



Greater Cambridge Partnership

Cambourne to Cambridge (CtoC) Scheme

CPPF Alternative Scheme – Engineering
Assessment



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Executive summary

This report assesses the engineering feasibility of the alternative public transport scheme proposed by Cambridge Past, Present and Future (CPPF) in their objection to the Cambourne to Cambridge (CtoC) guided busway. Unlike the applicant's segregated route, the CPPF scheme proposes in-highway bus priority along Madingley Road. The assessment is based on CPPF's written Statement of Case, as no engineering drawings were available at the time of writing. CPPF has since indicated that drawings will be provided separately, and an appraisal of their engineering drawings will be undertaken once they have been made available.

Key Findings

- Non-Compliance with Design Standards
- The CPPF proposals, particularly the central (offside) bus lane with filter pockets, do not comply with the Design Manual for Roads and Bridges (DMRB) or other relevant standards.
- Proposed lane widths are below the minimum recommended for high-speed rural roads and would require multiple Departures from Standard, especially in constrained sections near sensitive sites.
- The Departures from Standard that would be required to implement the CPPF scheme as presented are considered critical as they would impact the land requirements and as such are fundamental to the viability of the scheme.

Road Safety Concerns

- The central bus lane design proposed by CPPF introduces significant safety risks, including potential conflicts between buses and right-turning vehicles, lack of clear priority at filter pockets, and increased risk to cyclists and pedestrians.
- A high-level safety review suggests that these issues would likely be raised in a formal Road Safety Audit and are likely to prevent the scheme from gaining technical approval.

Environmental and Heritage Impacts

- The route passes alongside Madingley Wood Site of Special Scientific Interest (SSSI) and the Cambridge American Cemetery (Grade I Registered Park and Garden, with a Grade II* listed "Memorial and attached walls, steps and pool surround at American Military Cemetery").
- Both central and nearside bus lane options would require land acquisition and removal of mature trees and hedgerows, potentially affecting protected bat habitats and the setting of heritage assets.
- Natural England and Historic England have previously expressed concerns about online options along Madingley Road.

Engineering and Buildability Challenges

- The CPPF scheme lacks general arrangement plans and does not address critical engineering aspects such as drainage, utilities, and pavement condition.
- Construction would require prolonged lane closures and complex traffic management, with significant disruption expected over a 1 to 2-year period.

Alternative Concept Design

- An alternative nearside bus lane concept was developed by the applicant's team to test the feasibility. While safer, it still requires significant land acquisition and impacts on residential properties and environmental features.
- The design confirms that a compliant on-road solution cannot be delivered within the existing highway boundary without unacceptable impacts.

Assessment of Revised (April 2025) CPPF Proposals

- The revised CPPF scheme proposes a nearside bus lane, which is more conventional and mitigates some safety concerns.
- However, it still relies on substandard lane widths and omits key features such as ghost islands and hard strips.
- The use of the Active Travel England Route Cross-Section Tool to justify lane widths is inappropriate for the context of Madingley Road.

Recommendations

- The CPPF alternative scheme, in both its original and revised forms, is not a feasible or viable alternative to the proposed CtoC guided busway.
- The scheme fails to meet essential design, safety, and environmental standards and would likely not receive technical approval from the Highway Authority.
- The proposed CtoC scheme remains the preferred option due to its ability to deliver reliable, segregated public transport infrastructure with fewer environmental and safety risks.

1 Introduction

1.1 Background

- 1.1.1. Cambridgeshire County Council (CCC) on behalf of the Greater Cambridgeshire Partnership (GCP) is applying to the Secretary of State (SoS) for Transport for a Transport and Works Act Order (TWAo) to authorise the construction, operation and maintenance of a guided busway between the town of Cambourne and Cambridge City. The guided busway is referred to as the Cambourne to Cambridge Better Public Transport project ('the Scheme').
- 1.1.2. The objectives of the Scheme as set out in the Outline Business Case are to:
 - Achieve improved accessibility to support the economic growth of the Greater Cambridge region.
 - Deliver a sustainable transport network/system that connects areas between Cambourne and Cambridge along the A428/A1303 transport corridor; and
 - Contribute to enhanced quality of life by relieving congestion and improving air quality within the surrounding areas along the A428 /A1303 corridor and within Cambridge City.
- 1.1.3. The Scheme proposes the construction of a dedicated guided busway, running for approximately 13.6km between the town of Cambourne and the edge of Cambridge City. The busway will route to the south of the A428 and A1303, with a Travel Hub provided at Scotland Farm. The Scheme will provide bus stops at the existing communities of Cambourne, Hardwick, Coton and the West Cambridge campus as well as the consented Bourn Airfield development. An emergency and maintenance access track will be provided alongside most of the guided busway, which would be accessible to pedestrians and cyclists. Part of the service track will also function as a bridleway.
- 1.1.4. The Scheme will provide an attractive alternative to the car, encouraging more people from existing and future communities to travel by active modes and public transport for a range of journey purposes. Delivering an attractive service is fundamental to achieving modal shift from private vehicles and supporting the sustainable economic growth of Cambridge and South Cambridgeshire by providing inclusive access to jobs, services and opportunities.
- 1.1.5. The key factors in the attractiveness of public transport are **high frequencies, reliable and competitive journey times and consistent performance**. To be attractive to the commuter market it should provide competitive journey times to private vehicles during the peak travel periods. Reliability is a key attribute for attracting users, requiring high levels of segregation.
- 1.1.6. As a result, the Scheme includes high levels of segregation to provide operational resilience during periods of regular peak period network congestion and increased congestion during incident periods (roadworks and accidents), The operational resilience provided by

segregated running, combined with the journey time benefits substantially contribute to the attractiveness of the Scheme.

1.2 Purpose of this report

- 1.2.1. Cambridge Past Present and Future (CPPF) oppose the making of the TWA0, and oppose the request that a direction be made that planning permission be deemed to be granted. The CPPF objection letter to the SoS for Transport (COT1/1 (LPF)) [**CD2-OBJ-251**] sets out several reasons for their objection. The reasons relate to the transport modelling undertaken to support the Scheme, potential environmental impacts, and the CPPF view that the benefits of the Scheme can be achieved by an in-highway bus priority scheme on Madingley Road.
- 1.2.2. The letter sets out the CPPF 'Alternative Scheme', which proposes buses routing along Madingley Road rather than the proposed segregated route south of Madingley Road. The 'Alternative Scheme' proposes an inbound bus lane on Madingley Road to provide bus priority for eastbound buses. The perception that this scheme offers a better solution than the proposed CtoC scheme, and the misconception that such an on-line solution has not been duly considered to date are recurrent themes in several objections hence the need to respond to the CPPF paper.
- 1.2.3. An on-line inbound bus lane was assessed comprehensively in the various Options Appraisal Reports (OAR) which are Appended to the Outline Business Case, [**CD1-20.07 & CD1-20.08**] and that work is not revisited here.
- 1.2.4. OAR Part 1 [**CD1-20.07**] provides a summary of all options development and assessment work carried out since the scheme's inception, up to the formal consultation period on the initial shortlisted options that ran between November 2017 and January 2018. OAR Part 1 also included further assessment of the shortlisted options to develop and refine them and arrive at an optimised list of options that include a single recommended on-road option and a single recommended off-road option for Phase 1 of the CtoC project.
- 1.2.5. OAR Part 2 [**CD1-20.08**] provides an assessment of the refined shortlisted options from OAR Part 1 using Mott MacDonald's Investment Sifting and Evaluation Tool (INSET) against a series of assessment criteria, and incorporating an initial assessment of the scheme's value for money using traffic modelling output to provide initial Benefit Cost Ratios (BCRs) for each option. This assessment also incorporates the findings and feedback from consultation to arrive at a recommended option for Phase 1 of the CtoC project.
- 1.2.6. The purpose of this report is to document an Engineering Assessment which considers the feasibility of the CPPF 'Alternative Scheme', reviewing the proposals against the applicable geometric design standards. The report also highlights any significant road safety concerns alongside any engineering, and environmental challenges associated with the CPPF Alternative Scheme. Where significant road safety concerns are identified, alternative solutions for the delivery of an inbound bus lane along Madingley Road have been assessed.

- 1.2.7. The assessment is based on CPPF's Objection and written Statement of Case, as no engineering drawings were available at the time of writing. CPPF has since indicated that drawings will be provided separately, and an appraisal of their engineering drawings will be undertaken once they have been made available.

1.3 Documents Reviewed

- 1.3.1. Chapter 3 of this report contains an assessment of the CPPF Alternative Scheme as set out in the following document:
- Cambourne to Cambridge: In-Highway Proposals for High Quality Public Transport Scheme (revised) – extract, produced for Cambridge Past, Present & Future by Edward Leigh MA MSc, updated September 2024 [CD7-09].
- 1.3.2. An updated version of the CPPF proposal, originally published in February 2021, was subsequently submitted with CPPF's Statement of Case in April 2025 following the issue of Cambridgeshire County Council's Statement of Case.
- 1.3.3. The Applicant's Statement of Case addressed some of the early findings of the engineering assessment contained in Chapter 3 of this report including some of the significant safety concerns associated with the provision of a central (offside) inbound bus lane as proposed by CPPF.
- 1.3.4. The updated CPPF report includes a shift from a central (offside) inbound bus lane to a nearside lane. However, the revised report does not completely rule out a central (offside) bus lane, with CPPF asserting that there may be merit in providing a central bus lane.
- 1.3.5. Chapter 4 of this report contains an assessment of the revised proposals presented by CPPF in the following document:
- Alternative in-highway proposal for high quality Cambourne–Cambridge public transport scheme Produced for Cambridge Past, Present & Future by Edward Leigh MA MSc MTPS, updated April 2025 [CD23-18-02].

1.4 Limitations and Assumptions – September 2024 Proposals

- 1.4.1. The Alternative Scheme set out in the September 2024 [CD7-09] document provides a description of the proposals which include:
- Signalisation of the Madingley Mulch roundabout with bus priority measures including 'hurry' call signals, an inbound bus lane on St Neots Road, bus bypass through the roundabout and optional schemes including an outbound bus lane on Maddingley Road and the A428 off-slip.
 - Inbound central bus lane from Madingley Mulch Roundabout to Crome Lea Business Park.
 - Crome Lea Business Park to the American Cemetery, option for smart traffic signals to control the inbound flow of general traffic and prevent blocking back to the Madingley Mulch roundabout. Optional additional inbound traffic lane.

- American Cemetery to existing bus lane, inbound central bus lane is proposed and signal control of the Cambridge Road junction.
- M11 Junction inbound bus lane extension past the M11 off-slip.
- M11 Bridge, nearside bus lane extension and signalise M11 on-slip.
- M11 bridge to the P&R entrance, provision of a nearside bus lane, and bus responsive signals at the Park and Ride junction; and
- P&R to Northampton Street, bus responsive signals at all existing signal-controlled junctions.

1.4.2. The main limitation of the document is that it does not provide any general arrangement plans of the proposals to demonstrate that the Alternative Scheme proposals are feasible and will deliver the same scale of benefits as the proposed scheme.

1.4.3. Limitations of the Alternative Scheme also include:

- Bus priority is provided for inbound buses only from the Madingley Mulch roundabout to the Park and Ride site.
- Accidents, incidents and roadworks on the road network along with the variability in traffic conditions will lead to periods of increased congestion along Madingley Road that will impact inbound and outbound Cambourne to Cambridge buses, reducing the reliability of the scheme compared to a fully segregated route.
- Inbound traffic flow control, using traffic signals to ‘hold’ the inbound flow of general traffic is applied in some UK urban environments with co-ordinated urban traffic control networks. However, there are a number of challenges with this approach including:
 - A substantial investment in new signal control infrastructure along Madingley Road will be required;
 - The increased delays to peak period inbound general traffic could result in reassignment to alternative routes including through Madingley, Comberton and other radial routes into Cambridge, and increased speeding due to driver frustration; and
 - Consistently delivering journey time benefits to inbound buses along Madingley Road at a level that is ‘identical to the proposed scheme’ is not demonstrated. The ability to consistently hold sufficient inbound traffic during peak times on the exit from Madingley Mulch Roundabout and the M11 off-slip to increase bus journey times has not been demonstrated, with concerns raised with the potential for queuing back onto the M11 and the A428. Therefore, there is a risk that an investment in signal control solution to ‘hold’ inbound general traffic will not result in the achievement of consistent improvements to bus journey times.

1.4.4. In response to the lack of general arrangement plans a feasibility review has been undertaken and is presented in Chapter 3 of this report.

1.5 Limitations and Assumptions – April 2025 Proposals

1.5.1. The main changes to the Alternative Scheme as set out by CPPF in the updated April 2025 document [CD23-18-02] include:

- A change in position of the proposed inbound bus lane from a central (offside) lane to a more conventional nearside bus lane arrangement.
- Further details are provided regarding the sources used by CPPF to establish the recommended minimum lane widths stated in the report.
- A suggestion that relocating the active travel path to the north side of the Madingley Road and widening the carriageway southwards may reduce the loss of existing hedgerows and trees.
- A suggestion that provision of substandard facilities for active travel users is explored to minimise potential environmental impacts.
- A suggestion that further design work is undertaken to examine the pros and cons of a nearside vs an offside Bus Lane provision.

1.5.2. As with the September version the main limitation of the CPPF document is that it does not provide any general arrangement plans of the proposals to demonstrate that the Alternative Scheme proposals are feasible and will deliver the same scale of benefits as the proposed scheme.

1.5.3. A further feasibility review to assess the impacts of the changes made in CPPF's April version of their proposals has been undertaken and is presented in Chapter 4 of this report.

2 Existing Conditions

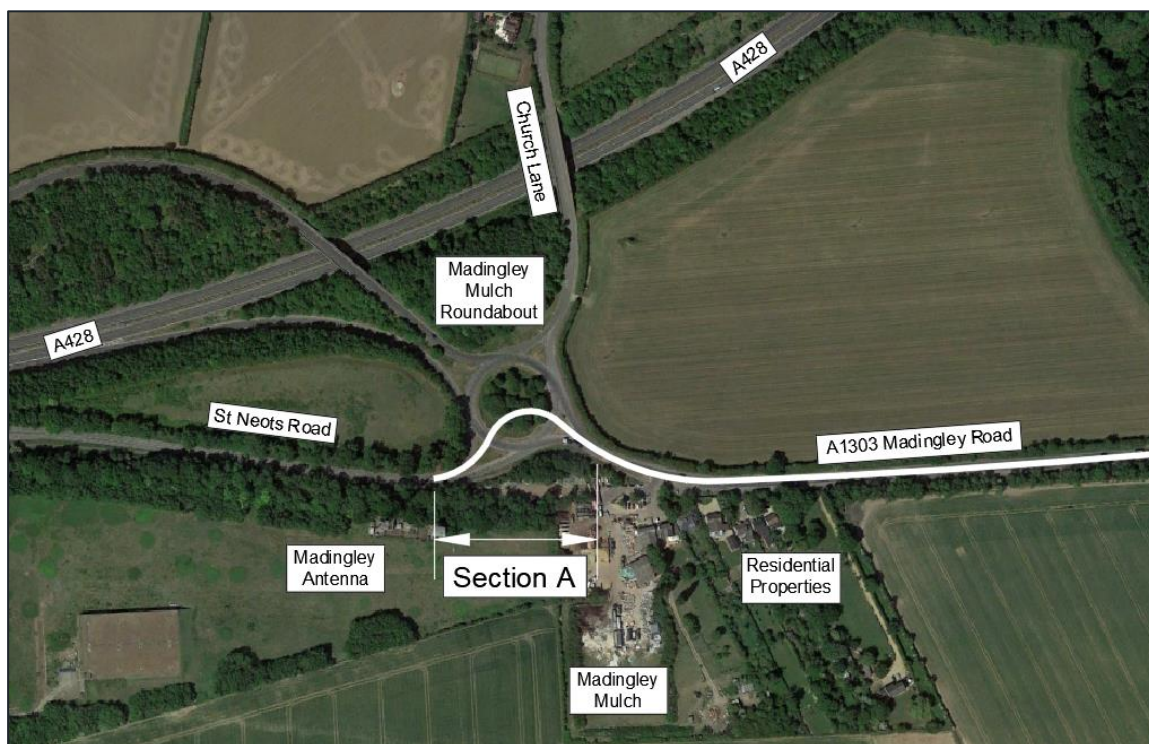
2.1 Introduction

- 2.1.1. This section provides a description of the existing infrastructure along Madingley Road, from the Madingley Mulch Roundabout in the west to the Northampton Street mini roundabout in the east. It adopts the same section structure as the Cambridge Past, Present & Future September 2024 document [CD7-09].

2.2 Overview

- 2.2.1. Madingley Road functions as an important multi-functional street. Its functions include:
- Providing radial access into the city from the west;
 - Access between the A428 and M11 strategic road networks;
 - Access to villages including Madingley and Coton;
 - Access to growing sites including Eddington and West Cambridge;
 - Local access to a range of land-uses along Madingley Road by all modes of travel; and
 - A high frequency bus route, including P&R and Cambourne buses.
- 2.2.2. Madingley Road currently provides limited bus priority measures (there is a short section of inbound bus lane at the M11 junction) and sub-standard pedestrian and cycle infrastructure (when compared to LTN 1/20 design guidance [CD8-23]). The road provides variable width and quality shared-use paths with limited on-street facilities.
- 2.2.3. Madingley Road has a relatively flat topography within the city. From the M11 Junction, the road becomes rural in nature and is bounded by mature vegetation along its length. It rises approximately 40 metres to Madingley Wood. On this section there are several sub-standard bends, frontage accesses and priority-controlled junctions.
- 2.2.4. Adjacent to Madingley Road are several protected land uses. Madingley Wood is located on the north side of Madingley Road towards the western end of the road and is a Site of Special Scientific Interest (SSSI). Immediately east of Madingley Wood is the Cambridge American Cemetery and Memorial, a Grade I registered Park and Garden and Grade II* Listed Building.
- 2.2.5. The sections below describe the nature, land-uses, vehicle, active travel and public transport infrastructure present on Madingley Road along with the speed limits and typical widths.

2.3 Section A: Madingley Mulch Roundabout



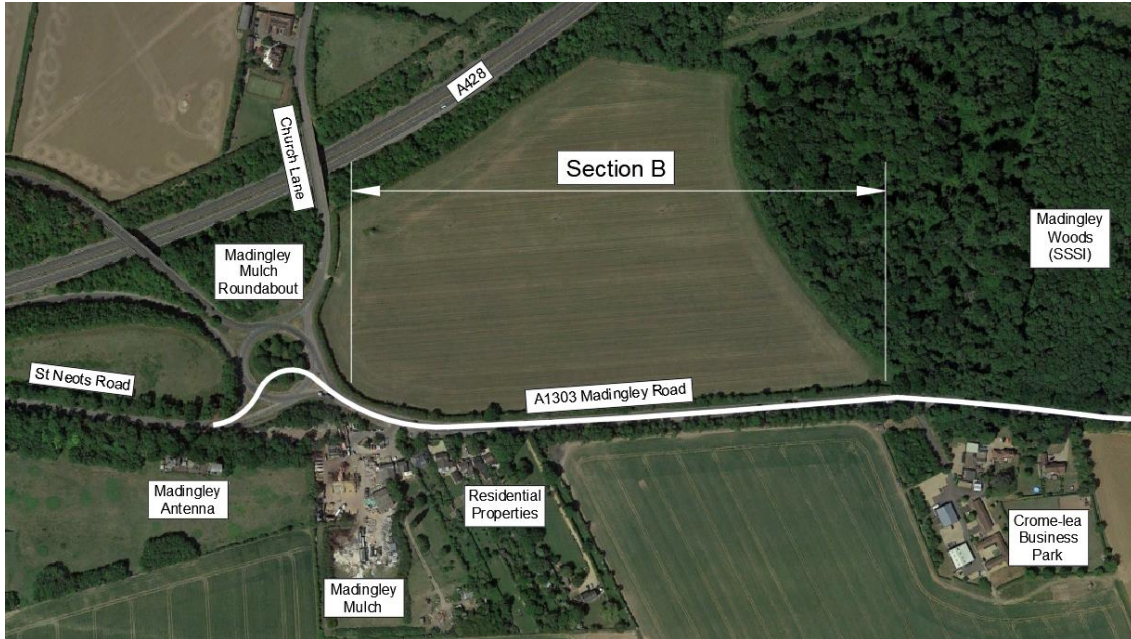
Google Earth, ©2025 Google

Figure 2-1 - Section A

- 2.3.1. The Madingley Mulch Roundabout is a large four-armed priority-controlled roundabout formed of the following approach arms:
- St Neots Road: Two-way single carriageway road proving access and egress towards Hardwick village and south towards Comberton via Long Road. St Neots Road runs parallel to the A428.
 - A428: West facing on and off slips provide access and egress from the A428.
 - Church Lane: Two-way single carriageway road proving access and egress to Madingley village. From Madingley village access is provided onwards to Dry Drayton and the A14 via The Avenue and the A1307.
 - Madingley Road (A1303): Two-way single carriageway road proving access and egress to Coton (via Cambridge Road), access only to Madingley village (via Cambridge Road), to the M11 south facing slips and onwards into Cambridge.
- 2.3.2. Madingley Road roundabout has single carriageway approaches flaring to two lanes at the priority-controlled entries. The roundabout is lit by existing street lighting. A narrow footway is provided on the east side of Church Lane. An uncontrolled crossing with tactile paving is provided on the Madingley Road splitter island from the footway to the shared-use path along the southern side of Madingley Road.

