2 Option 2a (Waterworks Travel Hub and on-road option)

Features	Step 2	Step 3			Step 4	
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	The study area covers a 3km wide corridor of land running between the new village of Cambourne and the A1303/St Neots Road roundabout. The area lies in the Western Claylands Landscape Character Area (LCA). The landscape is mainly rural and open, with a series of residential settlements to the south of the St Neots Road and A428. The field pattern tends to be large-scale and field boundaries are generally formed by hedgerows with hedgerow trees. The A428 dual carriageway runs east/west through the centre of the study area, severing the landscape north and south of the road. Woodland belts lining the A428 and associated slip roads and roundabouts reinforce the strong linear character of the road. The runways and adjoining open grassland areas of Bourne Airfield occupy a large area between Cambourne and Highfields Caldecote.	Local	Locally common	Local	The landscape pattern can be substituted or recreated	The busway would result in a limited alteration to the pattern of the landscape. It largely follows the existing roads and there are few hedgerows in the fields which the scheme crosses. The park and ride car park would be mainly within the existing waterworks site, but it would extend into the adjacent agricultural field. It would be highly visible from the open landscape of the valley to the south and uncharacteristic of the existing landscape pattern. There would be a loss of mature trees, hedgerow and screening vegetation required to create an access into the park and ride site. The impact would be a moderate adverse due to the loss of mature trees and vegetation at the waterworks site.
Tranquillity	The tranquillity of the study area overall is medium. The A428, local roads at peak times and Cambourne generate noise and activity, but east and west of the road corridor tranquillity is higher. Noise mitigation barriers between the A428 and the St Neots Road are only partly effective and noise from the dual carriageway is noticeable. Planting screens vehicles using the A428 from properties along the St Neots Road. Cambourne, the smaller settlements and the A428 are lit at night. Whilst at the eastern end of the study area the backdrop of Cambridge contributes to skyglow. The farmland north and south of the A428 is relatively dark at night.	Local	Locally common	Local	Tranquillity cannot easily be recreated, however, mitigation can be used to reduce the effects of the proposed scheme on tranquillity.	Tranquillity would be reduced by the increase in the number of buses through the study area, but in the context of the existing noise and activity generated by the A428, local roads and Cambourne, the difference would not be noticeable. Existing vegetation would screen much of the park and ride site on the waterworks site but vehicle movements would reduce tranquillity in the open landscape to the south. At night the car park would introduce additional lighting to the area, however, this would be seen in context with the already lit Madingley Mulch roundabout. The impact would be minor adverse due to the removal of vegetation for the construction of the park and ride site.
Cultural	The Parish Church of St Mary (Grade II*) at the southern end of Hardwick and Madingley Hall (Grade II*) are the most notable listed building within the study area. A network of public rights of way (PROW) and the Harcamlow and Wimpole Way long distance footpaths cross the landscape within the study area. East of Hardwick, between Long Road and Main Street, historic field patterns are largely unchanged from the boundaries on historic mapping from the 18th century. Some boundary hedgerows are intact, however a number are of poor quality or have been removed, with only hedgerow trees remaining.	Local	Locally common	Local	Cultural elements cannot easily be substituted.	The scheme will not affect the setting of the Parish Church of St Mary or Madingley Hall due to the screening effect of existing intervening vegetation. It would also not affect any areas of historic field pattern. It may be visible from PROW near the A428, but it will be seen in context of the existing transport network. The impact would be negligible.
Landcover	The majority of land cover within the study area is medium to large fields in arable cultivation. These are generally defined by hedgerows. There are a few small woodland blocks within the study area, including the Bucket Hill Plantation and New Barns Plantations to the south east of Bourn Airfield. The Madingley Hall estate is located on the northern extents of the study area. It comprises mature woodlands, pasture, formal gardens and plantations. The A428 dual carriageway occupies a wide corridor through the centre of the study area. Roads, associated roundabouts and slip roads are generally defined on both sides by mature hedgerows and woodland planting. The settlement of Cambourne is located to the western end of the study area. It comprises housing, employment uses and substantial areas of open landscape. The location for the park and ride site is currently composed of grassland with a woodland belt along the northern boundary and blocks of planting along the	Local	Locally common	Local	Landcover can be recreated or substituted.	The car park would result in the loss of part of the waterworks site and partial loss of a field south of the waterworks site. The agricultural use of the remaining field would be unaffected. Within the car park, arable land would be replaced by a road and car park with paving, lighting and moving vehicles. There would be a loss of important vegetation from the waterworks site. Mitigation planting around and within the car park would, in time, restore some of the woodland cover lost during construction. The impact would be minor adverse due to a loss of farmland and vegetation.
Summary of character	The proposed scheme is in the Western Claylands LCA. The landscape comprises large, relatively flat open agricultural fields, some bound by hedgerows. The landform is gently undulating and there are long views over the farmland from the southern part of the study area. Overall woodland cover is limited to a scattering of small to medium woodland blocks, but the character of the study area becomes more wooded at its eastern end. Cambourne is the most substantial settlement with small nucleated villages along the St Neots Road. The residential areas and associated transport infrastructure across the study area reduce overall tranquillity. Typical views are of a rural landscape, however there are detracting features of powerlines, street lighting and signage associated with roads.	Local	Locally common	Local	The landscape contains few features which cannot be substituted or recreated elsewhere.	There would be a loss of farmland, trees and screening vegetation as a result of the construction of the new park and ride site and the busway. The park and ride site will be clearly visible from the open landscape to the south of the waterworks site. Mitigation planting would be incorporated into the scheme proposals to restore the existing screening vegetation and to integrate the busway and car park into the landscape. Tranquillity would be reduced with the addition of buses on the busway and noise, activity and additional lighting in the car park. The overall impact would be minor adverse.