- 2.3.3. The footway from Church Lane extends along the northern side of Madingley Road past the crossing to opposite the Madingley Mulch access. The shared-use path on the south side of Madingley Road continues around the junction along the south side of St Neots Road.

2.4 Section B: Madingley Mulch Roundabout to Crome Lea Business Park



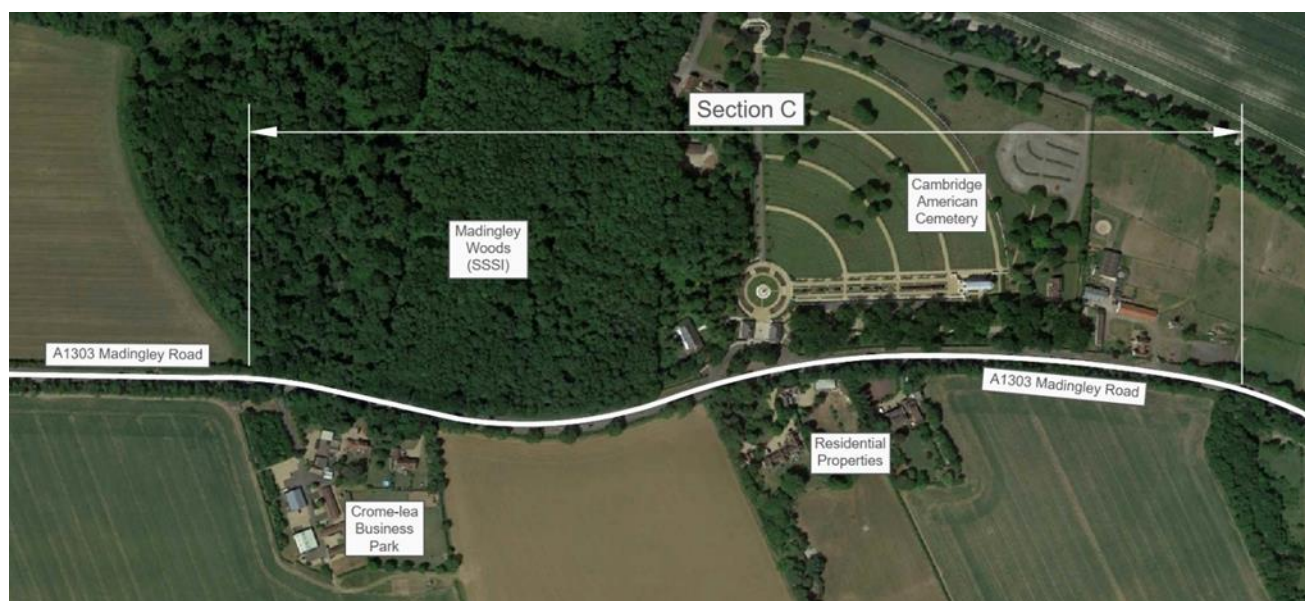
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Figure 2-2 - Section B

- 2.4.1. Upon exiting the Madingley Mulch Roundabout, this section of Madingley Road has a 50mph speed limit. The single lane carriageway is approximately 7.3m wide with a 2.0m shared-use path along the southside of the road, separated from the carriageway by a narrow grass verge.
- 2.4.2. On the south side of Madingley Road, approximately 82 metres east of the Madingley Mulch Roundabout is the simple T-Junction access and egress to the Madingley Mulch Garden Supplies Centre. Continuing east, there are a series of residential dwelling vehicle crossover accesses across the shared-use path for approximately 105 metres.
- 2.4.3. Continuing east along the south side of Madingley Road there is a gated field access approximately 100 metres east of the residential dwellings. The final access on the south side in this section is the Crome Lea Business Park T-junction. The central lane marking on Madingley Road on approach to the junction widen with hatching to then form a narrow central right turning area for vehicles waiting to turn into the Business Park. Tactile paving and dropped kerbs are provided at the junction on the shared-use path. Priority is given to vehicles entering and exiting the Business Park.

- 2.4.4. Along the north side of this section of Madingley Road there is a continuous mature hedgerow containing several trees along the back of a narrow grass verge. Within the grass verge along this section there are three road signs, a 50mph speed limit sign, 'Queues likely' sign and a warning dangerous bends sign for 1 mile.

2.5 Section C: Crome Lea Business Park to the Inbound layby east of Mill Farm



Google Earth, ©2025 Google

Figure 2-3 - Section C

- 2.5.1. From the Crome Lea Business Park Junction, this section of Madingley Road retains a 50mph speed limit. The single lane carriageway is approximately 7.3m wide with a 2.5m shared-use path continuing along the southside of the road. Along this section, the grass verge separating the shared-use path from the carriageway varies in width. In some sections there is no grass verge present, but for much of the section there is a narrow grass verge.
- 2.5.2. On the south side of Madingley Road, approximately 131 metres east of the Crome Lea Business Park junction is a simple T-Junction access to Woodfield House holiday accommodation. Continuing east for approximately 116 metres there is a layby that provides a dual purpose of vehicle parking and a bus stop. East of the layby, opposite the American Cemetery there are three residential dwellings accessed via vehicle crossover accesses. Between the residential properties is public footpath 55/2 that routes from the Madingley Road shared-use path to Coton.
- 2.5.3. Along the north side of this section of Madingley Road is Madingley Wood which is set back from the carriageway by a narrow grass verge. West of the American Cemetery entrance is public footpath 154/4 which connects from the grass verge on the northside of Madingley

Road to Cambridge Road. Close to the footpath entrance is a warning sign to warn approaching vehicles of pedestrians. No crossing or surfaced path on the northside of Madingley Road is provided at this location.

- 2.5.4. East of Madingley Woods is the Cambridge American Cemetery. This has three vehicle accesses on the northside of Madingley Road. The western access is entry only and accommodates eastbound vehicles along Madingley Road and buses and coaches including the Cambridge Sightseeing bus. The central junction is a simple two-way T-junction, providing access into the site car park and an exit for coaches and buses. Approximately 212 metres east of the car park entrance is the car park exit, formed of a simple bell mouth junction.
- 2.5.5. Along the frontage of the American Cemetery is a wide grass verge that contains entrance signage. Along the back of the grass verge is a well-maintained hedge, behind which are a variety of mature trees and the Cemetery car park.
- 2.5.6. Approximately 25 metres east of the American Cemetery car park exit is a vehicle access to private residential properties. A further 54 metres east is a vehicle access to Mill Farm. Continuing a further 64 metres east on the north side of Madingley Road is a vehicle parking layby. This is located on a right-hand bend.
- 2.5.7. Along this section of Madingley Road there is a solid white central line marking westbound from the American Cemetery entrance to a point approximately 28 metres west of the bus stop/layby. Eastbound, there is a central solid white line marking from the American Cemetery car park exit which changes to a double central solid white line past the vehicle parking layby. A solid central white line is used to indicate where it is not safe to overtake.

2.6 Section D: Inbound layby east of Mill Farm to Cambridge Road



Google Earth, ©2025 Google

Figure 2-4 - Section D

- 2.6.1. This section of Madingley Road is dominated by a left-hand bend and the Cambridge Road crossroads at its eastern extent. The 50-mph speed limit continues and reduces to a 40-mph speed limit on approach to the Cambridge Road junction. The single lane carriageway is approximately 10.4m wide with a 2.3m shared-use path continuing along the southside of the road, separated from the carriageway by a narrow grass verge. This section of Madingley Road has the steepest rise, rising from approximately 30 metres above sea level to 50 metres above sea level at Mill Farm.
- 2.6.2. From the parking layby, the north side of Madingley Road is bounded by a grass verge with mature trees along its northern boundary. On approach to the Cambridge Road junction a directional sign is provided followed by the 40-mph speed limit sign. The grass verge bounded by mature vegetation continues to the Cambridge Road bell mouth. No field access points are provided along this section on the north side of Madingley Road.
- 2.6.3. Eastwards along the south side of Madingley Road, the carriageway is bounded by a narrow grass verge, the shared-use path and then mature vegetation. There is a gated access into a private residential property on the inside of the bend. A ghost-island T-Junction is provided on the bend so that right turning vehicles can move out of the traffic lane. The ghost island is protected with kerbed islands at its start and end with hazard markers. Hazard marker bollards and sharp turn signage is provided in the grass verges

either side of the shared-use path around the bend. A sharp bend warning sign is also provided on approach to the bend.

- 2.6.4. At the point where the speed limit changes from 50 mph to 40 mph on approach to the Cambridge Road crossroads, a right turn ghost island develops for vehicles turning right into Cambridge Road towards Coton. The central right turn facility is approximately 132 metres long and is protected by a kerbed island with hazards markers.
- 2.6.5. For vehicles turning right into Cambridge Road towards Madingley, there is a 75m right turn ghost island protected by an uncontrolled pedestrian/cycle refuge and crossing with hazard markers. The crossing has dropped kerbs on the shared-use path on the north and south side of Madingley Road and on the central kerbed refuge.
- 2.6.6. The Cambridge Road arm on the south side of Madingley Road that provides access towards Coton is formed of a priority-controlled bell mouth. The raised kerbs of the bell mouth have been painted black and white to enhance the visibility of the junction and the hazard of turning vehicles. A dropped kerb crossing with tactile paving is provided across the junction.
- 2.6.7. The Cambridge Road arm on the north side of Madingley Road that provides access towards Madingley is formed of a kerbed bell mouth. The bell mouth has been subject to an improvement scheme that has banned vehicles exiting at this location, with the retention of two-way cycle access. The vehicle exit lane has been closed using bollards, with a two-way segregated cycle access provided from Cambridge Road to the narrow shared-use path provided along Madingley Road east of the junction.
- 2.6.8. Along this section of Madingley Road there are solid white central line markings in both directions around the bend to the Cambridge Road junction. Central carriageway hatching is also provided which widens for the right turn ghost island, for the private residential access and then continues through to the right turn ghost island at the Cambridge Road junction. The bend warning signage, hatching and solid central lane markings and hazard markings are all present to highlight the bend in this section and discourage vehicles from overtaking.

2.7 Section E: Cambridge Road to existing inbound bus lane



Google Earth, ©2025 Google

Figure 2-5 - Section E

- 2.7.1. From the Cambridge Road junction, this section of Madingley Road has a 40-mph speed limit. The single lane carriageway varies in width from approximately 10.5m wide down to 7.3m wide with a 1.9m shared-use path on both sides of the carriageway extending eastwards from the Cambridge Road junction.
- 2.7.2. Approximately 84m east of the Cambridge Road junction are two bus stops. The eastbound bus stop is formed of a bus cage marking, flag and buildout (painted black and white kerbs) with a hazard marker. The shared-use path on the northside of Madingley Road from Cambridge Road continues through the bus stop and throughout this section.
- 2.7.3. The shared-use path is initially adjacent to the carriageway with a grass verge to the rear, bounded by a hedgerow. As the shared-use path continues eastwards it narrows and becomes segregated from the carriageway by a grass verge and is bounded by mature trees and vegetation.
- 2.7.4. On the northern side of Madingley Road, approximately 195 metres east of the Cambridge Road junction is a farm access to several residential properties. It is formed of a dropped-kerb and vehicle crossover across the shared-use path.
- 2.7.5. The bus stop located on the south side of Madingley Road, approximately 101 metres to the east of Cambridge Road is formed of a layby with a flag. The shared-use path routes

through the bus stop adjacent to the carriageway and layby, bounded by a grass verge and mature vegetation.

- 2.7.6. The shared-use path on the south side of Madingley Road terminates approximately 129 metres east of the Cambridge Road junction at a second uncontrolled crossing with a central refuge and hazard markers. The crossing has tactile paving and dropped kerbs. Pedestrians and cyclists can cross at this location to continue their journeys along Madingley Road beyond Cambridge Road on the shared-use path or at the uncontrolled crossing at the Cambridge Road junction.
- 2.7.7. The Madingley Road carriageway is separated by white line hatching. This extends eastwards from the central crossing refuge located at the eastern end of the right turn ghost island for vehicles turning into Cambridge Road towards Madingley. The central white line hatching terminates as the carriageway narrows at the farm access located on the northern side of Madingley Road.
- 2.7.8. At the eastern end of this section an inbound bus lane begins to form as the carriageway widens. On approach to the bus lane there is signage in the grass verge stating 'vehicles in excess of 2.9m wide use bus lane' as the general traffic lanes narrow. There is also a bus lane sign showing the permitted vehicles (bus, taxi and bicycles).
- 2.7.9. The eastern end of this section has dense vegetation and a narrow grass verge adjacent to the westbound carriageway, and a sloping grass verge, narrow shared-use path and dense mature vegetation on the eastbound side.

2.8 Section F: Existing inbound bus lane to M11 off slip



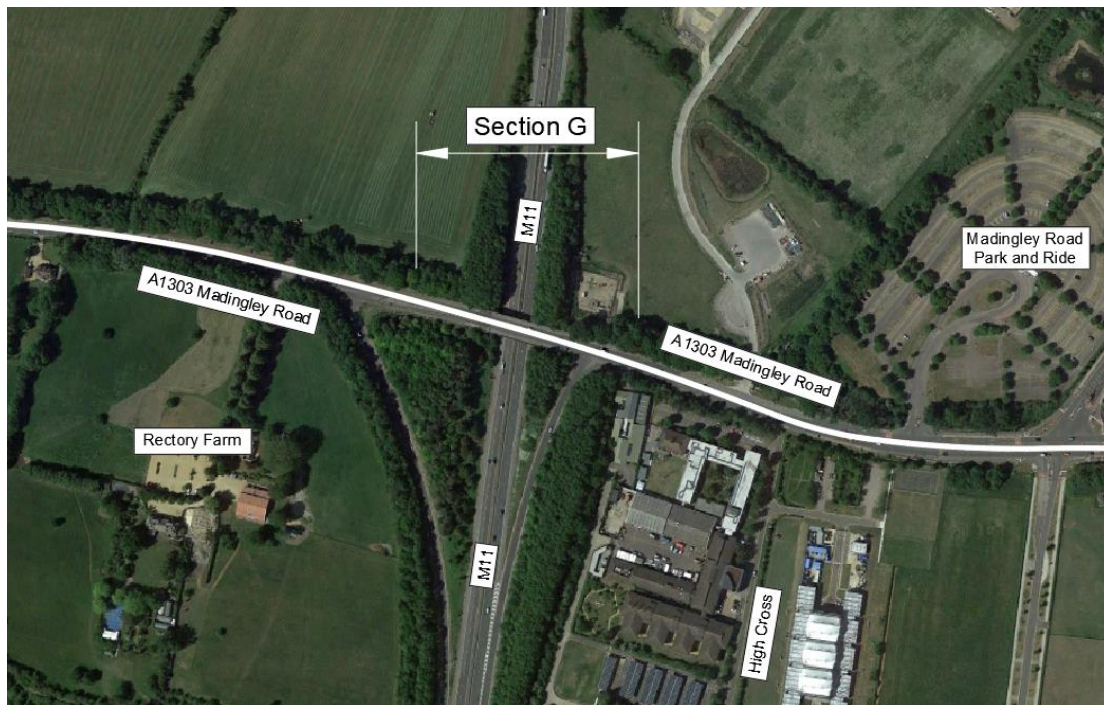
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Figure 2-6 - Section F

- 2.8.1. This section of Madingley Road includes the start of the eastbound bus lane through to the M11 off slip signal-controlled junction. In this section of Madingley Road the 40-mph speed limit is maintained. The single lane carriageway is approximately 7.3m wide with a 4.0m wide eastbound bus lane and a 2.8m shared-use path on the northern side of the carriageway.
- 2.8.2. On the south side of Madingley Road there is a narrow grass verge bounded by mature vegetation. There are two accesses on the south side, a gated access to a single residential dwelling and an access to Rectory Farm which is a wedding venue. This access is located approximately 41 metres west of the M11 off slip. There are no accesses on the north side of Madingley Road in this section.
- 2.8.3. The narrow shared-use path along the north side is lower than the carriageway and segregated by a sloping grass verge and bounded by a fence and mature trees. As the shared-use path continues east, the grass verge widens, and the shared-use path rises to a similar level to the carriageway. Within the grass verge are several traffic signs, one warning of the approaching signal-controlled junction and a second, a large directional sign.
- 2.8.4. The nearside eastbound bus lane extends for approximately 380 metres. The bus lane is traffic signal controlled with a single stop line and set of traffic lights controlling the bus lane and general traffic lane eastbound movements at the M11 off slip junction. The bus lane extends through the junction before merging with the general traffic lane. Buses cannot 'free flow' through the junction and are held on red when vehicles are exiting the M11 off slip.

- 2.8.5. The M11 off slip is formed of two lanes a left turn and right turn lane. The westbound approach to the junction is formed of a single general traffic lane, separated from the eastbound lane by central white lane hatching.
- 2.8.6. The narrow shared-use path continues through the junction on the northern side of Madingley Road, separated by a grass verge containing street lighting, traffic signals and directional signage. No active travel facilities are provided on the south side of the junction.

2.9 Section G: M11 off slip to M11 on slip



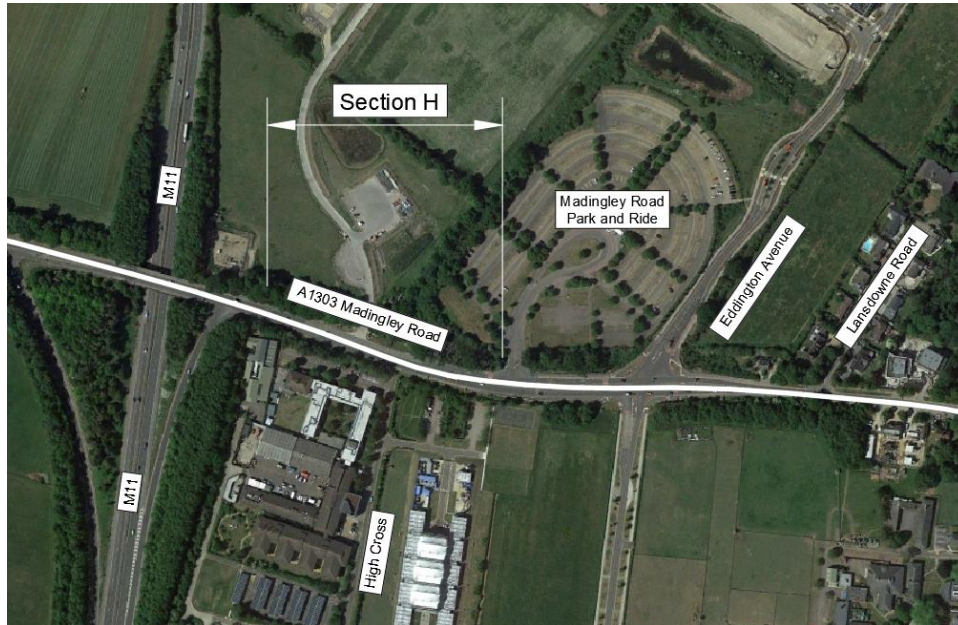
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Figure 2-7 - Section G

- 2.9.1. This section covers the M11 overbridge between the M11 on and off slips. The 40-mph speed limit is maintained. The carriageway narrows from the bus lane merge to approximately 10.0m wide with a 2.8m shared-use path on the northern side of the carriageway across the bridge. There is also a 3.3m wide surfaced path alongside the westbound carriageway. However, this does not connect to a segregated path along Madingley Road so is unlikely to be currently used by pedestrians or cyclists.
- 2.9.2. On the bridge a right turn ghost island forms approximately 89 metres east of the stop line for westbound vehicles. The right turn facility is for vehicles turning onto the M11 south facing on slip and extends for approximately 77 metres.
- 2.9.3. The M11 on slip has a dedicated nearside left turn flared lane, a westbound general traffic lane and an eastbound general traffic lane. Opposite the M11 off slip is a gated access. Routing south from Madingley Road, between the M11 on slip and the West Cambridge site

is bridleway 39/30 that routes through a heavily wooded area to the public rights of way routes connecting Coton and West Cambridge.

2.10 Section H: M11 on slip to P&R Access



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Figure 2-8 - Section H

- 2.10.1. This section of Madingley Road covers from the M11 off slip to the Madingley Road P&R signalised T-Junction. The 40-mph speed limit is maintained. In this section the carriageway is widened to four general traffic lanes approximately 14.2m wide. There are two eastbound lanes, a nearside left turn lane into the P&R and an ahead lane. Westbound, there is a nearside left turn lane to the M11 on slip and an ahead lane.
- 2.10.2. The narrow shared-use path continues through this section on the north side of the street. It is separated from the carriageway by a narrow grass verge and bounded by mature trees. No active travel infrastructure is provided on the south side of the street. A grass verge is provided from the M11 on slip, across the bridleway access and extending eastwards to a bus stop and pedestrian access into the West Cambridge University site.
- 2.10.3. On the north side, approximately 109 metres east of the M11 off slip is a construction vehicle access into the Eddington development. In the grass verge there are several large road signs for the P&R and directional signage.
- 2.10.4. Approximately 34 metres east of the construction access is an eastbound bus stop formed of a bus stop flag. The bus stop has a dedicated section of footway, with the narrow shared-use path running to the rear, separated by a narrow grass strip.
- 2.10.5. East of the bus stop is the P&R signal-controlled T-Junction. The eastbound Madingley Road arm has a two-lane approach and an advanced stop line (ASL) for cycles and the

signage suggests the shared-use path continues via a staggered signal-controlled crossing across the P&R entrance.

- 2.10.6. The P&R arm has a flared two lane exit with a shared-use path extending into the site alongside the exit lane. The Madingley Road westbound arm has two lanes extending back to the Eddington crossroads junction. There is a dedicated right turn lane and an ahead lane with an ASL.
- 2.10.7. Approximately 135 metres east of the M11 on slip is a westbound bus stop, marked by a flag and bus stop cage. Direct pedestrian access is provided into the West Cambridge site, and a footway is provided eastwards to the P&R junction.
- 2.10.8. From the P&R T-Junction, the footway on the south side from the westbound bus stop changes into a shared-use path that continues through to Northampton Street. The shared-use path varies in width but is typically sub-standard in width throughout. On the north side, the shared-use path also continues eastwards, typically below design guidance width standards.

2.11 Section J: P&R Access to Northampton Street



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Figure 2-9 - Section J

- 2.11.1. This section of Madingley Road covers the remaining extent of the street to the mini-roundabout junction at Northampton Street. This section is over 2km in length, so a higher-level summary of the key features is provided.

- 2.11.2. This section of Madingley Road is urban in nature and provides direct access to a range of sites including Eddington, West Cambridge, Churchill College, residential streets, College Campuses as well as fronted by buildings along some sections.
- 2.11.3. Starting in the west is a signal-controlled crossroads, providing access to Eddington and West Cambridge. Madingley Road continues eastwards as a single carriageway road with a series of frontage building and residential street accesses.
- 2.11.4. On approach to Conduit Head Road Junction and past JJ Thomson Avenue Junction, Madingley Road carriageway widens substantially to accommodate two priority-controlled crossroads. The western junction is a crossroads with Conduit Head Road and a left in / left out access into the West Cambridge site. A right turn ghost island junction is provided for vehicles turning right into Conduit Head Road. There is extensive use of nearside hatching on Madingley Road in this section to narrow the carriageway in each direction.
- 2.11.5. Between the Conduit Head Road junction and the JJ Thomson Avenue junction the speed limit reduces from 40 mph to 30 mph. The 30-mph speed limit is retained through to the eastern end of Madingley Road.
- 2.11.6. Immediately east of the Conduit Head Road junction is a large priority controlled staggered crossroads junction with a staggered signalised Toucan Crossing. There are central right turn facilities for vehicles turning into JJ Thomson Avenue and Madingley Rise, with left turn flares and extensive use of hatching.
- 2.11.7. Madingley Road also widens at the Clerk Maxwell Junction to the east of JJ Thomson Avenue where right turn ghost islands are provided. At this junction there are also pedestrian refuge islands with dropped kerbs and tactile paving.
- 2.11.8. Madingley Road continues eastwards at a relatively consistent width of 7.3 metres (outside of junction areas). Along this section there are a series of three simple priority-controlled T-Junctions and accesses to frontage properties along the south side of the street. The northern side is the grounds of Churchill College with the boundary marked by a hedgerow and mature trees.
- 2.11.9. Continuing east is the Storey's Way junction, a ghost island priority-controlled T-Junction with a signalled controlled crossing on the eastern side Madingley Road arm. This provides a connection to a shared-use path that routes south to Clarkson Road.
- 2.11.10. The next section of Madingley Road contains south side frontage development with vehicle accesses as well as two access on the north side between Storey's Way and Grange Road. Grange Road is a signal-controlled T-Junction. The Madingley Road eastbound arm widens to two lanes with an ahead and right turn lane with an ASL. The Madingley Road westbound lane and Grange Road arm are single lanes with ASL. Signal controlled crossings are provided across Grange Road and Madingley Road, south of Grange Road.
- 2.11.11. Madingley Road continues east to the signal-controlled T Junction of Madingley Road and Lady Margaret Road. The distance between the two junctions is approximately 261 metres.

Between the two junctions there are a series of accesses into frontage properties across the shared-use paths.

- 2.11.12. The signal-controlled T-Junction at Lady Margaret Road provides a single eastbound arm on Madingley Road with an ASL and a feeder advisory cycle lane. There is a two-lane flared approach on Lady Margaret Road and the westbound Madingley Road arm. An uncontrolled crossing is provided across Lady Margaret Road.
- 2.11.13. From Lady Margaret Road to the mini roundabout at Northampton Street there is one vehicle access into Westminster College on the northern side of the street. The carriageway widens to approximately 11 metres to accommodate the two-lane flared approach in both the eastbound and westbound directions. A staggered signal-controlled crossing is also provided between the two junctions.
- 2.11.14. Along this section of Madingley Road several bus stops are provided. To the west of the JJ Thomson Avenue junction there is an inbound and outbound bus stop. Eastbound and westbound bus stops are also provided along the Churchill College frontage, close to Bulstrode Gardens and close the junction with Storey's Way.
- 2.11.15. The cycle infrastructure along this section of Madingley Road is inconsistent, poor quality and predominantly consists of shared-use paths on both sides of the carriageway which are substandard in width. There are short sections of cycle lane on street, but these do not connect to form a continuous facility.

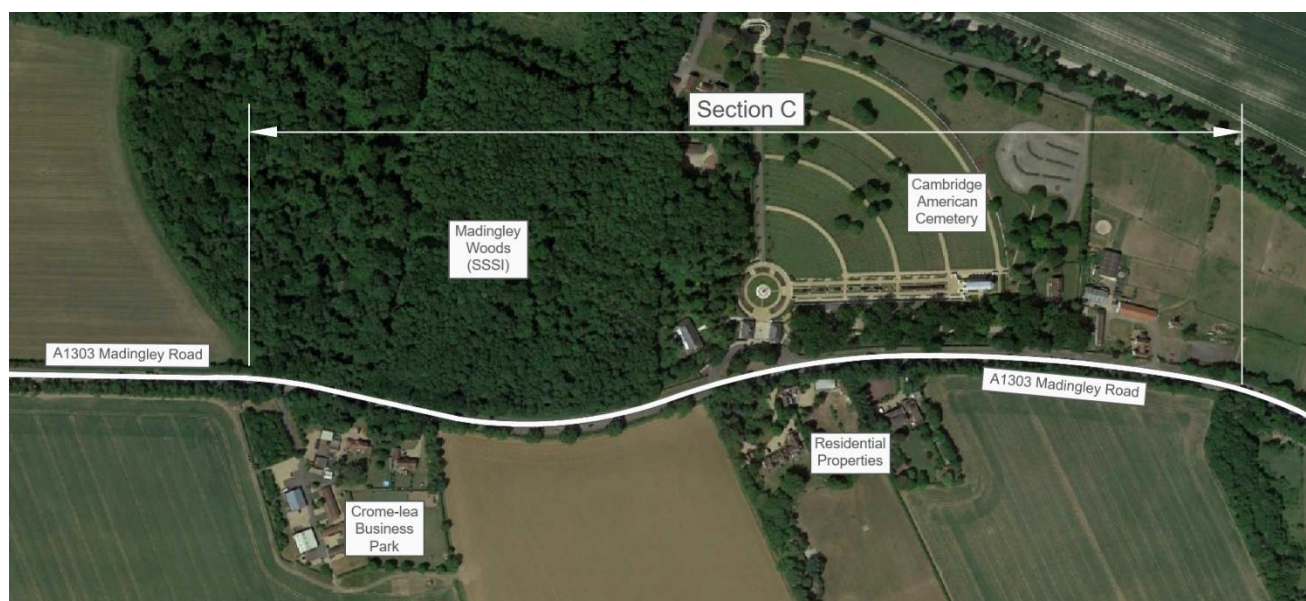
2.12 Environmental sensitivities

- 2.12.1. Madingley Road passes alongside sites of high environmental sensitivity, as well as by residential properties. Madingley Wood is an ancient woodland and SSSI that is known to contain a maternity roost of barbastelle bats. The hedgerows and trees that border the A1303 might also be used by barbastelle as commuting and foraging routes when leaving the woodland to disperse into the wider landscape and their core foraging areas.
- 2.12.2. Immediately east of Madingley Wood, the Cambridge American Cemetery is a Grade I Registered Park and Garden containing a Grade II* listed Memorial and Attached Walls, Steps and Pool Surround. Mature oaks occupy the southern curtilage of the cemetery, which is bounded by a mature hedge.
- 2.12.3. South of Madingley Road are several residential properties with gardens extending to the edge of the footway and cycleway. Mature trees form prominent boundary features for these properties.

3 Engineering Assessment – September 2024 Proposals

3.1 Scope of the Assessment

- 3.1.1. The CPPF report sets out numerous interventions to provide bus priority along the A1303 Madingley Road. Several of the proposed interventions included in the report are described as optional or complementary measures.
- 3.1.2. This engineering assessment focuses on the feasibility of delivering the core alternative scheme proposed by CPPF as summarised in the CPPF objection letter through the most constrained sections of the site i.e. Section C as set out in the CPPF alternative report. Specifically, CPPF states that it “proposes building an inbound bus lane down Madingley Hill¹” and that is assumed to be its proposed alternative despite the lack of clarity of its published report.
- 3.1.3. Section C is shown in **Figure 3-1** below. This section contains several sensitive sites on the north side of Madingley Road namely Madingley Woods (SSSI) and the American Cemetery and Memorial. It also includes several commercial and residential properties along the south side.



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Figure 3-1 - Extents of Section C

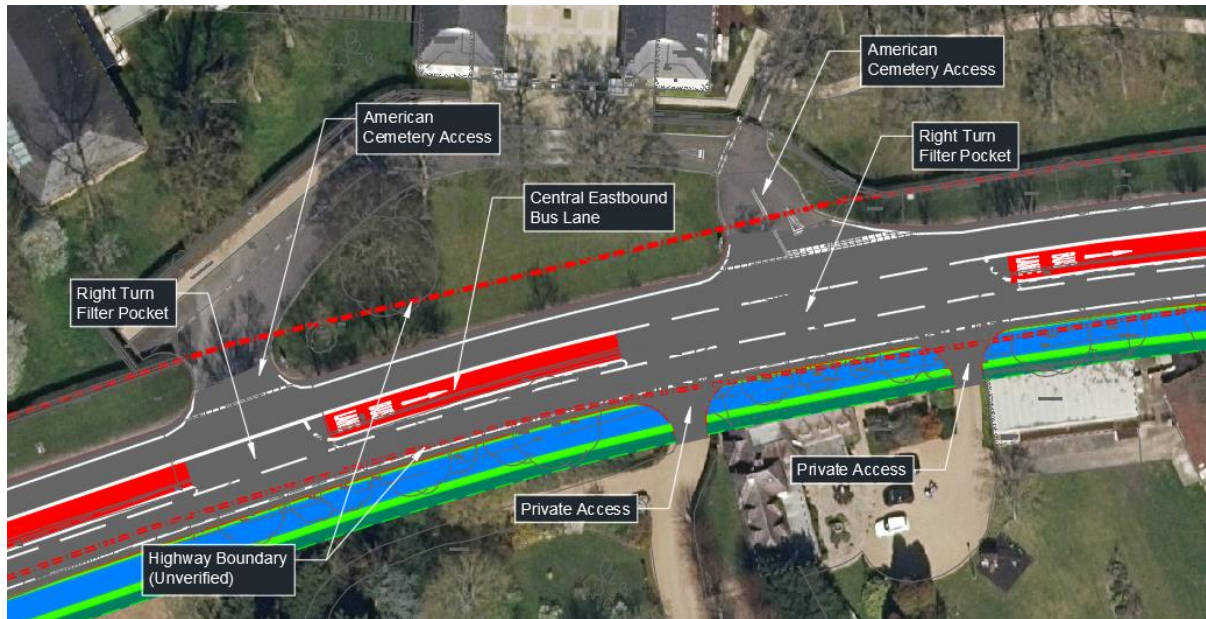
¹ Cambridge Past, Present and Future & Coton Parish Council's Objection letter [**CD2-OBJ-251**]

3.2 Interpretation of CPPF Proposals

Central Inbound Bus Lane on Madingley Road

- 3.2.1. The central bus lane layout incorporating filter pockets proposed by CPPF is an aspect not covered² in the DMRB or the other current and relevant design standards or guidance.
- 3.2.2. Offside bus lanes are not uncommon, but they are typically used in advance of junctions where they would facilitate right turns or straight-ahead movements for buses and where they do not impact vehicle movements into or out of other side roads or accesses.
- 3.2.3. The CPPF report provides very little information in relation to how right turn movements into and out of the numerous accesses along the corridor would be provided for. The only mention of this is in item B1 where it suggests that right-turn filter pockets could be incorporated into the central bus lane for the Crome Lea Business Park.
- 3.2.4. It is unclear what is meant by right-turn filter pockets but based on the cross sections presented in the report it is presumed that right-turning vehicles would be expected to wait within the central bus lane and that any existing facilities for right turn movements e.g. at Crome-lea Business Park would not be re-provided in the revised layout. This would not be compliant with standards and raises several road safety concerns. These issues are covered in more detail in the subsequent sections of the report.
- 3.2.5. **Figure 3-2** below illustrates how this type of arrangement might look opposite the American Cemetery and Memorial where several of the existing accesses and junctions are located.
- 3.2.6. A concept design of the CPPF proposed scheme is presented in drawing 70086660-WSP-HML-XX-DR-HW-001000 in **Appendix A**.

² An aspect not covered is a design feature or method not included/covered in the DMRB requirements and thus requiring a departure. Where an aspect of the works is not covered by existing requirements, the DMRB recommends the principles of current and relevant guidance should be followed where this exists.



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Figure 3-2 - Central Bus Lane with Filter Pockets as Proposed by CPPF

3.3 Compliance of CPPF Proposals with Current Design Standards

- 3.3.1. The A1303 Madingley Road is a Primary 'A' Class Road.
- 3.3.2. The section between the Madingley Mulch Roundabout is subject to 50/40mph speed limits and forms part of the Major Road Network (MRN) and is also a diversion route for the strategic road network.
- 3.3.3. The 2-way AADT on Madingley Road is forecast to be 24,075 in 2041. This figure is based on the Do Minimum baseline transport conditions in the study area as set out in the CtoC Transport Assessment [CD1-25.01] i.e. without the CtoC Scheme.
- 3.3.4. Cambridgeshire's Active Travel Strategy [CD7-34] and Local Cycling and Walking Infrastructure Plan (LCWIP) [CD7-34] identify Madingley Road as a Tier 1 Active Travel Route.
- 3.3.5. The design of major junctions and strategic highway links in Cambridgeshire are required to accord with the principles of the Design Manual for Roads and Bridges³.

³ Cambridgeshire Highways Development Management General Principles for Development (January 2023) [CD7-36] sets out requirements to applicants, developers, their agents and local authority officers in relation to new highway, access and adoptable infrastructure across Cambridgeshire.

- 3.3.6. The DMRB is a suite of documents which contains requirements and advice relating to works on high-speed all-purpose roads.
- 3.3.7. The DMRB embodies the collective experience of the key organisations involved in designing and maintaining all-purpose roads in the UK, and their agents, supply chain members and industry bodies. It provides requirements and advice resulting from research, practical experience of constructing and operating all-purpose roads, and from delivering compliance to legislative requirements.
- 3.3.8. The DMRB standards have been developed with the following considerations in mind:
- Safety;
 - Consistency between schemes;
 - Value for Money on a whole-life basis;
 - Acceptable level of performance;
 - Sustainability; and
 - Mitigating effects on the environment.
- 3.3.9. The DMRB standards should not be applied in such a rigid manner that innovative ideas are discouraged, or scheme costs are increased unnecessarily.
- 3.3.10. Where the constraints of a scheme do not permit a design to standards. The DMRB allows for flexibility through permitted relaxations and the Departures from Standards process. This process requires all departures to be fully appraised to ensure that robust justification exists for not adopting a design fully in accordance with requirements.
- 3.3.11. Any Departures from Standard that affect scheme extents or land requirements are considered critical, as they impact the scheme's viability. It is important to ensure that provisional agreement of any critical departures is secured at an early stage to reduce the risk of schemes proceeding on an untested assumption that a departure can be approved.
- 3.3.12. We understand that the Highway Authority cannot allow a scheme to progress through to the construction stage unless all the relevant Departures from Standards are in place and the appropriate technical approval has been given.

Proposed Cross Section

3.3.13. The DMRB Standard CD 127 **[CD9-09]** provides requirements and advice for the cross-sections and headrooms that shall be used for both new and improved motorways and all-purpose trunk roads including connector roads. The A1303 Madingley Road falls under the definition of a rural road given in CD 127. The cross section for rural all-purpose single carriageway road is depicted in Figure 2.1.1N1e of CD 127, see **Figure 3-3** below.