Reference Sources

Cambridge Landscape Character Assessment, Landscape Design Associates 2003, South Cambridgeshire Design Guide 2010

Step 5 - Summary Assessment Score

Option 2a would result in a Minor Adverse (negative) effect due to the effect from the Waterworks site

Qualitative Comments

In conclusion option 2a would result in adverse impacts due to the introduction of a new park and ride site and busway between Cambourne and the A1303/St Neots Road roundabout. The scheme would reduce tranquillity and would alter the pattern of the open rural landscape south of the waterworks site. There would be a loss of mature trees and screening vegetation on the boundaries of the waterworks site. Landscape mitigation planting would reduce the landscape and visual impacts of the proposed scheme over time.

TAG Landscape Impacts Worksheet - Phase 2 Option 2b (Scotland Farm Travel Hub and on road option)

Features	Step 2	Step 3			Step 4	
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	The study area covers a 3km wide corridor of land running between the new village of Cambourne and the A1303/St Neots Road roundabout. The area lies in the Western Claylands Landscape Character Area (LCA). The landscape is mainly rural and open, with a series of residential settlements to the south of the St Neots Road and A428. The field pattern tends to be large-scale and field boundaries are generally formed by hedgerows with hedgerow trees. The A428 dual carriageway runs east/west through the centre of the study area, severing the landscape north and south of the road. Woodland belts lining the A428 and associated slip roads and roundabouts reinforce the strong linear character of the road. The runways and adjoining open grassland areas of Bourne Airfield occupy a large area between Cambourne and Highfields Caldecote.	Local	Locally common	Local	The landscape pattern can be substituted or recreated	There would be a limited alteration to the pattern of the landscape due to the proposed scheme as it predominantly follows the line of the existing east-west road corridor. Field patterns would be largely unaffected by the route because where it passes through agricultural land, it is close to existing field boundaries, though some hedgerow and hedgerow trees would be lost. The park and ride car park would be wholly within the large open field at Scotland Farm and little vegetation would be removed to construct it. It would remove a portion of the field from agricultural use. The proposed park and ride site would be surrounded by a strong structural mitigation planting buffer to assist with mitigating the visual impact of the proposals and increase the visual amenity of the area. The impact would be negligible due to the loss of a farmland.
Tranquillity	The tranquillity of the study area overall is medium. The A428, local roads at peak times and Cambourne generate noise and activity, but east and west of the road corridor tranquillity is higher. Noise mitigation barriers between the A428 and the St Neots Road are only partly effective and noise from the dual carriageway is noticeable. Planting screens vehicles using the A428 from properties along the St Neots Road. Cambourne, the smaller settlements and the A428 are lit at night. Whilst at the eastern end of the study area the backdrop of Cambridge contributes to skyglow. The farmland north and south of the A428 is relatively dark at night.	Local	Locally common	Local	Tranquillity cannot easily be recreated, however, mitigation can be used to reduce the effects of the proposed scheme on tranquillity.	Tranquillity would be reduced by the increase in the number of buses through the study area, but in the context of the existing noise and activity generated by the A428, local roads and Cambourne, the difference would not be noticeable. Mitigation planting around the Scotland Farm park and ride site would screen vehicle movements from the surrounding landscape, through there would be oblique views from dwellings in Scotland Road. At night the car park would introduce additional lighting to the area, however, this would be seen in context of the already lit A428/Scotland Road junction. The impact would be minor due to the introduction of a vehicle movement and lighting in the car park into the agricultural landscape.
Cultural	The Parish Church of St Mary (Grade II*) at the southern end of Hardwick and Madingley Hall (Grade II*) are the most notable listed building within the study area. A network of public rights of way (PRoW) and the Harcamlow and Wimpole Way long distance footpaths cross the landscape within the study area. East of Hardwick, between Long Road and Main Street, historic field patterns are largely unchanged from the boundaries on historic mapping from the 18th century. Some boundary hedgerows are intact, however a number are of poor quality or have been removed, with only hedgerow trees remaining.	Local	Locally common	Local	Cultural elements cannot easily be substituted.	The scheme would not affect the setting of the Parish Church of St Mary or Madingley Hall due to the screening effect of existing intervening vegetation. It would also not affect any areas of historic field pattern. It may be visible from PRoW near the A428, but it would be seen in context of the existing transport network. The impact would be negligible.
Landcover	The majority of land cover within the study area is medium to large fields in arable cultivation. These are generally defined by hedgerows. There are a few small woodland blocks within the study area, including the Bucket Hill Plantation and New Barns Plantations to the south east of Bourn Airfield. The Madingley Hall estate is located on the northern extents of the study area. It comprises mature woodlands, pasture, formal gardens and plantations. The A428 dual carriageway occupies a wide corridor through the centre of the study area. Roads, associated roundabouts and slip roads are generally defined on both sides by mature hedgerows and woodland planting. The settlement of Cambourne is located to the western end of the study area. It comprises housing, employment uses and substantial areas of open landscape. The location for the park and ride site is currently composed of grassland with a woodland belt along the northern boundary and blocks of planting along the southern boundary.	Local	Locally common	Local	Landcover can be recreated or substituted.	The route would be constructed close to the A428 for much of its extent, minimising the loss of farmland. The car park would result in the loss of part of a large field, northeast of the A428/Scotland Road junction. The agricultural use of the remaining field would be unaffected. Within the car park, arable land would be replaced by a road and car park with paving, lighting and moving vehicles. Mitigation planting around and within the car park would introduce new woodland planting within the study area. The impact would be minor adverse due to a loss of farmland.
Summary of character	The proposed scheme is in the Western Claylands LCA. The landscape comprises large, relatively flat open agricultural fields, some bound by hedgerows. The landform is gently undulating and there are long views over the farmland from the southern part of the study area. Overall woodland cover is limited to a scattering of small to medium woodland blocks, but the character of the study area becomes more wooded at its eastern end. Cambourne is the most substantial settlement with small nucleated villages along the St Neots Road. The residential areas and associated transport infrastructure across the study area reduce overall tranquillity. Typical views are of a rural landscape, however there are detracting features of powerlines, street lighting and signage associated with roads.	Local	Locally common	Local	The landscape contains few features which cannot be substituted or recreated elsewhere.	There would be a loss of farmland and vegetation as a result of the construction of the Proposed Scheme. There would be oblique views of the park and ride site from dwellings on Scotland Road but there would be no widespread landscape impacts. Mitigation planting would be incorporated to reinstate existing screening vegetation and to integrate the car park into the landscape. Tranquillity would be reduced with the additional buses on St Neots Road and noise, activity and additional lighting in the car park. The overall impact would be minor adverse.