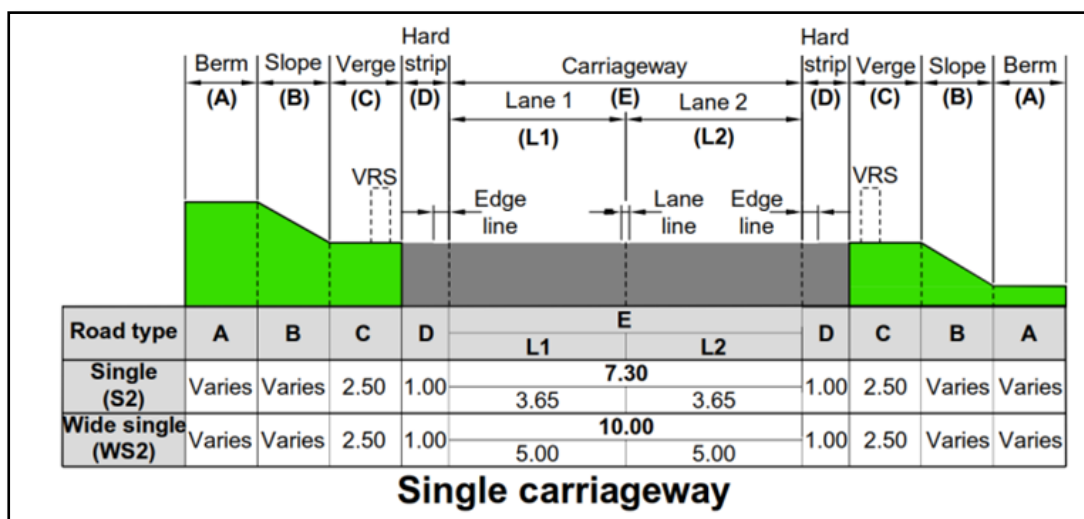


Figure 3-3 - Standard Rural All Purpose Road Cross Section

- 3.3.14. The standard cross section for a rural all-purpose single carriageway road consists of two 3.65m lanes, 1m hard strips, 2.5m wide verges and provision for cutting and embankment slopes which vary depending on the surrounding topography and boundary treatments.
- 3.3.15. Any deviation from the specified lane widths or the omission of hard strips would require a departure from standard. The 2.5m dimension given for verge widths is a minimum and this can be increased for several reasons the most common being to provide the requisite stopping site distances along the mainline and at side roads and accesses.
- 3.3.16. Some of the key reasons for the adoption of wider standard traffic lanes (3.65m wide) and the inclusion of hard strips in high-speed rural road environments include:
- Pavement integrity/stability in un-kerbed sections.
 - Partial provision for stopped vehicles.
 - Snow and water collection.
 - Can improve the economy of drainage systems through permitting increased flow widths in the channel thereby reducing the number of road gullies or other forms of drainage inlets.
 - Overrun facility for driver error or evasive action.
 - Improved level of service and driver comfort.
 - Increased widths to facilitate temporary traffic management.

- Supports edge lines in un-kerbed sections.
- Reduces the risk of vegetation encroachment over edge lines in un-kerbed sections.
- Allows for the placement of road studs outside vehicle wheel paths, where appropriate.

- 3.3.17. The 3.25m general traffic lane widths presented in Figures 4, 5 and 6 of the CPPF report appear to be based on the principles Contained in Manual for Streets 1 & 2 **[CD9-02 & CD9-03]** which is not considered appropriate for Madingley Road and would be more applicable to a Street setting in a low-speed urban environment.
- 3.3.18. Traffic lanes narrower than 3.65m are sometimes used for economic or environmental reasons. However, research conducted on two-lane rural roads⁴ has shown that for increasing lane widths up to 3.65m there is a corresponding decrease in accident rates for vehicles running off the road, and for head-on and sideswipe accidents between vehicles travelling in opposite directions. A decrease in lane widths below 3.65m would be expected to have the opposite effect.
- 3.3.19. The A1303 Madingley Road forms part of the diversion route for the adjacent strategic road network. As such, the lane widths on Madingley Road need to be suitable to accommodate diverted traffic in an emergency or during major maintenance or construction.
- 3.3.20. The design of designated lanes for specific vehicle types e.g. bus lanes is not covered in CD 127 **[CD9-09]**. CD 127 refers to Chapter 5 of the Traffic Signs Manual (TSM) **[CD9-19]** for advice on the design of bus lanes. The TSM recommends that where space permits with-flow bus lanes should be 4.25m wide, certainly at least 4m. This allows buses to overtake cycles safely and reduces the likelihood of interference from general traffic in the adjacent lane. The minimum recommended lane width is 3m.
- 3.3.21. The cross sections presented in the CPPF report include a 3m wide central bus lane. This is the minimum lane width recommended in the TSM. However, assuming that cyclists would be prohibited from using the central bus lane on safety grounds, a central bus lane width of 3.65m⁵ is considered to be more appropriate given the high-speed rural road environment.
- 3.3.22. Where an off-side bus lane is provided in a two-way road the TSM Chapter 3 **[CD9-17, page 91, paragraph 9.1.3]** recommends that it should generally be separated from the opposing flow of traffic by a solid island or hatch markings to diagram 1040 where the boundary line is formed by the marking to diagram 1049A. There is no such provision included in the cross sections contained in the CPPF report.
- 3.3.23. The design of shared use routes is covered by the DMRB standard CD 143 **[CD9-10]**. CD 143 **[CD9-10, page 32, paragraph E/3.5]** specifies a minimum width of 3m for

⁴ Zegeer, C.V., and Deacon, J.A., Effect of lane width, shoulder width, and shoulder type on highway safety. State of the art report 6. Washington, DC: The Transportation Research Board, 1987, 1-21 **[CD9-27]**.

⁵ 3.65m is the standard traffic lane width for rural all-purpose roads in DMRB CD 127 **[CD9-09]**

unsegregated shared use routes where there are 200 users an hour or more. It also recommends a minimum separation from the carriageway of 1.5m (inclusive of the hard strip where provided) on roads with a speed limit greater than 40mph.

- 3.3.24. The cross sections contained in the CPPF report suggest the inclusion of a 3m wide footway on the south side of Madingley Road with a 1m separation from the edge of the carriageway which is 0.5m less than the 1.5m recommended in CD 143.
- 3.3.25. Cambridgeshire's Active Travel Strategy [CD7-34] and Local Cycling and Walking Infrastructure Plan (LCWIP) [CD7-35] identify Madingley Road as a Tier 1 Active Travel Route. Further work would be required to establish if the 3m shared use path included in the CPPF proposals would be an appropriate level of provision along the corridor. However, for the purpose of this report, it has been assumed that this level of provision would be appropriate.
- 3.3.26. In summary the cross section and lane widths depicted in Figure 5 of the CPPF report (see **Figure 3-4** below) does not comply with the relevant design standards and does not include any provision for verges and other key features that would need to be accommodated within the overall cross-section. The total width of 13.5m stated in the CPPF report does not represent the true overall width of the corridor required to deliver an online bus lane.

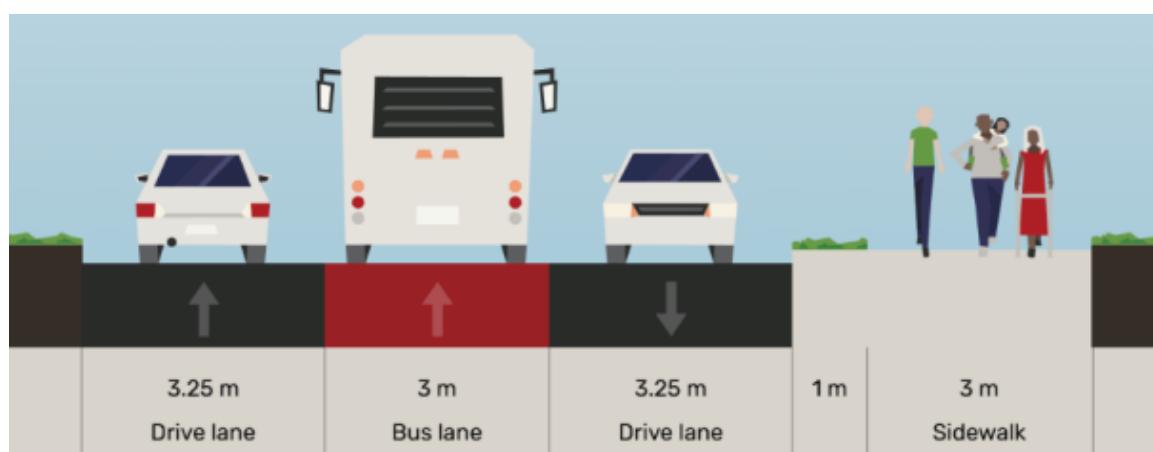


Figure 3-4 - Cross Section Proposed in CPPF Report

- 3.3.27. For comparison **Figure 3-5** below provides an indication of how a compliant cross section based on the CPPF proposals might look and the likely overall corridor width required to accommodate it. A 1.5m allowance has been included in the cross section for earthworks. This is based on an assumed 0.5m level difference at the back of the verge and a 1in3 embankment/cutting slope. The total width of the cross section comes to approximately 24m and may exceed this in areas where verge widening is required to provide the requisite stopping sight distances and visibility splays at junctions or where more significant level differences exist.

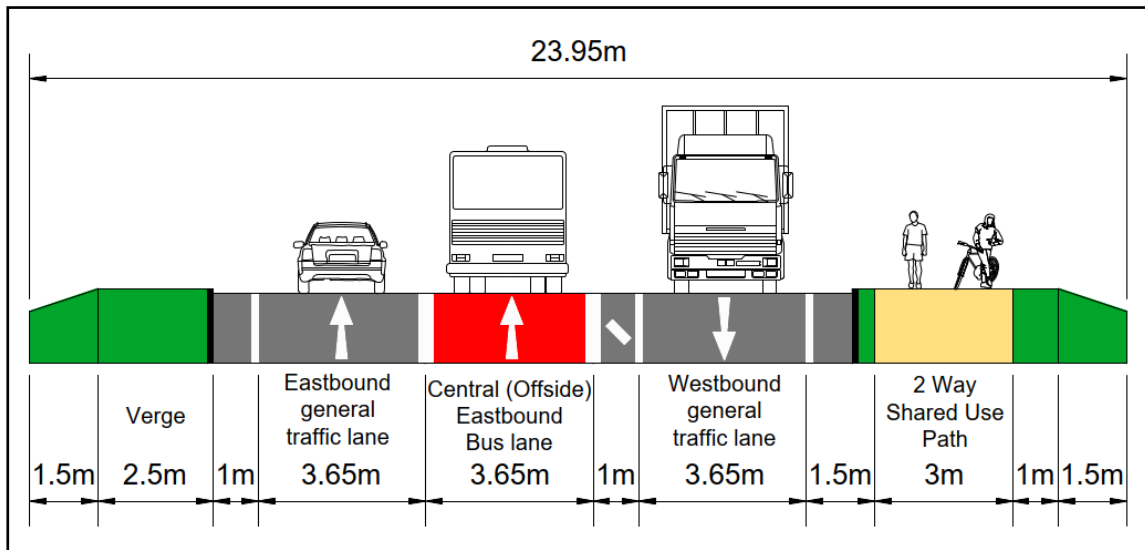
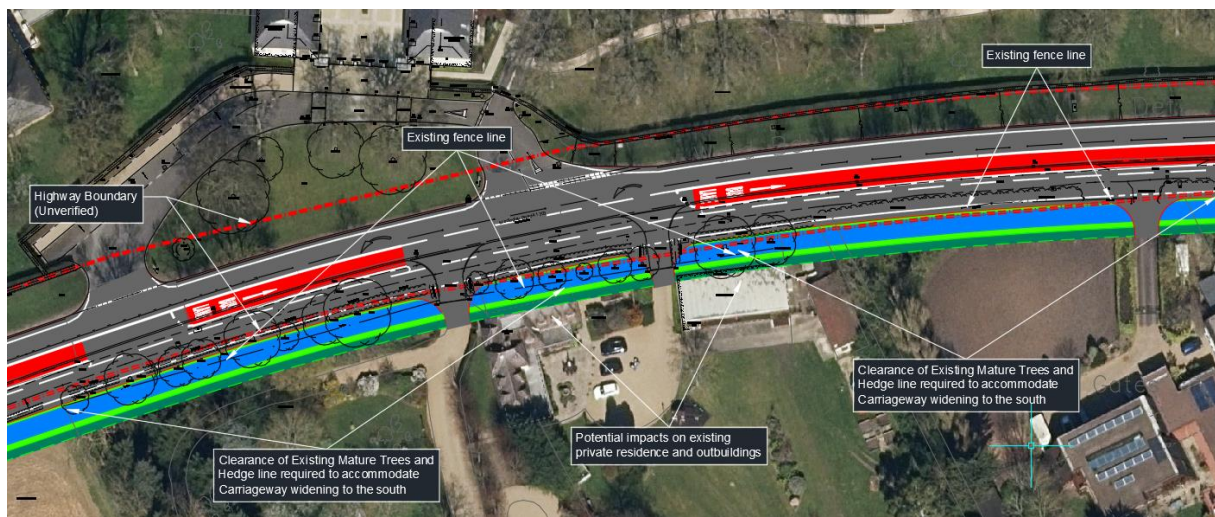


Figure 3-5 - Compliant Cross Section based on CPPF Proposals

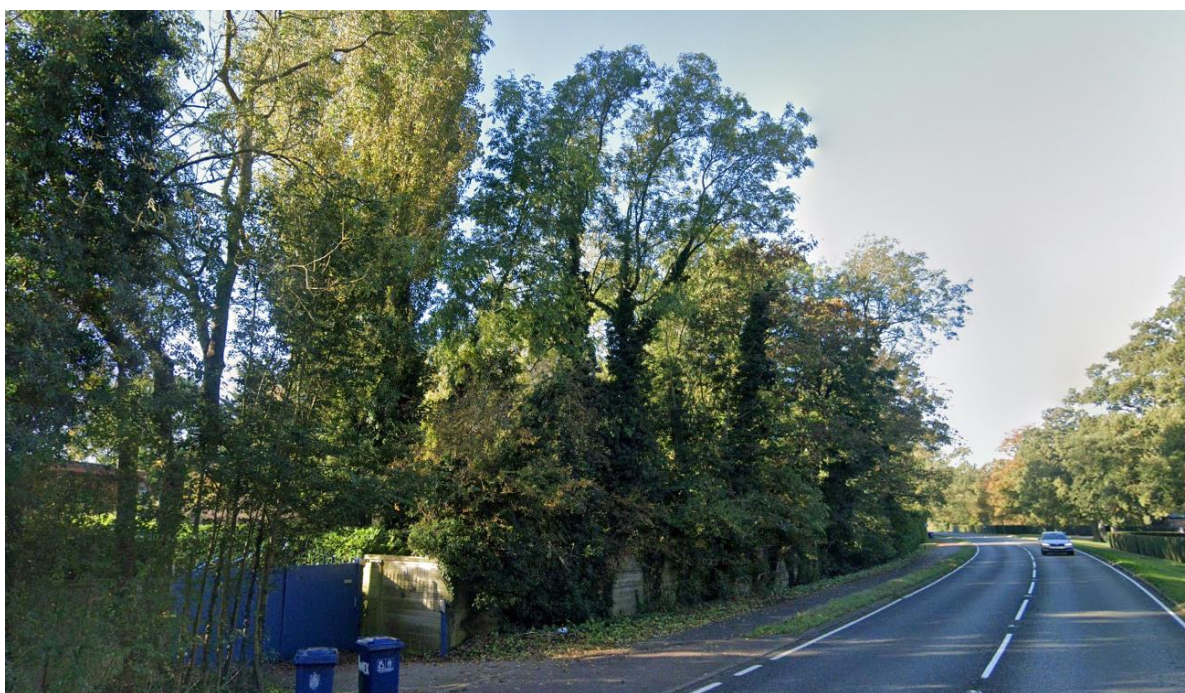
- 3.3.28. The existing kerb line on the north side of Madingley Road has been retained when developing the concept design for the central (offside) bus lane and the active travel provision remains on the south side of the carriageway. Widening to the south is considered by both Natural England and Historic England to pose less risk of direct impacts on the woods and cemetery sites as described in their responses to consultations in 2017 **[Appendix D]**.
- 3.3.29. The additional width required to deliver the proposed cross section will necessitate acquisition of land outside of the highway boundary and will impact the existing features along Madingley Road including the commercial and residential properties to the south. **Figure 3-6** below provides an indication of the level of impact that the CPPF scheme may have.



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Figure 3-6 – Impacts on Existing Features to the South of Madingley Road

- 3.3.30. Extensive clearance of the existing trees (including mature specimens) and hedge lines to the south of Madingley Road depicted in **Figure 3-7** below, would also be required to facilitate the construction of the proposed CPPF scheme.



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Figure 3-7 - Existing Mature Trees and Hedge Line

Junctions and Accesses

- 3.3.31. The DMRB standard CD 123 [**CD9-08**] covers the geometric design of at-grade priority and signal-controlled junctions and is applicable to both new and improved junctions.

- 3.3.32. The junction selection process during the option development stage uses 2-way Annual Average Daily Traffic (AADT) design year flows to determine the approximate level of junction provision prior to more detailed traffic modelling being undertaken to check capacity.
- 3.3.33. The selection of priority junction and major road central treatment for single carriageway roads is determined based on the standard of the major road and traffic flows on both the major and minor roads.
- 3.3.34. CD 123 **[CD9-08, page 16, paragraph 2.12]** requires priority junctions to include a major road central treatment when the minor road flow exceeds 300 vehicles 2-way annual average daily traffic (AADT), or the major road flow exceeds 13,000 vehicles 2-way AADT.
- 3.3.35. The Cambridge Sub-Regional Traffic Model (CSRM) forecasts the 2-way AADT on Madingley Road to be 24,075 in 2041, as shown in **Table 3-1** below. This figure is based on the Do Minimum baseline transport conditions in the study area as set out in the CtoC Transport assessment **[CD1-11.12, chapter 5]** i.e. without the CtoC Scheme. As such a major road central treatment would be required for any priority junctions.

Table 3-1 - 2041 Do Minimum (No Making Connections) CSRM AADT Forecast

Model link number	Description	AADT	HDV
21703-21603	A1303 Madingley Road between St Neots Rd/A428 junction and the junction with Cambridge Road	12283	4.3%
21603-21703	A1303 Madingley Road between the junction with Cambridge Road and St Neots Rd/A428 junction	11792	3.6%

- 3.3.36. The appropriate central road treatment for Madingley Road is the provision of ghost islands. Ghost islands afford right-turning vehicles some protection and assist free flow of major road through traffic.
- 3.3.37. The CPPF proposals do not appear to make any provision for any central road treatments i.e. ghost islands and are non-compliant in this regard. If ghost islands were to be added to the CPPF proposals it would increase the area of land required outside of the existing highway to deliver the scheme, resulting in increased costs and environmental impacts. It is also unclear how a ghost island could operate safely in combination with a central bus lane. The omission of central road treatments gives rise to Road Safety Concerns which are covered in more detail in the subsequent sections of the report.

Horizontal Alignment

- 3.3.38. The CPPF proposals do not contain details of the proposed horizontal alignment for the central bus lane scheme. However, it is assumed that the proposed scheme would closely follow the existing alignment of Madingley Road.

- 3.3.39. The existing horizontal alignment of Madingley Road contains inherent (existing) departures from standard. These departures include sub-standard horizontal radii, transition curves and stopping sight distances.
- 3.3.40. It would not be possible to design out these non-compliant aspects without significantly deviating from the existing road alignment. As such these inherent departures would need to be taken into account when considering an online solution. This would include assessing the potential cumulative effects on road safety where several relaxations and departures from standard are proposed to be used in combination.
- 3.3.41. A double white line system has been introduced along sections of Madingley Road as a mitigation measure for the various departures present. The double white line system prohibits drivers from overtaking where forward visibility levels are below the requisite overtaking sight distances for the design speed. **Figure 3-8** below shows the tight bend and double white line system present on the section adjacent to Madingley Woods.
- 3.3.42. Some of the existing horizontal radii along Madingley Road would make it impossible to meet the same passenger comfort criteria⁶ that has been applied to the design of the proposed offline CtoC scheme. This would result in a reduced passenger experience when compared to the proposed off-road scheme.