Reference Sources

Cambridge Landscape Character Assessment, Landscape Design Associates 2003, South Cambridgeshire Design Guide 2010

Step 5 - Summary Assessment Score

Option 2b would result in a minor adverse (negative) effect

Qualitative Comments

In conclusion option 2b would result in adverse impacts due to the introduction of a new park and ride site and busway between Cambourne and the A1303/St Neots Roundabout. The scheme would reduce tranquillity and would alter the pattern of the landscape at Scotland Road where a car park would replace part of an arable field. The scheme would increase light levels in the open landscape north of the

TAG Landscape Impacts Worksheet - Phase 2 Option 3a (Waterworks Travel Hub and bus lane option)

Features	Step 2	Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	The study area covers a 3km wide corridor of land running between the new village of Cambourne and the A1303/St Neots Road roundabout. The area lies in the Western Claylands Landscape Character Area (LCA). The landscape is mainly rural and open, with a series of residential settlements to the south of the St Neots Road and A428. The field pattern tends to be large-scale and field boundaries are generally formed by hedgerows with hedgerow trees. The A428 dual carriageway runs east/west through the centre of the study area, severing the landscape north and south of the road. Woodland belts lining the A428 and associated slip roads and roundabouts reinforce the strong linear character of the road. The runways and adjoining open grassland areas of Bourne Airfield occupy a large area between Cambourne and Highfields Caldecote.	Local	Locally common	Local	The landscape pattern can be substituted or recreated	There would be a limited alteration to the pattern of the landscape due to the proposed scheme as it predominantly follows the line of the existing east-west road corridor. Loss of roadside vegetation along the A428 and St Neots Road will increase the openness of the landscape, especially north of Hardwick, where views of the A428 and the landscape beyond will be opened up. The bus way would be effectively widen the road corridor along St Neots Road from around 6m to around 14m wide. Loss of vegetation and road widening would remove the existing country road character of the St Neots Road. Mitigation planting along the route would restore some of the screen planting between the road and the A428. Field patterns would be largely unaffected by the route because where it passes through agricultural land, it is close to existing field boundaries, though some hedgerow and hedgerow trees would be lost. The park and ride car park would be largely within the existing waterworks site, but it would extend into the adjacent agricultural field. It would be highly visible from the open landscape of the valley to the south and uncharacteristic of the existing landscape pattern. The impact would be moderate adverse due to the loss of vegetation along the St Neots Road and at the waterworks site, the effective widening of the existing east-west road corridor and the loss of hedgerows and farmland.
Tranquillity	The tranquillity of the study area overall is medium. The A428, local roads at peak times and Cambourne generate noise and activity, but east and west of the road corridor tranquillity is higher. Noise mitigation barriers between the A428 and the St Neots Road are only partly effective and noise from the dual carriageway is noticeable. Planting screens vehicles using the A428 from properties along the St Neots Road. Cambourne, the smaller settlements and the A428 are lit at night. Whilst at the eastern end of the study area the backdrop of Cambridge contributes to skyglow. The farmland north and south of the A428 is relatively dark at night.	Local	Locally common	Local	Tranquillity cannot easily be recreated, however, mitigation can be used to reduce the effects of the proposed scheme on tranquillity.	The impact would be moderate adverse due to the loss of boundary and screening vegetation north of Hardwick and at the waterworks site, the effective widening of the existing east-west road corridor and the loss of hedgerows and farmland.
Cultural	The Parish Church of St Mary (Grade II*) at the southern end of Hardwick and Madingley Hall (Grade II*) are the most notable listed building within the study area. A network of public rights of way (PROW) and the Harcamlow and Wimpole Way long distance footpaths cross the landscape within the study area. East of Hardwick, between Long Road and Main Street, historic field patterns are largely unchanged from the boundaries on historic mapping from the 18th century. Some boundary hedgerows are intact, however a number are of poor quality or have been removed, with only hedgerow trees remaining.	Local	Locally common	Local	Cultural elements cannot easily be substituted.	The scheme will not affect the setting of the Parish Church of St Mary or Madingley Hall due to the screening effect of existing intervening vegetation. It would also not affect any areas of historic field pattern. It may be visible from PROW near the A428, but it will be seen in context of the existing transport network. The impact would be negligible.
Landcover	The majority of land cover within the study area is medium to large fields in arable cultivation. These are generally defined by hedgerows. There are a few small woodland blocks within the study area, including the Bucket Hill Plantation and New Barns Plantations to the south east of Bourne Airfield. The Madingley Hall estate is located on the northern extents of the study area. It comprises mature woodlands, pasture, formal gardens and plantations. The A428 dual carriageway occupies a wide corridor through the centre of the study area. Roads, associated roundabouts and slip roads are generally defined on both sides by mature hedgerows and woodland planting. The settlement of Cambourne is located to the western end of the study area. It comprises housing, employment uses and substantial areas of open landscape. The location for the park and ride site is currently composed of grassland with a woodland belt along the northern boundary and blocks of planting along the southern boundary.	Local	Locally common	Local	Landcover can be recreated or substituted.	The route would be constructed close to the A428 for much of its extent, minimising the loss of farmland. The car park would result in the loss of part of the waterworks site and partial loss of a field south of the waterworks site. The agricultural use of the remaining field would be unaffected. Within the car park, arable land would be replaced by a road and car park with paving, lighting and moving vehicles. There would be a loss of mature woodland vegetation from the waterworks site and an additional loss of screening vegetation along the A428, St Neots Road. Mitigation planting along the route and around and within the car park would, in time, restore some of the woodland cover in the study area lost during construction. The impact would be moderate adverse due to a loss of farmland and vegetation.
Summary of character	The proposed scheme is in the Western Claylands LCA. The landscape comprises large, relatively flat open agricultural fields, some bound by hedgerows. The landform is gently undulating and there are long views over the farmland from the southern part of the study area. Overall woodland cover is limited to a scattering of small to medium woodland blocks, but the character of the study area becomes more wooded at its eastern end. Cambourne is the most substantial settlement with small nucleated villages along the St Neots Road. The residential areas and associated transport infrastructure across the study area reduce overall tranquillity. Typical views are of a rural landscape, however there are detracting features of powerlines, street lighting and signage associated with roads.	Local	Locally common	Local	The landscape contains few features which cannot be substituted or recreated elsewhere.	There would be a loss of farmland, trees and screening vegetation as a result of the construction of the Proposed Scheme. The impacts of the new busway would be most noticeable where it passes along the A428 and St Neots Road, due to the removal of existing vegetation, which would open up views of the A428, and the loss of the rural character of St Neots Road. Mature trees would be removed to construct the car park at the waterworks site and the car park would be clearly visible from the open landscape to the south of the site. Mitigation planting would restore the existing screening vegetation and integrate the busway and car park into the landscape. Tranquillity would be reduced with the addition of buses on the busway and noise, activity and additional lighting in the car park. The overall impact would be moderate adverse.

Reference Sources

Cambridge Landscape Character Assessment, Landscape Design Associates 2003, South Cambridgeshire Design Guide 2010

Step 5 - Summary Assessment Score

Option 3a would result in a Moderate Adverse (negative) effect due to the impact from the Waterworks site

Qualitative Comments

In conclusion option 3a would result in adverse impacts due to the introduction of a new park and ride site and busway between Cambourne and the park and ride site. The scheme would reduce tranquillity and would alter the pattern of the open rural landscape south of the waterworks site and the wooded road corridor along the St Neots Road. There would be a loss of mature trees and screening vegetation on the boundaries of the Waterworks site and along the St Neots Road. Landscape mitigation planting would reduce the landscape and visual impacts of the proposed scheme over time.