⁶ The limiting value for lateral acceleration on curves adopted for CtoC is 1.0m/s², as recommended in the Britpave Guided Busway Design Handbook **[CD9-04, page 16, paragraph 3.5.2]**



Google Earth, ©2025 Google

Figure 3-8 - Existing Sub-standard bend adjacent to Madingley Woods

Summary of Non-Compliant Aspects

3.3.43. As a preliminary design of the CPPF proposals has not been developed in sufficient detail it is not possible to identify all the potential relaxations and departures from standard (i.e. non-compliant aspects) that may be required. However, some of the key issues identified which are likely to require relaxations or departures include but are not limited to:

- Non-standard proposed central bus lane incorporating filter pockets;
- Sub-standard lane widths;
- Sub-standard horizontal radii;
- Sub-standard transition curves;
- Reduced separation between the shared use path and the edge of the carriageway;
- Omission of a physical island or hatch markings between the central (offside) bus lane and opposing flow of traffic;
- Omission of hard strips;
- Omission of major road central treatment (ghost islands); and
- Sub-standard stopping site distances and junction visibility.

3.3.44. Many of the identified non-compliant aspects are related to the same locations and are within the immediate approaches to a junction or access. As such, they are likely to result in a significant number of issues being identified in the Road Safety Audit (RSA). The potential impacts of any interacting departures would need to be appraised collectively, as part of the

Departure from Standard application process and it is unlikely that technical approval would be granted to implement an online solution.

3.4 Road Safety Concerns

- 3.4.1. As the alternative scheme proposals put forward by the CPPF would involve physical changes to the highway impacting on road user behaviour the design development process for such a scheme must include a Road Safety Audit (RSA).
- 3.4.2. An RSA is the standard process for checking the road safety implications of highway improvements and new road schemes. The objective of the process is to minimise future road collision occurrence and severity once the scheme has been constructed, and the road comes into use.
- 3.4.3. The audit considers all road users, particularly vulnerable users such as pedestrians and pedal cyclists. Where potential road safety problems with the proposals have been identified, the audit then makes practical recommendations for improvement.
- 3.4.4. It is Cambridgeshire County Councils Policy⁷ that Road safety audits are carried out on all significant County Council and third party promoted highway schemes. This is to ensure that:
 - Adequate levels of safety are maintained;
 - safety risks are designed out of new highway infrastructure as best possible; and
 - problems previously identified at similar sites are avoided in new works.
- 3.4.5. The first stage in the RSA process is a Stage 1 audit and is usually undertaken at the completion of preliminary design. As a preliminary design of the CPPF proposals has not been developed in sufficient detail it has not been possible to conduct a formal Stage 1 Safety Audit at this time. However, a high-level safety review of the general design concepts proposed by the CPPF has been undertaken.
- 3.4.6. The high-level safety review has identified several potential road safety issues associated with the proposed layout described in the CPPF report i.e. a central inbound bus lane and removal of existing right turning facilities. These concerns include:
 - Non-standard layout could potentially lead to driver confusion.
 - Potential conflicts between buses and right turning vehicles where the proposed “filter pockets” create areas with no clear priority for right turning traffic or buses.

⁷ Cambridgeshire Highways Development Management General Principles for Development [CD7-36, page 7, paragraph 2.4]

- Vehicles turning right from the mainline which choose to wait in the general traffic lanes would impede the progress of general traffic and this could lead to frustrated drivers using the central bus lane to overtake.
- Buses heading eastbound in a central bus lane would meet head on with any Westbound vehicles turning right from the mainline that are waiting in a “Filter Pocket” located within the Bus Lane. This could result in a head on collision, or the progress of the inbound bus would be impeded and would also limit visibility of traffic in the nearside general traffic lane for the driver completing the right turn manoeuvre.
- Eastbound vehicles turning right from the mainline which choose to wait in the general traffic lanes, resulting in buses approaching from the rear being positioned in their blind spot.
- Drivers exiting side roads or private accesses may block the path of active travel users while waiting for an appropriate gap to turn right.
- Drivers focused on identifying a gap in the traffic to complete a right turn may pull out in front of or potentially collide with active travel users.
- Potential abuse of the bus lane for overtaking or early commencement of right turn manoeuvres by frustrated motorists.
- Lack of separation between the central bus lane and opposing traffic lane as recommended in the TSM may result in conflicts and potential head on collisions between buses and opposing traffic that intentionally or mistakenly enters the bus lane.
- Potential use of central bus lane by cyclists unless prohibited placing them in a vulnerable position in a high-speed road environment.

- 3.4.7. The end of the preliminary design stage is often the last occasion at which land requirements can have the potential to be changed. The Stage 1 RSA should include road safety matters which have a bearing upon land take, licences or easements before the draft orders are published or planning consent is applied for.
- 3.4.8. One of the key safety concerns that has been identified in relation to the CPPF proposals is the potential for conflicts between right turning vehicles, buses and active travel users. It is considered highly likely that this would be identified as a potential road safety issue through the RSA process and that recommendations would be made to eliminate or mitigate this issue.
- 3.4.9. Introducing a road layout which is non-standard and is unfamiliar to the public would come with an increased risk of road traffic collisions. The proposed filter pockets provide no clear indication of priority and would position right turning vehicles in a vulnerable position where they may be at risk of a collision with buses or other vehicles completing right turn movements.
- 3.4.10. Some amendments to the CPPF proposals which could potentially design out or mitigate some of the road safety issues identified as part of the high-level safety review include:
- Provision of a nearside bus lane;
 - Retention of the existing ghost island junctions;

- Prohibiting right turns into and out of some of the junctions and accesses; and
- Reduced speed limits.

- 3.4.11. The roundabout at the western end of Madingley Road would afford drivers an opportunity to make U-turns. However, there are no similar opportunities to the east of the existing accesses and junctions along Madingley Road. As such, the option to prohibit right turns does not appear to be viable as it is likely to result in round trips of over 2km which would not be considered acceptable.
- 3.4.12. The existing speed limits along Madingley Road are appropriate considering the existing characteristics of the road, they also align with CCC's current Speed Limit Policy⁸. An increase in the overall carriageway width along Madingley Road is likely to result in increased speeds as the level of constraint imposed by the cross section would be significantly reduced. As such, any reductions proposed to the existing speed limits are unlikely to be approved by the Highway Authority or supported by the local constabulary.
- 3.4.13. The most viable option out of those identified appears to be provision of a nearside bus lane and retention of the existing ghost island junctions. This is likely to result in a road layout which most motorists are expected to be familiar with.
- 3.4.14. A nearside bus lane also removes several of the potential safety issues associated with right turning vehicles crossing a central bus lane which follows the first Principle of Prevention under CDM i.e. to avoid/design out any identified risks where possible.

3.5 Development of Alternative Concept Designs

- 3.5.1. Considering the potential road safety issues identified in relation to the CPPF proposals, an alternative scheme to deliver an inbound bus lane along Madingley Road has been developed by the Applicant and assessed by the Applicant.
- 3.5.2. The alternative scheme which has been assessed includes the provision of a nearside bus lane on the north side of Madingley Road and an improved active travel path along the south side.
- 3.5.3. Concept designs have been developed to show how a scheme incorporating a nearside bus lane and improved active travel provision is expected to look and to provide an indication of the likely land requirements and the potential impacts on existing features along the corridor.
- 3.5.4. Several design assumptions have been made when developing the alternative scheme designs:

⁸ Cambridgeshire County Council, Highway Operational Standards 2024-2034, 7th August 2024 [**CD22-04, page 67, paragraph 28**].

- The kerb line on north side of Madingley Road has been retained to minimise impacts on sensitive sites to the north i.e. Madingley Wood and the American Cemetery and Memorial.
- Vehicles turning right from the mainline into the various existing accesses where there is currently no turning lane provision would have to wait within the general traffic lanes as per the existing arrangement.
- Existing ghost island junctions e.g. at Crome-lea business park would be re-provided.
- Cyclists would not be prohibited from using a nearside bus lane on safety grounds so a standard 4m wide lane has been provided.
- A 3m shared use path with 1.5m separation from the edge of the carriageway (inclusive of the 1m hard strip) on the south side is appropriate.
- The use of a traditional kerb and gully drainage system.

3.5.5. The existing verge between the edge of the carriageway and the decorative hedging along the southern boundary of the American Cemetery and Memorial site has a considerable slope in the range of 12 to 15% gradient. The verge also contains two ornamental signs for the American Cemetery and Memorial which appear to be constructed from Marble as shown in **Figure 3-9** below.



Google Earth, ©2025 Google

Figure 3-9 - Northern Verge and Boundary of the American Cemetery

- 3.5.6. The adjacent carriageway through this section of Madingley Road is also superelevated⁹ at around 2.5%. As such, any widening to the north to accommodate a bus lane or improved active travel facilities is likely to have a significant impact on the existing hedge along the boundary of the American Cemetery and Memorial. It would also require the removal of the existing ornamental signs and may also impact the root protection areas of some of the existing trees located to the north of the hedge line.
- 3.5.7. Any carriageway widening to the north adjacent to the Madingley Woods (SSSI) has been avoided as it is likely to impact the root protection areas of a significant number of trees. A no-dig pavement construction is a common solution adopted to minimise the impacts on the root protection areas of trees. However, this approach would not be feasible in this area due to the need to tie-into the existing carriageway levels.
- 3.5.8. **Figure 3-10** below shows a typical cross section through the alternative scheme layout and provides an indication of the overall corridor width required to accommodate it. A 1.5m allowance has been included in the cross section for earthworks. This is based on an assumed 0.5m level difference at the back of the verge and a 1in3 embankment/cutting slope. The total width of the cross section comes to approximately 23.3m and may exceed this in areas where verge widening is required to provide the requisite stopping sight distances and visibility splays at junctions or where more significant level differences exist at the interfaces with the existing ground.

⁹ In highway design, superelevation refers to the banking of a roadway at a curve. It involves raising the outer edge of the road above the inner edge to help counteract the lateral acceleration experienced by vehicles as they navigate the curve. This design feature improves safety and comfort by reducing the tendency of vehicles to skid outward due to centrifugal force.

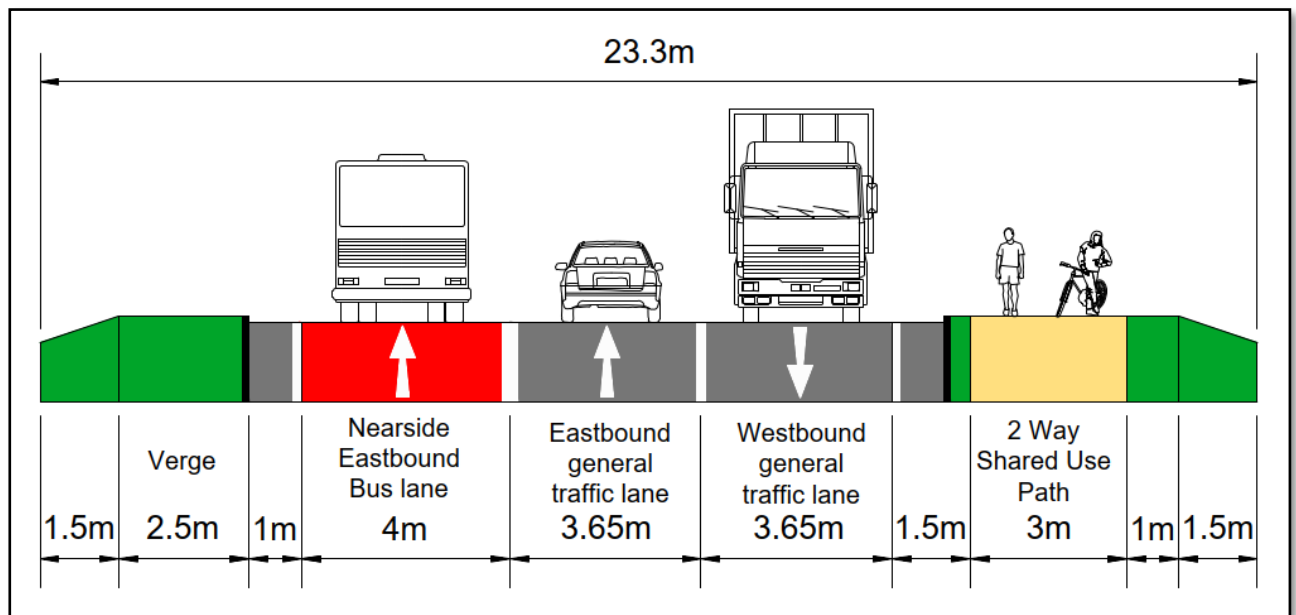


Figure 3-10 – Compliant Typical Cross Section with Nearside Bus Lane

- 3.5.9. A concept design of the alternative scheme is presented in drawing 70086660-WSP-HML-XX-DR-HW-001001 in **Appendix B**.
- 3.5.10. The overall corridor width of the alternative scheme is very similar to the compliant CPPF scheme cross section. Acquisition of land outside of the existing highway boundary to the south as well as removal of the existing tree lines and hedges would be required to deliver the scheme.
- 3.5.11. The land acquisition required to the south includes arable farmland, commercial and residential properties. The Lodge, Coton Court and one of the existing outbuildings located to the front of the property boundary would potentially be directly impacted by the scheme.
- 3.5.12. Other properties to the south including Coton Court and Blue Gates would lose the existing screening provided by the existing mature trees and hedge line. If physical impacts on the existing buildings at The Coton Court Lodge could be avoided, there is unlikely to be sufficient space available to provide replacement screening.
- 3.5.13. An extract from the concept design drawings providing an indication of the likely impact on the existing tree line, hedges and residential properties opposite the entrance to the American Cemetery is shown in **Figure 3-11** below.



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Figure 3-11 - Impact on Residential Properties Opposite the American Cemetery

3.6 Road Safety Concerns Associated with a Nearside Bus Lane

3.6.1. Whilst a nearside bus lane would remove many of the conflicts and safety concerns associated with a central (offside) lane arrangement, it still presents its own challenges and safety concerns that would need to be taken into consideration during the design development. These safety concerns include:

- Buses travelling at speed in a nearside bus lane undertaking slower moving and potentially stationary queuing traffic in the eastbound general traffic lane.
- Collision risk between buses (travelling at speed) in the bus lane and slower moving or stationary vehicles in queuing traffic initiating left turn manoeuvres using the allocated road space.
- Collision risk due to utilisation of the bus lane by frustrated drivers to initiate left turns early allowing them to undertake queuing traffic.
- Collision risk due to high sided vehicles queuing in the eastbound general traffic lane blocking buses (travelling at speed) from the view of westbound drivers completing right turns.
- Vehicles turning right from the mainline waiting in the general traffic lanes (in the absence of ghost any island facilities) would impede the progress of general traffic and this could lead to frustrated drivers using the nearside bus lane to undertake. Where gaps are introduced into the bus lane to facilitate left turns for other traffic this could potentially exacerbate this issue.
- Increased collision risk due to widened carriageway and lack of crossing provision for pedestrians to access Public Footpath 154/4 and the American Cemetery and Memorial.

- More confident cyclists travelling eastbound are likely to use the bus lane as opposed to any offroad provision. Especially since this would allow them to take the most benefit from the steep downhill gradients in the eastbound direction.
- The bus lane may be perceived as a safer and more convenient option by confident cyclists as it would avoid crossing several side roads and accesses some of which have limited intervisibility.
- Cyclists using the inbound bus lane may impede the progress of buses if the bus lane was not sufficiently wide to allow buses to safely overtake cyclists.
- Queuing traffic may prevent buses from moving across into the general traffic lane to safely overtake cyclists.
- Any buses moving across into the general traffic lane to overtake cyclists would increase the risk of sideswipes.

3.6.2. Potential mitigation measures or options that could be explored to reduce some of the risks associated with a nearside bus lane include:

- Provision of additional space within the carriageway cross section to enable vehicles making right turns across stationary traffic travelling in the opposite direction to see any approaching buses before moving across the bus lane.
- Provision of right turn facilities (ghost islands) for all side road junctions and accesses.
- Provision of a suitable crossing to facilitate access for active travel users to Footpath 154/4 and the American Cemetery and Memorial.
- Provision of a wide bus lane or additional hatched area alongside the bus lane to ensure buses can safely overtake any cyclists which choose to cycle in the bus lane.
- Provision of high standard off road facilities for cyclists to encourage more confident cyclists away from the bus lane.

3.6.3. All the options identified above to mitigate the safety concerns associated with a nearside bus lane arrangement would result in a wider corridor cross section and require additional land take to deliver them.

3.7 Potential Engineering Difficulties

Drainage

- 3.7.1. The existing drainage infrastructure along Madingley Road is unlikely to have sufficient spare capacity to accommodate the additional runoff generated by the increased impermeable areas created by the CPPF proposed scheme.
- 3.7.2. The CPPF report makes no mention of a drainage strategy, so it appears that this aspect of the design and the potential land requirements and associated environmental impacts have not been considered.
- 3.7.3. It is highly likely that additional land will be required to deliver the drainage infrastructure required for the scheme including the provision of attenuation basins, ponds and ditches etc. to mitigate any increase in flood risk.

- 3.7.4. Hard strips provide an important drainage function – wide multi lane roads generate a high volume of surface water runoff especially through superelevated sections where the whole width of the carriageway drains to the same side. The hard strip enables drainage inlets to be spaced further apart as a greater width of flow can be permitted without encroaching into the running lanes. This helps to prevent a nuisance to users of the adjacent active travel facilities resulting from surface water being splashed/sprayed onto them by passing vehicles.
- 3.7.5. Minimising the number of drainage inlets reduces the time taken to maintain them which brings both health and safety and cost saving benefits. If hard strips were to be omitted from the proposed cross section, this would only result in a width reduction of 1m as the buffer/verge width between the active travel facility would need to be increased by 1m to maintain suitable separation from the running lanes.
- 3.7.6. There are sections of open drainage ditches located to the back of the existing shared use path on the south side of Madingley Road. It appears that it would be necessary to culvert sections of these existing ditches to re-provide the existing or improved walking and cycling facilities. Culverting the ditches would result in loss of flood storage capacity which may lead to an increased risk of surface water flooding especially when combined with the significant increase in impermeable area. Alternatively, the ditches could be re-provided but this would require additional land to be acquired.
- 3.7.7. The Topographic Survey has picked up a section of an existing ditch that would be impacted by any widening to the north in the vicinity of Madingley Wood. If this ditch is lost this will result in loss of flood storage capacity. Re-providing the ditch would require additional land and increase the potential impacts on Madingley Wood.
- 3.7.8. Where incorporated, typical SuDS features such as filter strips, grassed swales etc. may also significantly increase the overall width of the corridor required to deliver the proposed cross sections.
- 3.7.9. The indicative cross sections presented in the CPPF proposals do not make any provision for these types of features which play an important part in the SuDS treatment train and help to manage flows and improve the quality of highway surface water runoff.

Underground and Overhead Utilities

- 3.7.10. It is assumed that no enquiries have been completed to provide an indication of the scale and costs of the potential diversionary works required to enable the proposed online scheme to be implemented.
- 3.7.11. The proposed changes to the corridor cross section may physically impact or affect access to existing utilities for inspection and maintenance purposes, this may necessitate significant and costly diversionary works.
- 3.7.12. Future planned or emergency maintenance on any utilities/services along the corridor may require full or partial closures resulting in potential delay and disruption to bus services.

Pavement Condition

- 3.7.13. It is assumed that no assessment of existing pavement surface or structural condition have been completed to confirm the level of intervention required to provide an acceptable residual life.
- 3.7.14. Notwithstanding the potential road safety and other issues associated with providing a narrow lane in a high-speed road environment, intervention measures may be required to ensure that the channelised traffic flows resulting from the proposed narrow traffic lanes proposed by CPPF would not lead to excessive rutting.
- 3.7.15. When traffic is channelized past refuge islands, vehicles tend to follow the same path, concentrating the wheel loads in specific areas of the pavement. This repeated stress can lead to compaction and lateral movement of pavement layers, resulting in rutting.
- 3.7.16. The image in **Figure 3-12** below shows evidence of pavement failures along Madingley Road where traffic is already channelized past a traffic island. The historic Google Street view imagery for this location suggests that this section of Madingley Road was resurfaced at some point between November 2022 and October 2024 when the image below was captured. The early failure (rutting and cracking in the wheel paths) of the surfacing in this location indicates there are deeper seated failures within the pavement construction which are likely to be a result of the channelised traffic flows.