TAG Landscape Impacts Worksheet - Phase 2 Option 3b (Scotland Farm Travel Hub and bus lane option)

Features	Step 2	Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	The study area covers a 3km wide corridor of land running between the new village of Cambourne and the A1303/St Neots Road roundabout. The area lies in the Western Claylands Landscape Character Area (LCA). The landscape is mainly rural and open, with a series of residential settlements to the south of the St Neots Road and A428. The field pattern tends to be large-scale and field boundaries are generally formed by hedgerows with hedgerow trees. The A428 dual carriageway runs east/west through the centre of the study area, severing the landscape north and south of the road. Woodland belts lining the A428 and associated slip roads and roundabouts reinforce the strong linear character of the road. The runways and adjoining open grassland areas of Bourne Airfield occupy a large area between Cambourne and Highfields Caldecote.	Local	Locally common	Local	The landscape pattern can be substituted or recreated	There would be a limited alteration to the pattern of the landscape due to the proposed scheme as it predominantly follows the line of the existing east-west road corridor. Loss of roadside vegetation along the A428 and St Neots Road will increase the openness of the landscape, especially north of Hardwick, where views of the A428 and the landscape beyond will be opened up. The busway would be effectively widen the road corridor along St Neots Road from around 6m to around 14m wide. Loss of vegetation and road widening would remove the existing country road character of the St Neots Road. Mitigation planting along the route would restore some of the screen planting between the road and the A428. Field patterns would be largely unaffected by the route because where it passes through agricultural land, it is close to existing field boundaries, though some hedgerow and hedgerow trees would be lost. The park and ride car park would be wholly within the large open field at Scotland Farm and little vegetation would be removed to construct it. The impact would be moderate adverse due to the loss of boundary and screening vegetation north of Hardwick and the effective widening of the existing east-west road corridor.
Tranquillity	The tranquillity of the study area overall is medium. The A428, local roads at peak times and Cambourne generate noise and activity, but east and west of the road corridor tranquillity is higher. Noise mitigation barriers between the A428 and the St Neots Road are only partly effective and noise from the dual carriageway is noticeable. Planting screens vehicles using the A428 from properties along the St Neots Road. Cambourne, the smaller settlements and the A428 are lit at night. Whilst at the eastern end of the study area the backdrop of Cambridge contributes to skyglow. The farmland north and south of the A428 is relatively dark at night.	Local	Locally common	Local	Tranquillity cannot easily be recreated, however, mitigation can be used to reduce the effects of the proposed scheme on tranquillity.	Tranquillity would be reduced by the addition of buses and a new road through the study area, but in the context of the existing noise and activity generated by the A428, local roads and Cambourne, the difference would not be marked. Loss of vegetation between the A428 and the St Neots Road would open up views of passing traffic on the dual carriageway from properties on the St Neots Road. Noise barriers along parts of the route could reduce the existing noise generated by the A428 where it passes close to Hardwick and Highfields. Mitigation planting around the Scotland Farm park and ride site would screen vehicle movements from the surrounding landscape, through there would be oblique views from dwellings in Scotland Road. At night the car park would introduce additional lighting to the area, however, this would be seen in context of the already lit A428/Scotland Road junction. The impact would be minor adverse due to the removal of vegetation, opening up views of the A428 and the presence of new infrastructure.
Cultural	The Parish Church of St Mary (Grade II*) at the southern end of Hardwick and Madingley Hall (Grade II*) are the most notable listed building within the study area. A network of public rights of way (PRoW) and the Harcamlow and Wimpole Way long distance footpaths cross the landscape within the study area. East of Hardwick, between Long Road and Main Street, historic field patterns are largely unchanged from the boundaries on historic mapping from the 18th century. Some boundary hedgerows are intact, however a number are of poor quality or have been removed, with only hedgerow trees remaining.	Local	Locally common	Local	Cultural elements cannot easily be substituted.	The scheme will not affect the setting of the Parish Church of St Mary due to the screening effect of existing intervening vegetation. It would also not affect any areas of historic field pattern. It may be visible from PRoW near the A428, but it will be seen in context of the existing transport network. The impact would be negligible.
Landcover	The majority of land cover within the study area is medium to large fields in arable cultivation. These are generally defined by hedgerows. There are a few small woodland blocks within the study area, including the Bucket Hill Plantation and New Barns Plantations to the south east of Bourn Airfield. The Madingley Hall estate is located on the northern extents of the study area. It comprises mature woodlands, pasture, formal gardens and plantations. The A428 dual carriageway occupies a wide corridor through the centre of the study area. Roads, associated roundabouts and slip roads are generally defined on both sides by mature hedgerows and woodland planting. The settlement of Cambourne is located to the western end of the study area. It comprises housing, employment uses and substantial areas of open landscape. The location for the park and ride site is currently composed of grassland with a woodland belt along the northern boundary and blocks of planting along the southern boundary.	Local	Locally common	Local	Landcover can be recreated or substituted.	The route would be constructed close to the A428 for much of its extent, minimising the loss of farmland. The car park would result in the loss of part of a large field, northeast of the A428/Scotland Road junction. The agricultural use of the remaining field would be unaffected. Within the car park, arable land would be replaced by a road and car park with paving, lighting and moving vehicles. Mitigation planting along the route and around and within the car park would, in time, restore some of the woodland cover in the study area lost during construction and introduce new woodland planting. The impact would be moderate adverse due to a loss of farmland and screening vegetation.
Summary of character	The proposed scheme is in the Western Claylands LCA. The landscape comprises large, relatively flat open agricultural fields, some bound by hedgerows. The landform is gently undulating and there are long views over the farmland from the southern part of the study area. Overall woodland cover is limited to a scattering of small to medium woodland blocks, but the character of the study area becomes more wooded at its eastern end. Cambourne is the most substantial settlement with small nucleated villages along the St Neots Road. The residential areas and associated transport infrastructure across the study area reduce overall tranquillity. Typical views are of a rural landscape, however there are detracting features of powerlines, street lighting and signage associated with roads.	Local	Locally common	Local	The landscape contains few features which cannot be substituted or recreated elsewhere.	There would be a loss of farmland, trees and screening vegetation as a result of the introduction of the new park and ride site and the busway. The impacts of the new busway would be most noticeable where it passes along the A428 and St Neots Road, due to the removal of existing vegetation, which would open up views of the A428 and the loss of the rural character of St Neots Road. The car park would be visible in oblique views from dwellings on Scotland Road. Mitigation planting would be incorporated into the scheme proposals to reinstate existing screening vegetation and to integrate the busway and car park into the landscape. Tranquillity would be reduced with the addition of buses on the busway and noise, activity and additional lighting in the car park. The overall impact would be moderate adverse.

Reference Sources

Cambridge Landscape Character Assessment, Landscape Design Associates 2003, South Cambridgeshire Design Guide 2010

Step 5 - Summary Assessment Score

Option 3b would result in a Moderate adverse effect

Qualitative Comments

In conclusion option 3b would result in adverse impacts due to the introduction of a new park and ride site and busway between Cambourne and the A1303/St Neots Roundabout. The scheme would reduce tranquillity and would alter the pattern of the landscape along the wooded road corridor of the St Neots Road. There would be a loss of mature trees and screening vegetation along St Neots Road. Landscape mitigation planting would reduce the landscape and visual impacts of the proposed scheme over time.

H. Noise

Cambourne to Cambridge (C2C) - Noise Assessment – Phase 1 Summary Tables

Option	Assessment	Significance
Low Cost A	<p>This Option comprises improvements to M11 Junction 13 and the addition of the Waterworks Park and Ride. Other on-line improvements will form part of the do-minimum.</p> <p>Traffic noise at source is a function of gradient, road surface, traffic volume, speed and percentage HGVs. Traffic noise is assessed over an 18-hour period (06:00 – 24:00) and the index conventionally used to calculate it is the $L_{A10,18\text{-hour}}$. For webTAG this value is converted into an $L_{Aeq,16\text{-hour}}$.</p> <p>In order to achieve an increase of 1dB, in broad terms, a traffic increase of 25% would be necessary. Similarly, in order to achieve an increase of 3dB, existing traffic would have to be doubled. Alternatively, noise changes could also occur as a result of significant changes in flow parameters such as speed and percentage HGV etc.</p> <p>Since this Option is an online scheme, changes in traffic flow or composition that would result in significant changes in noise are unlikely. Although Waterworks Park and Ride is new and there are residential receptors in the vicinity, it is considered that standard good design can be applied such that noise changes at these receptors is minimal.</p>	Neutral
Low Cost B	<p>This Option comprises improvements to M11 Junction 13 and the addition of the Scotland Farm Park and Ride further to the west than that of Low Cost A.</p> <p>Since this Option is an online scheme, changes in traffic flow or composition that would result in significant changes in noise are unlikely. Although Scotland Farm Park and Ride is new and there are residential receptors adjacent to the site, it is considered that standard good design can be applied such that noise changes at these receptors is minimal.</p>	Neutral
Do Something 1a	<p>Option 1a is predominantly an offline route comprising a dedicated busway. The route commences at Adams Road which is located in a residential area. The route would pass approximately 170m behind residential receptors on Madingley Road which are unlikely to be affected. The route crosses Cambridge road approximately 10m from residences fronting this road, and approximately 70m from other residences in Coton. Thereafter the route crosses the M11 and connects with Grange Road via Adams Road, passing close to residential receptors.</p> <p>Traffic, hence noise level at adjacent properties is unlikely to change so much that noise levels will alter significantly, so are judged to remain unchanged on the A1303 and A428. Noise changes will depend on existing background noise levels, and for the majority of this option these are likely to be dominated by distant (A1303, A428, M11) and localised (Cambridge Road, Grange Road, M11) road traffic. Given that the number of buses proposed is relatively low, the majority of impacts will be negligible, however there will be some minor adverse impacts to the rear of some properties. There will be opportunities for mitigation such as acoustic barriers which will reduce these impacts further. The Waterworks Park and Ride would be at Madingley Mulch Interchange. Although the Park and Ride is new and there are residential receptors in the vicinity, it is considered that mitigation can be applied such that noise changes at these receptors is minimal.</p>	Minor Adverse
Do Something 1b	<p>Option 1b follows the same alignment as Option 1a and similar comments apply, with the difference being the location of the Scotland Farm Park and Ride further west along the A428. Although the Park and Ride is new and there are residential receptors in the vicinity, it is considered that mitigation can be applied such that noise changes at these receptors is minimal.</p>	Minor Adverse
Illustrative comparator A	<p>As Option 1a except the route is extended to the west to Cambourne. The extension forms a dedicated busway aligned between the A428 and St Neot's Road. Any increases in noise levels will depend on the current and future contribution to overall traffic noise from</p>	Minor Adverse