Google Earth, ©2024 Google

Figure 3-12 - Pavement Failures on Madingley Road

- 3.7.17. Existing site constraints e.g. kerb heights, drainage and iron work, existing threshold levels at direct accesses and junctions etc. may potentially limit options for structural overlays of

the existing pavements. This may necessitate costly full depth reconstruction of sections of Madingley Road where the residual life of the existing pavements is not considered acceptable.

- 3.7.18. Failure to address any issues within the existing pavements may result in the need for periods of planned or emergency maintenance to address pavement defects along the corridor. Depending on the location, this maintenance work may require full or partial closures resulting in potential delay and disruption to bus services.

3.8 Buildability

- 3.8.1. A single lane busway provides very little working space, and either needs an adjacent lane closure, or for the nearside option the verge widened, and trees removed to provide an off-road access.
- 3.8.2. The Central bus lane construction would either be in an island site, or in a worksite including one running lane. The road past the American Cemetery is too narrow for an island site, so a length of single lane running with traffic lights will be required.
- 3.8.3. The nearside bus lane construction would require the eastbound lane to be closed for access, with temporary traffic lights and single lane running.
- 3.8.4. The construction would need to be carried out after traffic management for utility diversions and works to lay new surface water sewers, this is potentially four to six months of lane closures with traffic lights.
- 3.8.5. The construction would need to be phased, to minimise disruption to the A1303, and to the users of the junctions onto the road. The single lane running can be off peak only on weekdays, minimising disruption to the traffic, but this will result in a construction duration and associated disruption of two years.
- 3.8.6. If a lane closure and single lane running could be implemented, this would potentially reduce the duration to a year, with phases as the worksites move along the A1303.
- 3.8.7. Any work near the American Cemetery would need to be timed to avoid disruption to their key dates and events.

3.9 Conclusions

- 3.9.1. The CPPF proposals do not comply with the relevant design standards. The lane widths proposed are more suitable for a low-speed urban environment and the central bus lane layout incorporating filter pockets is an aspect not covered in the DMRB or the other current and relevant design standards and guidance.
- 3.9.2. There are significant road safety concerns associated with providing a central inbound bus lane in a high speed-road environment. The key concern being potential conflicts with vehicles turning right into and out of the existing side roads and accesses.

- 3.9.3. A review of the CPPF proposals has also shown that the land requirements and impacts to the existing features along Madingley Road are not accurately reflected in the CPPF report.
- 3.9.4. It is considered unlikely that all the departures from standard required for the scheme would be approved by the Highway Authority considering the potential road safety implications.
- 3.9.5. There are several aspects of an overall scheme design which the CPPF report does not consider including drainage, utilities and existing pavement condition. All these items could potentially have a significant impact on the overall cost of delivering an online solution.
- 3.9.6. An alternative option to the delivery of an inbound bus lane along Madingley Road has been investigated. This alternative option was based on the introduction of an inbound nearside bus lane.
- 3.9.7. The concept designs developed address many of the potential road safety issues identified with the CPPF scheme and provide a good indication of the likely land requirements and potential impact on the existing features along Madingley Road.
- 3.9.8. The delivery of an inbound nearside bus lane does not come without its own challenges and safety concerns which may ultimately result in additional land being required over and above that indicated by the concept designs that have been developed for this report.
- 3.9.9. An on-road solution has been assessed previously in the work leading to the production of the Outline Business Case **[CD1-20.07 & CD1-20.08]** but given the interest in this matter it has been revisited by the current design team in this report.
- 3.9.10. It has been demonstrated that if damage to the SSSI is to be avoided as well as direct impacts on the curtilage of the Grade I listed registered park and garden of the American Cemetery it would not be possible to deliver either a nearside or central inbound bus lane along Madingley Road without acquiring additional land outside of the existing Highway Boundary and without having a significant impact on the existing commercial and residential properties to the south side of Madingley Road as well as the setting of the American Cemetery and Memorial.

3.10 Environmental appraisal

- 3.10.1. The location of the Madingley Wood SSSI makes the route inherently sensitive to potential disturbance impacts to its wildlife communities; with the highly protected barbastelle bats in particular potentially vulnerable to impact. It is assumed that the CPPF scheme could be retained within the existing northern kerbline and that direct landtake to the wood could be avoided. Notwithstanding this, Natural England expressed concerns with regard to the use of an online option along Madingley Road in correspondence to the GCP in January 2018 [Appendix D].
- 3.10.2. The route's passage past the Grade I Registered Park and Garden of the American Cemetery would have potential impacts on the setting of this highly protected heritage designation, as it would also for the Grade II* listed memorial and attached walls, steps and pool surround. It is assumed that direct landtake within the curtilage of these two designated heritage assets could be avoided, although this is not certain, and were it required, it is assumed that Historic England would, based on the advice they provided to the GCP in February 2018 [Appendix D] with respect to options along Madingley Road, also have concerns.
- 3.10.3. To avoid physical impacts within the cemetery curtilage, a more southerly alignment for the Scheme proposals would require landtake from the edge of the residential properties (see Figure 3-11), as well as loss of trees within their gardens, with implications for the views of residents, for the setting of the listed cemetery, as well as for the varied wildlife for which the trees provide habitat.
- 3.10.4. To avoid impacts to the cemetery and SSSI, the more southerly alignment would also require the loss of mature trees and hedgerows to the south, east and west of the SSSI that are likely to be important habitat features for commuting and foraging barbastelle and other bat species as they exit the woodland, restricting their ability to move through the landscape. The loss of tall canopy at this location could also reduce the height that bats cross the existing carriageway if they use the canopy to cross at height over the road, which is currently being investigated. This could increase the risk of collision with road traffic. Widening the carriageway at this location could also affect the behaviour of bats crossing the carriageway, increasing the number of traffic lanes and overall width that they need to traverse. This could also increase the risk of collisions with road traffic.
- 3.10.5. Calculations have been undertaken to understand the implications of construction of the CPPF Alternative on Greenhouse Gas emissions compared with those associated with the construction of the Proposed CtoC Scheme.
- 3.10.6. In relation to Phase 1 only, the assessment has calculated that the CPPF Alternative would produce 3,890 tonnes of carbon dioxide equivalent (tCO₂e). This is compared with 14,910 tCO₂e for Phase 1 of the proposed CtoC Scheme, representing a total of 26% of the Scheme. **Figure 3-13** below shows the extents of Phase 1.

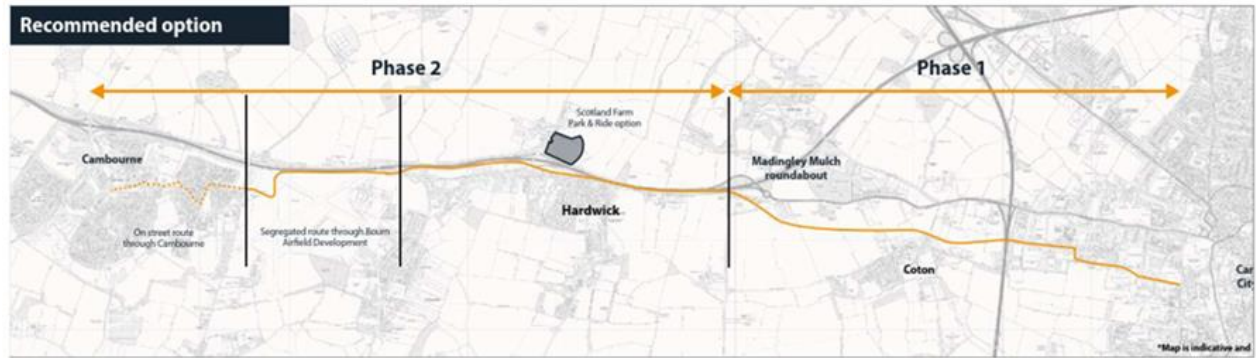


Figure 3-13 - Phase 1 and Phase 2

- 3.10.7. Once construction of the full CtoC Scheme is considered from Cambourne to Cambridge, the infrastructure greenhouse gas emissions from the CPPF Alternative (incorporating the Phase 2 works and the P&R) is estimated to be 18,110 tCO₂e compared with the CtoC Scheme (Phase 1, Phase 2 and the P&R) which is estimated to be 29,130 tCO₂e [see **Appendix C of this Note**]. When compared to the CtoC Scheme, the potential infrastructure greenhouse gas emissions saving from an equivalent end to end route incorporating the CPPF Alternative is estimated to be 38%.
- 3.10.8. The calculations and the assumptions / limitations for the construction greenhouse gas emission estimates are provided in **Appendix C**.
- 3.10.9. While the CPPF Alternative Scheme has the potential to require less infrastructure and produce lower infrastructure emissions compared to the Proposed Scheme, a similar scheme to the Alternative which included an inbound bus lane along Madingley Road has shown less modal shift, and as a result the operational emission savings from the CPPF Alternative are expected to be considerably lower than the Proposed Scheme.
- 3.10.10. Overall, the Madingley Road options are far from environmentally benign, with potential impacts to some of the most highly protected heritage and ecological categories of designation in the UK, and/or for the property and amenity of people living along the southern boundary of this road. These are considered to make this proposal no better and potentially inferior in environmental terms to that proposed under the TWA Order application.

4 Assessment of the Revised CPPF Scheme – April 2025 Proposals

4.1 Scope of the Assessment

- 4.1.1. This assessment focuses on the April 2025 version of the CPPF alternative scheme. It looks at the changes CPPF have made to address some of the concerns previously expressed.

4.2 Change to a Nearside Bus Lane Arrangement

- 4.2.1. The latest version of the CPPF proposals assumes that the proposed inbound bus lane would be provided on the nearside.
- 4.2.2. As set out in the previous chapter of this report a nearside arrangement is a more conventional layout and would help to minimise potential conflicts with right turning vehicles, a significant safety concern associated with the central (offside) bus lane arrangement previously proposed.
- 4.2.3. Nevertheless, CPPF maintains their view that there may be merit in setting the bus lane in the middle of the road i.e. an offside lane arrangement.
- 4.2.4. As an assessment of both a nearside and offside bus lane arrangement is covered in Chapter 3 of this report, there is nothing further to add in this regard considering the CPPF updated proposals.

4.3 Proposed lane widths

- 4.3.1. The lane widths proposed by CPPF in the latest update remain unchanged. However, further details are provided regarding the sources used to establish the recommended minimum lane widths stated in the CPPF report, namely the Active Travel England (ATE) Route Cross Section Tool.
- 4.3.2. The ATE Route Cross-Section Tool is a design tool developed by ATE to support the development of designs and the assessment of design quality for active travel interventions and schemes. In the accompanying user manual¹⁰ ATE makes the following statement in relation to the tool “It is not an audit, and it does not give answers, and while it is comprehensive, it may not cover all possible eventualities and contexts. It goes on to state that “It is the responsibility of the scheme designer to be familiar with the relevant design codes and work out the most suitable options that balance all the needs of a street”.

¹⁰ Active Travel England Route Cross-Section Tool User Manual, February 2024 [CD8-34].

- 4.3.3. The ATE Tool itself takes the form of a Microsoft Excel Spreadsheet into which the user must populate traffic data and additional information including contextual information such as traffic flows, speed limits, street function etc.
- 4.3.4. Under the street function drop down box in the ATE tool the user has three options to choose from including:
 - Highstreet (active frontages);
 - Residential Street; and
 - Local distributor road.
- 4.3.5. The A1303 Madingley Road is:
 - An 'A' Road, the classification given to major roads intended to provide large-scale transport links within or between areas.
 - Part of the Primary Route Network (PRN), which designates roads between places of traffic importance across the UK, with the aim of providing easily identifiable routes to access the whole of the country.
 - Part of the Major Road Network (MRN), the middle tier of the country's busiest and most economically important local authority 'A' roads, sitting between the national Strategic Road Network (SRN) and the rest of the local road network.
 - A part of the (SRN) diversion routes which are a set of pre-planned routes used to guide traffic around road closures triggered by unplanned events or planned roadworks on England's motorways and major A-roads.
- 4.3.6. The ATE tool does not include an option in the Street Function drop down box which fits the context of Madingley Road. As such, the traffic lane widths and absolute minimum cross-sections indicated by the tool do not draw upon the relevant standards i.e. DMRB Standard CD 127 Cross-sections and headroom's **[CD9-09]**. This results in the tool suggesting inappropriate (substandard) traffic lane widths because the tool is not applicable in this context.
- 4.3.7. The ATE Tool also fails to make any provision for level differences introduced at the interfaces with the existing ground levels due to cross falls on the carriageway, verges and active travel path, making the overall desirable and absolute minimum cross-sections generated by the Tool misleading, as a much wider corridor would be required to make them practically feasible.
- 4.3.8. Providing narrow lanes and omitting hard strips from any proposed improvements to Madingley Road is likely to result in:
 - Increased accident risk
 - Reduction in capacity
 - Reduction in journey time reliability
 - Reduced network resilience
- 4.3.9. Narrow lanes and no hard strips will reduce the carriageway width, limiting safe traffic management for planned and emergency maintenance on the highway or utilities.

- 4.3.10. Narrow lanes would make it more difficult for traffic to safely pass a broken-down vehicle potentially leading to lengthy delays.

4.4 Relocating active travel path to the north side of Madingley Road and widening the carriageway to the south

- 4.4.1. Relocating the active travel path to the north, as proposed in the latest CPPF alternative, would not change the overall cross section width.
- 4.4.2. Any widening of the carriageway for the bus lanes discussed in Chapter 3 was assumed to occur on the southern side.
- 4.4.3. In areas where the westbound traffic lane is aligned with a left-hand bend, many of the existing trees and hedges are located within the minimum 2.5m wide verge and the required visibility splays.
- 4.4.4. Several of the mature trees along the south side of Madingley Road have canopies that extend near or over the southern edge of the carriageway. This suggests that the construction of any carriageway widening to the south would impact the root protection areas of the existing trees. The use of no-dig construction methods in this area would not be viable given the need to tie into the existing carriageway levels.
- 4.4.5. Widening the carriageway to the south would also move the live traffic lanes much closer to the existing large diameter trees. Any of the larger trees that were not impacted by the carriageway widening and that were still deemed to be viable, would be considered a potential hazard and would need to be included in a Road Restraint Risk Assessment Process (RRRAP).
- 4.4.6. If the level of risk posed by the trees was not deemed acceptable the mitigation options would include:
- Eliminating the risk (by removing the trees).
 - Controlling the risk (by installing a vehicle restraint system).
- 4.4.7. Given the proximity of the trees to the edge of the carriageway in the revised layout it is unlikely there would be sufficient space to provide a vehicle restraint system, leaving removal of the trees the only viable option.

4.5 Potential Departures for Substandard Active Travel Facilities

- 4.5.1. The CPPF report suggests that substandard facilities for Active travel users could be justified by the current provision level and reduced ecological impacts.
- 4.5.2. Provision of high-quality Active travel facilities is important if the use of active travel modes is to be encouraged, and cyclists are expected to use them and not the main carriageway where they would be exposed to greater risk and could potentially hold up all outbound traffic and inbound buses in the proposed nearside bus lane.

- 4.5.3. As set out in LTN 1/20 **[CD8.23, page 8, paragraph 1.1.1]** Consideration of the opportunities to improve provision for cycling will be an expectation of any future local highway schemes funded by Government.
- 4.5.4. The 3.25m wide lanes proposed by CPPF sit within the range of lane widths not recommended in LTN 1/20 **[CD8.23, page 74, paragraph 7.2.5]** as they could result in unsafe overtaking of cyclists.

4.6 Offside Bus Lane and Filter Pockets

- 4.6.1. The updated CPPF report lacks specific plans or detailed explanations on the proposed filter pockets for a central bus lane.
- 4.6.2. The terminology filter pocket is also used throughout the CPPF report to describe ghost islands which are a major road central treatment that uses road markings to create an additional lane to allow traffic waiting to turn right from the major road into the minor road to do so without impeding through traffic movement or being placed at risk from that traffic.
- 4.6.3. What CPPF is proposing appears to be very different to a conventional ghost island arrangement. The CPPF report implies that the filter pockets they propose are effectively areas within the live central bus lane which could be used by right turning traffic to wait for a gap in the opposing general traffic lane to complete a right turn manoeuvre. No explanation is provided as to who would have priority within the filter pockets or how this unconventional arrangement could be regulated effectively to ensure safe operation.
- 4.6.4. The filter pocket arrangement proposed by CPPF has the potential to place right-turning vehicles in direct conflict with other right-turn movements and high-speed buses, which could lead to collisions or hinder the progress of inbound buses.
- 4.6.5. The CPPF report asserts that it is only the Crome Lea Business Park access that is provided with a ghost island and fails to acknowledge the existing ghost island at Madingley Rise. The original CPPF proposals for a central (offside) bus lane suggested that this Ghost Island and the associated hatching in the centre of the carriageway could be utilised to deliver a central bus lane.
- 4.6.6. The existing ghost island at Madingley Rise is only likely to serve a low volume of right turns. However, it also serves an important safety function as there is steep down gradient on the approach to this junction and substandard visibility.
- 4.6.7. According to Google Maps Street View imagery, the current road layout near Madingley Rise was introduced in 2012. The previous road layout included two westbound lanes, one of which was likely intended to function as a climbing lane.
- 4.6.8. The records of the road traffic collisions shown in Figure 4-1 below indicates there were multiple fatal and serious incidents at this location prior to the changes to the road layout introduced in 2012. The number of incidents recorded at this location appears to have reduced significantly since 2012 with only one slight and one fatal incident recorded. This reduction correlates with the introduction of the ghost island, which may suggest that the

ghost island plays a critical road safety function at this location. As such, any proposals to the remove the existing ghost island and reallocate the road space for bus priority measures would also need to clearly demonstrate how a safe direct access to Madingley Rise could be delivered in conjunction with the bus lane.