Option	Assessment	Significance
	the A428 and St. Neot's Road. It is likely that noise from these sources will exceed that of Illustrative comparator A, thus impacts from this section are considered negligible.	
Illustrative comparator B	As Illustrative comparator A except the route is extended to the west to Cambourne. The extension forms a dedicated busway aligned between the A428 and St Neot's Road. Any increases in noise levels will depend on the current and future contribution to overall traffic noise from the A428 and St. Neot's Road. It is likely that noise from these sources will exceed that of Illustrative comparator B, thus impacts from this section are considered negligible.	Minor Adverse

Cambourne to Cambridge (C2C) - Noise Assessment – Phase 2 Summary Tables

Option	Assessment	Significance
Option 1a	<p>This Option comprises a new off-road public transport route in varying proximity to existing roads although following the general alignment of St Neots Road and the A428 for the majority of its length. This Option includes the Waterworks Park and Ride site.</p> <p>Traffic noise at source is a function of gradient, road surface, traffic volume, speed and percentage HGVs. Traffic noise is assessed over an 18-hour period (06:00 – 24:00) and the index conventionally used to calculate it is the $L_{A10,18\text{-hour}}$. For webTAG this value is converted into an $L_{Aeq,16\text{-hour}}$. In order to achieve an increase of 1dB, in broad terms, a traffic increase of 25% would be necessary.</p> <p>Similarly, in order to achieve an increase of 3dB, existing traffic would have to be doubled. Alternatively, noise changes could also occur as a result of significant changes in flow parameters such as speed and percentage HGV etc.</p> <p>This Option is unlikely to result in significant changes in traffic (hence noise) on the existing road network. Where this Option is adjacent to an existing road such as A428, noise from the latter is likely to predominate and significant impacts are unlikely to result.</p> <p>Where this Option is adjacent to, or on more lightly-trafficked roads, such as those on its route within Upper Camborne and Great Camborne, noise from public transport is likely to be audible at nearest properties.</p> <p>Noise from traffic within the Waterworks Park and Ride has the potential to be audible at the rear of nearest properties, although this can be reduced with mitigation.</p> <p>With this Option there is scope to provide mitigation against traffic noise from the existing A428, although this will depend on the relative heights of the A428 and Option 1. There is also the option of providing mitigation elsewhere along the route.</p>	Slight Adverse
Option 1b	<p>This Option comprises a new off-road public transport route in varying proximity to existing roads although following the general alignment of St Neots Road and the A428 for the majority of its length. This Option includes the Scotland Farm Park and Ride site.</p> <p>Traffic noise at source is a function of gradient, road surface, traffic volume, speed and percentage HGVs. Traffic noise is assessed over an 18-hour period (06:00 – 24:00) and the index conventionally used to calculate it is the $L_{A10,18\text{-hour}}$. For webTAG this value is converted into an $L_{Aeq,16\text{-hour}}$. In order to achieve an increase of 1dB, in broad terms, a traffic increase of 25% would be necessary.</p> <p>Similarly, in order to achieve an increase of 3dB, existing traffic would have to be doubled. Alternatively, noise changes could also occur as a result of significant changes in flow parameters such as speed and percentage HGV etc.</p> <p>This Option is unlikely to result in significant changes in traffic (hence noise) on the existing road network. Where this Option is adjacent to an existing road such as A428, noise from the latter is likely to predominate and significant impacts are unlikely to result.</p> <p>Where this Option is adjacent to, or on more lightly-trafficked roads, such as those on its route within Upper Camborne and Great Camborne, noise from public transport is likely to be audible at nearest properties.</p>	Slight Adverse