Source: www.crashmap.co.uk, Background map Google©, Road Safety Data DfT

Figure 4-1 - Fatal and Serious Crashes Reported between 2002 and 2012 (slight incidents have been excluded)

4.7 Conclusions

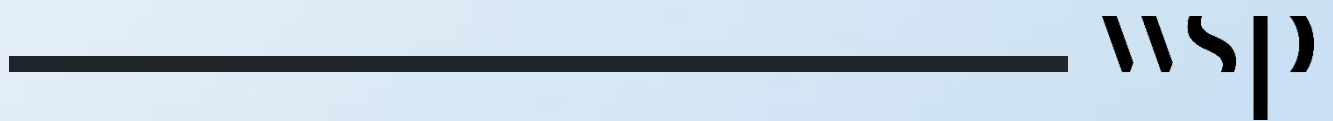
- 4.7.1. The conclusions drawn from the assessment of the September version of the CPPF report which considered both a central (offside) and nearside bus lane proposal remain valid.
- 4.7.2. The ATE Tool employed by CPPF to develop their proposed cross-sections is unsuitable for the specific context of Madingley Road. As such, the revised CPPF proposals still do not comply with the relevant design standards.
- 4.7.3. Moving the active travel provision to the north and widening the carriageway to the south is unlikely to reduce the loss of hedgerows and trees as suggested in the CPPF report. This would also potentially increase the overall impacts of the scheme on the SSSI and Cemetery; a view shared by both Natural England and Historic England.
- 4.7.4. Any scheme to implement an inbound bus lane through Section C whilst staying within the existing highway boundary to minimise environmental impacts would require a significant

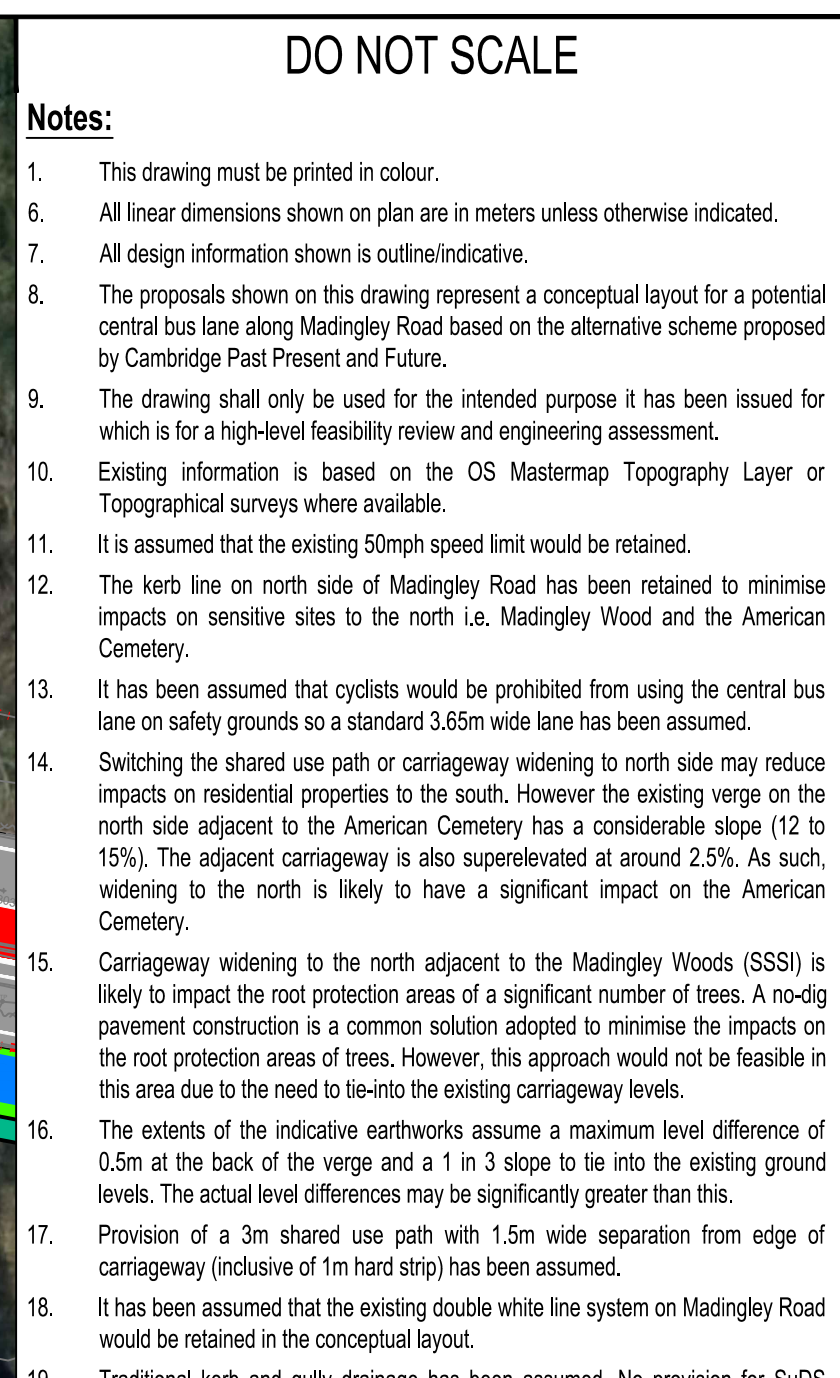
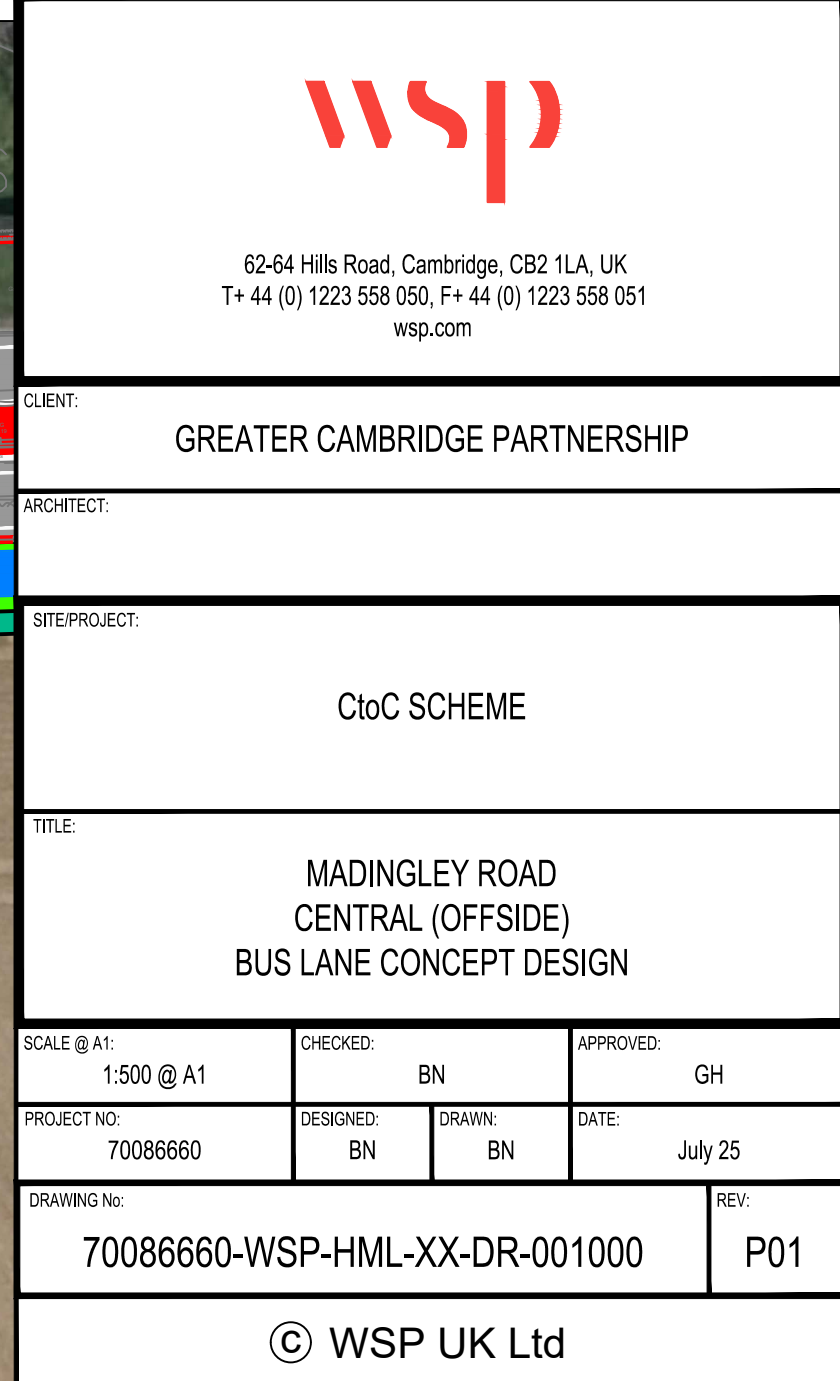
number of departures from standard to be used in combination on the immediate approaches to junctions.

- 4.7.5. It is improbable that an experienced design practitioner familiar with the relevant design standards would advocate implementing a scheme based on the cross sections and lane widths presented in the CPPF report. This is due to the context and the potential repercussions for road safety, capacity, journey time reliability and network resilience.
- 4.7.6. It is improbable that Cambridgeshire County Council acting in the capacity of the Technical Approval Authority would be willing to sign off the necessary departures from standard required for the scheme to achieve technical approval.
- 4.7.7. It is unlikely that the existing level/standard of provision for active travel users and the potential reduced ecological impacts would be accepted as justification for the implementation of substandard active travel facilities given the context and potential safety implications.
- 4.7.8. The CPPF report still offers no explanation as to how the proposed 'filter pockets' in a central (offside) bus lane would operate in practice, without significantly increasing the risk of road traffic collisions.

Appendix A

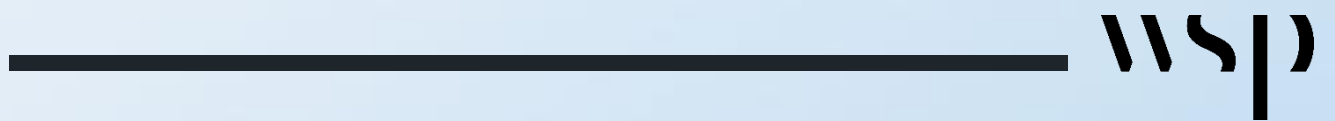
Central (Offside) Bus Lane Concept Design Drawings

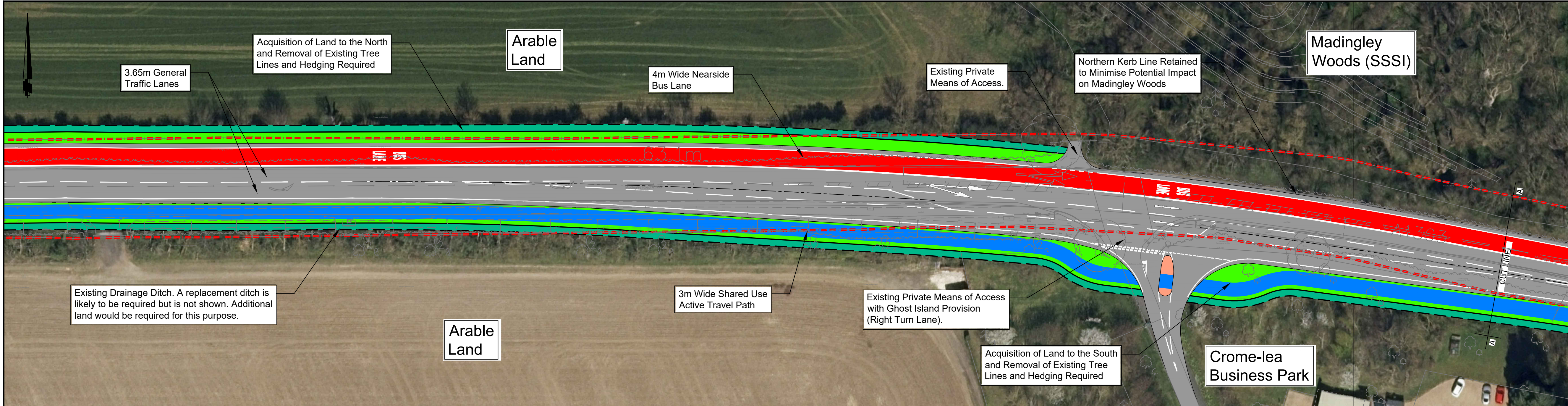




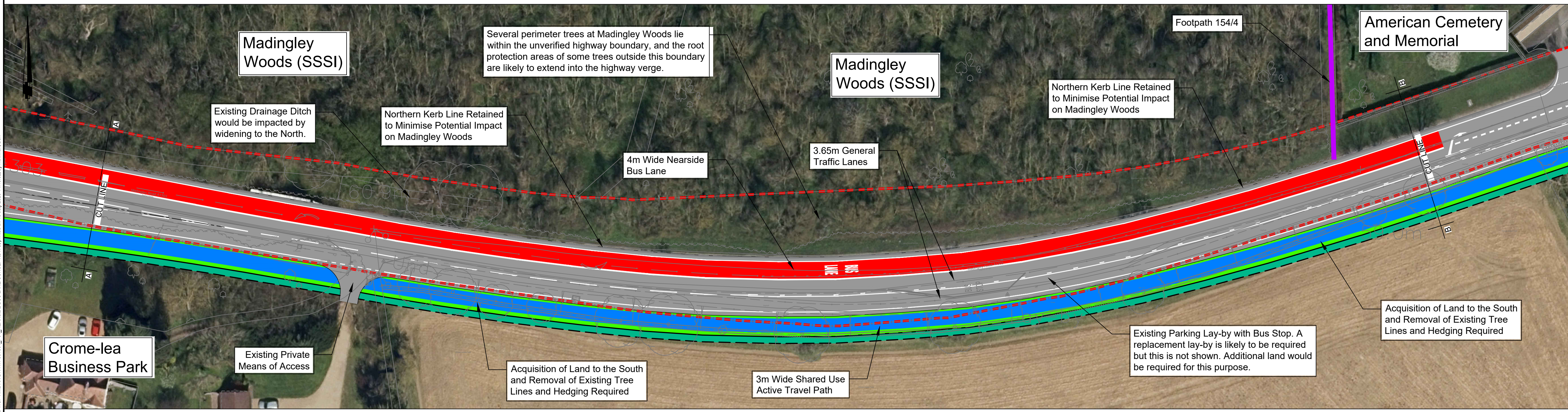
Appendix B

Nearside Bus Lane Concept Design Drawings





- Notes:**
1. This drawing must be printed in colour.
 2. All linear dimensions shown on plan are in meters unless otherwise indicated.
 3. All design information shown is outline/indicative.
 4. The proposals shown on this drawing represent a conceptual layout for a potential nearside bus lane along Madingley Road to reduce the potential conflicts with right turns into and out of private means of access associated with the central bus lane concept proposed by Cambridge Past Present and Future.
 5. The drawing shall only be used for the intended purpose it has been issued for which is for a high-level feasibility review and engineering assessment.
 6. Existing information is based on the OS Mastermap Topography Layer or Topographical surveys where available.
 7. It is assumed that the existing 50mph speed limit would be retained.
 8. The kerb line on north side of Madingley Road has been retained to minimise impacts on sensitive sites to the north i.e. Madingley Wood and the American Cemetery.
 9. Switching the shared use path or carriageway widening to north side may reduce impacts on residential properties to the south. However the existing verge on the north side adjacent to the American Cemetery has a considerable slope (12 to 15%). The adjacent carriageway is also super-elevated at around 2.5%. As such, widening to the north is likely to have a significant impact on the American Cemetery.
 10. Carriageway widening to the north adjacent to the Madingley Woods (SSSI) is likely to impact the root protection areas of a significant number of trees. A no-dig pavement construction is a common solution adopted to minimise the impacts on the root protection areas of trees. However, this approach would not be feasible in this area due to the need to tie-into the existing carriageway levels.
 11. The extents of the indicative earthworks assume a maximum level difference of 0.5m at the back of the verge and a 1 in 3 slope to tie into the existing ground levels. The actual level differences may be significantly greater than this.
 12. Provision of a 3m shared use path with 1.5m wide separation from edge of carriageway (inclusive of 1m hard strip) has been assumed.
 13. It has been assumed that the existing double white line system on Madingley Road would be retained in the conceptual layout.
 14. Traditional kerb and gully drainage has been assumed. No provision for SuDS features has been made within the cross section.

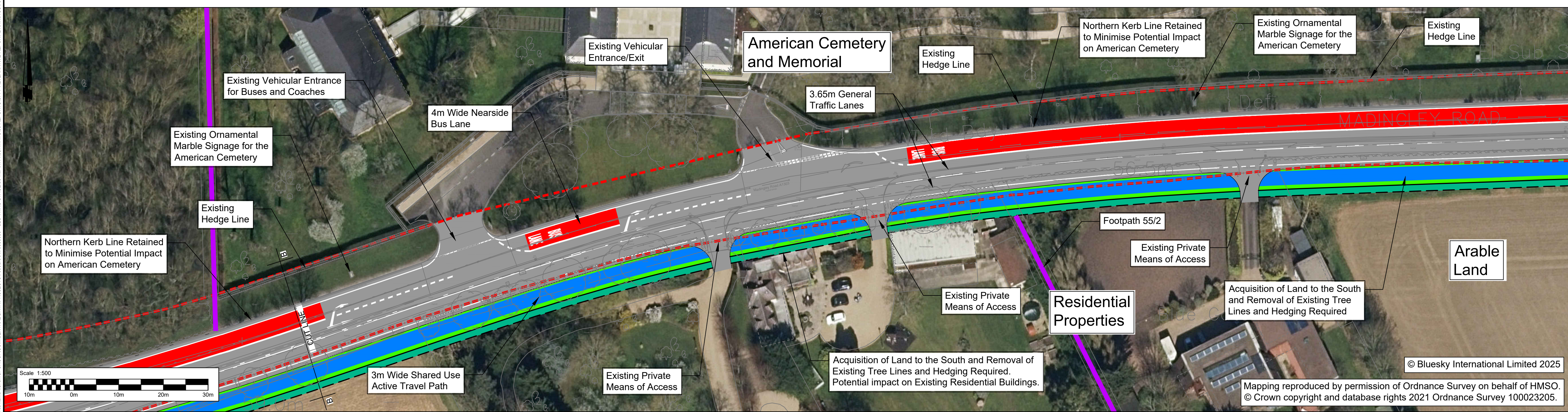


Key:

- Proposed Carriageway and Accesses
- Proposed Bus Lane
- Proposed Shared Use Path
- Proposed Verges
- Proposed Indicative Earthworks Extents
- Proposed Traffic/Refuge Island
- Indicative Highway Boundary (Unverified)
- Public Right of Way (Footpath)

POI	18/07/2025	BN	FIRST ISSUE	BN	GH
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS: S2 - FOR INFORMATION



wsp

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wsp.com

CLIENT: GREATER CAMBRIDGE PARTNERSHIP

ARCHITECT:

SITE/PROJECT: CtoC SCHEME

TITLE: MADINGLEY ROAD NEARSIDE BUS LANE CONCEPT DESIGN

SCALE @ A1:	CHECKED:	APPROVED:
1:500 @ A1	BN	GH

PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70086660	BN	BN	July 25

DRAWING NO:	REV:
70086660-WSP-HML-XX-DR-HW-001001	P01

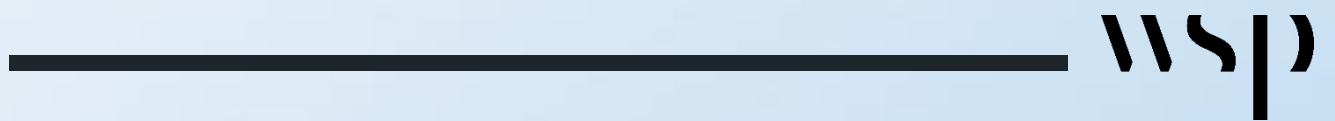
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Appendix C

Construction Carbon Emissions Estimates



Construction Carbon Emissions Comparison for CtoC Phase 1 vs CPPF Alt.

Lifecycle stages		Phase 1		CPPF Alternative		Comparison		
		Emissions* (tCO2e)	% of total**	Emissions* (tCO2e)	% of total**	Absolute (tCO2e)	CPPF Alternative as % of Phase 1	Commentary
A1-3, A5	Product stage and A5 Waste disposal	6,160	41%	1,460	38%	- 4,700	24%	Reasons for the lower emissions for the CPPF Alternative are discussed below. Some items could not be included in the GHG calculation due to the level of detail provided by CPPF. This GHG emissions calculation of the CPPF alternative has: - 58% less asphalt (~1,500 tCO2e) than Phase 1 of the Proposed Scheme - 70% less imported aggregate / soil disposed of (4,300 tCO2e) than Phase 1 of the Proposed Scheme - No street furniture or steel for civils work (~250tCO2e) has been assumed as this was not able to be quantified based on the detail provided by CPPF. Street furniture and steels for civils work will be required for the CPPF Alternative. - 92% less concrete pipework (~950tCO2e) than Phase 1 of the Proposed Scheme - Not included detail on utility diversions and these are not able to be quantified based on the detail provided by CPPF. Utility diversion will be required for the CPPF Alternative is designed. - No drainage plan and it is not possible to estimate emissions from drainage basins based on the detail provided by CPPF. A drainage plan will be required for the CPPF Alternative is designed. Scheme costs are significantly lower in the Alternative (~65% - not accounting for inflation).
A4, A5	Transport of materials to and away from site	4,980	33%	1,040	27%	- 3,940	21%	
A5	Plant and equipment use during construction	920	6%	270	7%	- 650	29%	
B2-B5	Maintenance, repair, replacement, refurbishment***	2,850	19%	1,120	29%	- 1,730	39%	Only the asphalt requires replacing in the CPPF Alternative and the quantity of is (58% [1,550 tCO2e]) lower in the Alternative. Street furniture also does not require replacing in the Alternative (150 tCO2e)
Total		14,910	100%	3,890	100%	- 11,020	26%	

*Rounded to the nearest 10 tCO2e.