Option	Assessment	Significance
	<p>Noise from traffic within the Scotland Farm Park and Ride has the potential to be audible at the rear of nearest properties fronting Scotland Road, although this can be reduced with mitigation.</p> <p>With this Option there is scope to provide mitigation against traffic noise from the existing A428, although this will depend on the relative heights of the A428 and Option 1. There is also the option of providing mitigation elsewhere along the route.</p>	
Option 2a	<p>Option 2 predominantly uses the existing St Neots Road. To the west of the junction between St Neots Road and Highfields Road the route follows the same alignment as Option 1. This Option includes the Waterworks Park and Ride site.</p> <p>Traffic noise at source is a function of gradient, road surface, traffic volume, speed and percentage HGVs. Traffic noise is assessed over an 18-hour period (06:00 – 24:00) and the index conventionally used to calculate it is the $L_{A10,18\text{-hour}}$. For webTAG this value is converted into an $L_{Aeq,16\text{-hour}}$. In order to achieve an increase of 1dB, in broad terms, a traffic increase of 25% would be necessary.</p> <p>Given that the number of buses proposed on the existing road network is relatively low, the majority of impacts will be negligible.</p> <p>This Option is unlikely to result in significant changes in traffic (hence noise) on the existing road network. Where this Option is adjacent to an existing road such as A428, noise from the latter is likely to predominate and significant impacts are unlikely to result.</p> <p>Where this Option is adjacent to, or on more lightly-trafficked roads, such as those on its route within Upper Camborne and Great Camborne, noise from public transport is likely to be audible at nearest properties.</p> <p>Noise from traffic within the Waterworks Park and Ride has the potential to be audible at the rear of nearest properties, although this can be reduced with mitigation.</p>	Slight adverse
Option 2b	<p>Option 2 predominantly uses the existing St Neots Road to the east of the junction between St Neots Road and Highfields Road. To the west of this junction the route follows the same alignment as Option 1. This Option includes the Scotland Farm Park and Ride.</p> <p>Traffic noise at source is a function of gradient, road surface, traffic volume, speed and percentage HGVs. Traffic noise is assessed over an 18-hour period (06:00 – 24:00) and the index conventionally used to calculate it is the $L_{A10,18\text{-hour}}$. For webTAG this value is converted into an $L_{Aeq,16\text{-hour}}$. In order to achieve an increase of 1dB, in broad terms, a traffic increase of 25% would be necessary. Given that the number of buses proposed on the existing road network is relatively low, the majority of impacts will be negligible.</p> <p>Where this Option is adjacent to, or on more lightly-trafficked roads, such as those on its route within Upper Camborne and Great Camborne, noise from public transport is likely to be audible at nearest properties.</p> <p>Noise from traffic within the Scotland Farm Park and Ride has the potential to be audible at the rear of nearest properties fronting Scotland Road, although this can be reduced with mitigation.</p>	Slight adverse
Option 3a	<p>This Option is the same as Option 2a except for the provision of segregated lanes along St Neots Road.</p> <p>Traffic noise at source is a function of gradient, road surface, traffic volume, speed and percentage HGVs. Traffic noise is assessed over an 18-hour period (06:00 – 24:00) and the index conventionally used to calculate it is the $L_{A10,18\text{-hour}}$. For webTAG this value is converted into an</p>	Slight Adverse

Option	Assessment	Significance
	<p>$L_{Aeq,16-hour}$. In order to achieve an increase of 1dB, in broad terms, a traffic increase of 25% would be necessary. Given that the number of buses proposed on the existing road network is relatively low, the majority of impacts will be negligible.</p> <p>Where this Option is adjacent to, or on more lightly-trafficked roads, such as those on its route within Upper Camborne and Great Camborne, noise from public transport is likely to be audible at nearest properties.</p> <p>Noise from traffic within the Waterworks Park and Ride has the potential to be audible at the rear of nearest properties, although this can be reduced with mitigation.</p> <p>With this Option there is scope to provide mitigation against traffic noise from the existing A428 as it will require the construction of an additional carriageway between St Neots Road and the A428. The effectiveness of the mitigation will depend on the relative heights of the A428 and the additional carriageway and the height of any mitigation proposed.</p>	
Option 3b	<p>This Option is the same as Option 2a except for the provision of segregated lanes along St Neots Road</p> <p>Traffic noise at source is a function of gradient, road surface, traffic volume, speed and percentage HGVs. Traffic noise is assessed over an 18-hour period (06:00 – 24:00) and the index conventionally used to calculate it is the $L_{A10,18-hour}$. For webTAG this value is converted into an $L_{Aeq,16-hour}$. In order to achieve an increase of 1dB, in broad terms, a traffic increase of 25% would be necessary. Given that the number of buses proposed on the existing road network is relatively low, the majority of impacts will be negligible.</p> <p>Where this Option is adjacent to, or on more lightly-trafficked roads, such as those on its route within Upper Camborne and Great Camborne, noise from public transport is likely to be audible at nearest properties.</p> <p>Noise from traffic within the Scotland Farm Park and Ride has the potential to be audible at the rear of nearest properties fronting Scotland Road, although this can be reduced with mitigation.</p> <p>With this Option there is scope to provide mitigation against traffic noise from the existing A428 as it will require the construction of an additional carriageway between St Neots Road and the A428. The effectiveness of the mitigation will depend on the relative heights of the A428 and the additional carriageway and the height of any mitigation proposed.</p>	Slight Adverse