** Percentages equate to proportion of infrastructure carbon only, not the whole-life carbon impact.

*** WSP has updated their calculation approach for B2-B5 since the ES was completed in 2023. The CPPF Alternative has been assessed using the same methodology as the ES to allow for a direct comparison between the Phase 1 design and the CPPF Alternative.

Construction Carbon Emissions Comparison for End-to-End Schemes

Proposed CtoC Scheme vs CPPF Alt.

Lifecycle stages		Proposed Scheme		CPPF Alternative		Comparison		
		Emissions* (tCO2e)	% of total**	Emissions* (tCO2e)	% of total**	Absolute (tCO2e)	CPPF Alternative as % of Phase 1	Commentary
A1-3, A5	Product stage and A5 Waste disposal	11,630	40%	6,940	38%	-4,690	60%	<p>Reasons for the lower emissions for the CPPF Alternative are discussed below. Some items could not be included in the GHG calculation due to the level of detail provided by CPPF.</p> <p>This GHG emissions calculation of the CPPF alternative has:</p> <ul style="list-style-type: none">- 28% less asphalt (~1,500 tCO2e).- 38% less imported aggregate / soil disposed of (~4,300 tCO2e)- No street furniture or steel for civils work (~250tCO2e) has been assumed for the CPPF Alternative between Maddingly Mulch roundabout and Cambridge. This was not able to be quantified based on the detail provided by CPPF for this phase of the Alternative. Street furniture and steels for civils work will be required for this phase of the CPPF Alternative.- 92% less concrete pipework (~950tCO2e).- Not included detail on utility diversions for the CPPF Alternative between Maddingly Mulch roundabout and Cambridge and as these are not able to be quantified based on the detail provided by CPPF. Utility diversion will be required for this phase of the CPPF Alternative.- No drainage plan for the CPPF Alternative between Maddingly Mulch roundabout and Cambridge was provided CPPF. It is not possible to estimate emissions from drainage basins for this phase of the CPPF Alternative based on the detail provided by CPPF. A drainage plan will be required for this phase of the CPPF Alternative.
A4, A5	Transport of materials to and away from site	9,760	34%	5,820	27%	-3,940	60%	
A5	Plant and equipment use during construction	1,850	6%	1,190	7%	-660	64%	
B2- B5	Maintenance, repair, replacement, refurbishment***	5,890	20%	4,160	23%	-1,730	71%	
Total		29,130	100%	18,110	100%	-11,020	62%	

*Rounded to the nearest 10 tCO2e.

** Percentages equate to proportion of infrastructure carbon only, not the whole-life carbon impact.

*** WSP has updated their calculation approach for B2-B5 since the ES was completed in 2023. The CPPF Alternative has been assessed using the same methodology as the ES to allow for a direct comparison between the Phase 1 design and the CPPF Alternative.

Appendix D

**Natural England / Historic England
letters**

WSP

Date: 22 January 2018
Our ref: 231872
Your ref: [Click here to enter text.](#)



Ashley Heller
Transportation Projects Team
The Greater Cambridge Partnership

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BY EMAIL ONLY contactus@greatercambridgeshire.gov.uk

T 0300 060 3900

Dear Ms Heller

Cambourne to Cambridge Better Bus Journeys Phase One consultation

Thank you for consulting Natural England on the above in your email dated 13 November 2017.

You will be aware that Natural England provided comments at the earlier options stage of this scheme, in our letter dated 12 October 2016 (ref: 197667).

Please note that our comments below only apply to the proposed route between Madingley Mulch roundabout and Cambridge. We are not aware that route options from Cambourne to Madingley Mulch roundabout form part of the current consultation. Natural England will expect to be consulted on the rest of the proposed route in due course.

It is also important to note at this stage that the level of detail provided for the proposed route options is too indicative for us to provide any detailed comments or advice. Based on the detail currently available Natural England is unable to make any judgement regarding likely impact of the proposed options. This is particularly the case with respect to on-line route options A and B which are located in very close proximity to Madingley Wood Site of Special Scientific Interest (SSSI). Further plans should clearly indicate the boundary of the SSSI in relation to detailed route options.

Traffic modelling / air quality screening should be undertaken for the different route options, to inform the assessment process and preferred route selection. This will be particularly important in assessing potential impacts on the sensitive ancient woodland habitat of Madingley Wood SSSI. This is located within the 200m screening distance¹ for air quality impacts associated with road schemes.

As mentioned previously we are supportive of the aims of the scheme to achieve improved connectivity and reduced congestion between residential and employment areas while improving the quality of life in Greater Cambridge. Natural England is pleased that potential impacts on the natural environment have been given better consideration. Whilst we welcome preparation of an environmental constraints map we are aware that a number of locally designated wildlife sites have been omitted from the plan. These should be included and given appropriate consideration through this and future phases of scheme development.

¹ <http://publications.naturalengland.org.uk/file/135001>

Route Options A and B

The route plans do not show the boundary of Madingley Wood Site of Special Scientific Interest (SSSI) and the supporting habitat of the adjacent 800 Wood. Options A and B are located in close proximity to this nationally designated site and proposals could have an adverse impact, through direct and indirect effects, on the notified features of the ancient woodland. Potential impacts are not considered in the route descriptions.

Route option A appears to be an on-line scheme involving widening of the transport corridor to the north. This would bring the road corridor closer to the boundary of Madingley Wood SSSI. This option therefore appears to pose the greatest risk of direct and indirect impact to the SSSI. The strip of land between the existing road corridor and the SSSI provides an important habitat buffer which protects the SSSI from adverse effects associated with the road corridor including traffic emissions, contamination, noise, lighting and access.

The nationally important and sensitive habitats of this site are very limited in extent and isolated from similar habitat; consequently this habitat and dependent species are extremely vulnerable to environmental change through the effects of development. Natural England will not support any project likely to have an adverse impact on this designated site or buffering habitat. Detailed ecological assessment will need to demonstrate that any project will not have an adverse impact on this site through direct or indirect effects. Ancient woodland is particularly sensitive to changes in air quality associated with transport schemes hence detailed assessment will need to include consideration of air quality impacts on Madingley Wood SSSI.

Natural England advises that options / proposals should seek to reduce the amount of traffic passing close to the SSSI as far as possible. We would also welcome consideration of proposals to deliver an enhanced habitat buffer between the road corridor and Madingley Wood, to reduce traffic related adverse effects to the SSSI and thus provide benefits for wildlife.

Route option B appears to be an on-line scheme involving widening of the existing transport corridor to the south. This scheme is therefore located slightly further from the boundary of Madingley Wood SSSI than Route A and should therefore pose less risk of direct impact to the woodland. Nonetheless our comments and advice relating to Route A apply similarly to Route B.

Route Option C

This off-line route option appears to be sufficiently distanced from designated sites and therefore unlikely to have any adverse impact on these. Potential indirect impacts will need to be assessed in detail.

We are aware of the presence of a number of locally designated wildlife sites, not indicated on the route plans or discussed in the route descriptions, with the potential to be adversely affected by proposed development. This includes potential direct impact to Coton Path Hedgerow County Wildlife Site (CWS) and impacts to several City Wildlife Sites. The plans should be revised to show these sites and potential impacts should be assessed to identify an appropriate route that avoids these sites of local biodiversity importance.

This route also includes Priority Biodiversity Action Plan habitat and areas of Best and Most Versatile (BMV) land (Agricultural Land Classification grades 1 -3a).

Any further development of Route C should ensure that impacts to CWSs and other locally designated sites and Priority Habitat are avoided. Proposals should also seek to prioritise development on lower grade agricultural land, to protect higher quality land, as far as possible.

Park & Ride options

Natural England does not have specific concerns with either of the proposed options as these are unlikely to affect key interests within our remit. However, we would wish to see details of traffic modelling and air quality assessment to be satisfied that proposals will not have any adverse effect

on nearby designated sites.

Other comments

A scheme of this scale should deliver significant biodiversity net gain, in accordance with paragraph 109 of the National Planning Policy Framework. Further consultation should include proposals for ecological enhancement including creation of green infrastructure / corridors and ecological networks – implemented and managed to make a valuable contribution to local Biodiversity Action Plan targets and Green Infrastructure Strategy² objectives.

Natural England will be pleased to provide further comments on proposed route options following the preparation of additional information to address our advice above.

I hope these comments are helpful. For any queries relating to the specific advice in this letter only please contact Janet Nuttall on 0300 060 1239. For any new consultations, or to provide further information on this consultation please send your correspondence to consultations@naturalengland.org.uk.

Yours sincerely

Janet Nuttall
Sustainable Land Use Adviser

² Cambridgeshire Green Infrastructure Strategy (Cambridgeshire Horizons 2011)



Historic England

EAST OF ENGLAND OFFICE

Mr David Atkinson

Direct Dial: [REDACTED]

Cambridge County Council

Strategic Planning, Box No. ET 1011

Our ref: PA00404372

Castle Court, Castle Hill

Cambridge

Cambridgeshire

CB3 0AP

27 February 2018

Dear Mr Atkinson

Pre-application Advice

CAMBRIDGE TO CAMBOURNE (BUS ROUTE)

Thank you for consulting Historic England about your proposals for the above bus route and the associated park and ride site options. As the Government's adviser on the historic environment Historic England is keen to ensure that the protection of the historic environment is fully taken into account at all stages and levels of the local planning process. Therefore we welcome this opportunity to review the proposed alternative routes for this important new transport link. We will not be providing a view on which option is preferred, but will instead consider what harm, if any, each option would cause to the significance of heritage assets. This letter should be read alongside our previous consultation response (Nov 2015).

Summary



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EAST OF ENGLAND OFFICE

The proposals offer three alternative routes for a dedicated route for buses between Cambridge and Cambourne using a mixture of new and/or existing road infrastructure. These are presented as Routes A, B and C, of which C has a number of potential alternative routes. In addition there are two potential park and ride car park options being consulted upon: Scotland Farm, north of Hardwick on the northern side of the A428 junction with Scotland Road; and The Waterworks, located at the junction of the A1303 Madingley Road and St Neots Road. We consider that all three of the routes, and the car parking location options, are likely to cause a level of harm to the significance of heritage assets, and that considerable attention needs to be paid to the mitigation strategies of all options in order to meet the requirements of national planning policy. We also strongly recommend that, prior to the final selection of the route, a detailed heritage impact assessment is carried out that identifies the harm to heritage assets for each potential option, and which can be used to inform the route selection process.

Advice

This consultation focuses on Phase 1 of the bus route, which is the section of the route between the Madingley Mulch roundabout to Cambridge. It is stated that the second phase, between Cambridge and Madingley Mulch, will be consulted upon at a future stage. Our response therefore only considers the routes as presented between the two proposed park and ride sites and their termination in Cambridge.

Route A and B

Route A would operate along the existing line of Madingley Road out towards either of the two proposed park and ride car parking sites, and would require the widening of the existing road along this route to facilitate the construction of a dedicated bus lane along one side. The option would mostly use the existing alignment of the carriageway, with the exception of a short section of road immediately east of the American Military Cemetery, which would be realigned to reduce the angle of the existing bend.

Route B would be very similar to Route A, and would involve the widening of the existing road to accommodate a central 'tidal' bus lane sandwiched between two normal carriageways, with a pedestrian and cycle way along the northern edge of the road. Route B also differs from Route A in that it would not require the realignment the A1303 to the east of the American Military Cemetery, and would make use of the A428 instead of the St Neots Road were the Scotland Farm park and ride site selected.

The American Cemetery and Memorial is a Grade I Registered Park and Garden with a Grade II* memorial chapel. The cemetery is one of twenty four permanent Second World War cemeteries erected on foreign soil by the American Battle Monuments



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Commission and is the only permanent United States of America Second World War military cemetery in the British Isles. It is built on land gifted to the United States by Cambridge University, and is subject to a 1954 international agreement signed by United Kingdom Prime Minister Anthony Eden and United States Ambassador Winthrop W. Aldrich. This agreement includes various clauses that protect some areas of the land around the cemetery, including that along the roadside, from future development. The original buildings of the cemetery, which are constructed of very high quality Portland Stone, were designed by the architects Perry, Shaw, Hepburn and Dean of Boston, Massachusetts, and are set within a ceremonial landscape laid out by Olmsted Brothers, an important firm of twentieth century landscape architects based in Brookline, Massachusetts.

The site of the cemetery is located on the north facing side of the hill on the north side of the A1303. Its location and siting creates a strong emphasis on its relationship with the landscape to the north, reinforced through soft landscaping within the cemetery site and the north-east orientation of its principal features. The graves of the cemetery are laid out in arc facing north-east, with the flagpole on its raised platform forming the focal point of the fan. From within the cemetery the topography allowing expansive views north across the Cambridgeshire countryside towards Ely, with its cathedral visible on the horizon. To the east of the flagpole is a series of reflective rectangular pool gardens, linking the flag to the Memorial Chapel, which is also orientated to the north. However, the principal approach to the main entrance of the cemetery is along the A1303 from the east and west, with its main ceremonial entrance gateway flanked by two small classically proportioned loggias that face each other across an area of hard landscaping that leads through to a circular garden containing a central flagpole.

The present A1303 runs directly along the southern boundary of the cemetery, and is separated from it by a sloping strip of road verge and a thick roadside hedge, inside which is narrow tree belt that contains areas of car parking set within the trees. A tall brick wall encloses the area of the cemetery to the north and separates it from this car parking, although pedestrian access is possible. Despite these barriers, the noise generated by the relatively high levels of traffic travelling along the road is a constant presence within the cemetery, with larger road vehicles remaining visible above the high brick wall. These factors detract from the sense of spiritual calm that one would normally associated with a cemetery, although the effect is lessened further into the cemetery and down the hill.

The cemetery is a designated heritage asset of the highest significance, reflecting not only an important international and historic relationship between the United Kingdom and the United States - demonstrated by the original gift of the land - but also the spiritual significance attached to the resting place of 3,812 United States service



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personnel who lost their lives and who are commemorated by the cemetery. It is the only American Second World War cemetery in the United Kingdom. Underlying these factors, the cemetery is also an important example of the work of an internationally renowned family firm of landscape architects, and an unusual example of their work in the United Kingdom. This importance is reflected by its Grade I status.

Both Route A and Route B would involve the encroachment of the highway further towards the cemetery, the removal of part of the cemetery's site along its boundary with the road, and would also involve the intensification of the road use along the A1303. These effects are considered to be harmful to the significance and special interest of the cemetery, and are explored in more detail for each option below.

Specific Commentary on Route A

This route will impact upon both the physical fabric of the American Military Cemetery and its setting.

We would highlight that there is a discrepancy between the photo-montage image on p14 of the consultation document and the larger format photo-montage. The consultation document shows a pedestrian path immediately abutting the cemetery hedge, while the larger photo-montage document shows a bus lane.

The option presented by Route A would require the removal of a section of the cemetery site along its boundary so that that the highway can be widened in order to accommodate a cycle path or a bus lane. The section of land that would be lost to the highway currently comprises open green space in which the entrance stone to the cemetery sits prominently at a perpendicular angle. The route A option would see this area converted to highway which would immediately abut the hedge row boundary with the cemetery. The entrance stone is shown as repositioned to sit parallel with the cemetery boundary. The rationalisation of the entrance space in the way proposed would alter detrimentally the ceremonial approach to the cemetery and reduces the prominence of the entrance stones. The red asphalt surface treatment of the bus lane and road markings immediately against the cemetery boundary would conflict with the subdued palette of colours evident within the cemetery itself which would be harmful to its contemplative, commemorative nature. There would also be an intensification of the road use with its associated noise and traffic, although we note that this factor is already an element affecting the setting of the cemetery. This would be harmful to the appreciation of the entrance to the cemetery when approaching it along the A1303, and from within the cemetery site.

The proposal, by reason of the proximity of the highway to the cemetery and loss of verge, would result in irreversible, adverse impacts upon the approach, setting and



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layout of the cemetery site. This harm would be compounded by the associated intensification of the road which would further erode the experiential significance of this nationally important contemplative space both in terms of noise, pollution, vibration, and visual intrusion. It is acknowledged that planting would be retained along the boundary of the highway with the cemetery in an effort to differentiate space, but this planting is unlikely to be successful in mitigating the harm which has been identified to the designated heritage asset and it is recommended that mitigation measures are explored further. We consider that the proposal would result in less than substantial harm to the heritage asset, as defined by paragraph 134 of the NPPF.

Specific Commentary on Route B

This route has the potential to have physical and setting impacts on the American Military Cemetery Registered Park and Garden (Grade I Registered). Like Route A, the option presented by Route B in the photo montages would require the removal of a section of the cemetery site along its boundary, and an urbanising of its immediate surroundings to provide a cycle path. There would be the loss of the existing road verge, and the carriageway would encroach into this area to abut the hedge. There would also be an intensification of the road use with its associated noise and traffic, although we note that this factor is already an element affecting the setting of the cemetery. This would be harmful to the appreciation of the entrance to the cemetery when approaching it along the A1303, and from within the cemetery site.

In terms of the carriageway treatment, we consider that the option of Route B would be marginally less harmful to the immediate setting of the cemetery than Route A, at least as illustrated in the large-scale photo-montages. This is owing to the presence of the less intrusive pedestrian and cycle path immediately adjacent to the cemetery gates which would act as a buffer between the cemetery and vehicular movement. The less intensive use profile and more muted surface colour treatment of which would be less harmful to the appreciation of the cemetery's entrance than the red tarmac proposed for the bus lane in Route A, and it would also allow pedestrian or cycle access to the cemetery. Notwithstanding that point, cycle lane markings on the pedestrian footway should be carefully positioned so as to reduce their impact upon the immediate approach to the cemetery,

We are, however, concerned about the position, size, scale, and detailed design of the traffic signal gantries proposed. The gantries are large, spanning across both the pedestrian and vehicular routes and would introduce an unduly urban, over-engineered element into this relatively rural location. The height and position of the gantries along with the illuminated signage would visually intrude upon the cemetery, affecting views both from within and into the Registered Park and Garden to the detriment of its overall character. The consultation documents do not contain a



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justification for these large gantries nor is it clear why a gantry would be required immediately outside the southern boundary of the cemetery.

Overall, we consider that Route B as presently illustrated would cause a moderate level of harm to the appreciation of the heritage asset within its setting and from within the asset itself. This would be caused by encroachment of the carriageway into the existing verge truncating its principal entrance, as well as the placement of the proposed signal gantry. There would be long term and permanent impacts to the setting of the cemetery as a result of the additional carriageway, and the intensification of the road use. As with Route A, we recommend that possible mitigation measures are explored further. We consider that Route B would cause a moderate level of harm to the heritage asset, which would, in planning policy terms, be considered 'less than substantial'. Were Route B presented without the construction of the large signal gantry immediately outside the cemetery boundary, the harm would be less, and would be marginally lower than Route A as presented in the large format photomontages.

Please note, however, our comment regarding the potential discrepancy between the consultation imagery discussed under Route A above. Were Route A also to locate the pedestrian and cycle path against the cemetery, overall Route A would cause a lower level of harm than Route B to the significance of the cemetery.

Route C

Route C comprises three different potential routes. All three share the principle of a new bus and cycle route on an alignment through presently undeveloped land between the village of Coton (designated as a Conservation Area, and containing a number of listed buildings) and the line of the A1303 to the west of the M11; a new crossing over the M11; and routes south of Madingley Road and the University Sports Grounds that would terminate at Grange Road. From Grange Road the bus service would either run north to travel into the city using the existing Madingley Road route to Magdalene Street, or south and east along a new route that would terminate at Silver Street.

We would note that all three potential options for route C run through the Green Belt. The Green Belt around Cambridge helps to meet the requirement of paragraph 80 of the NPPF, 'to preserve the setting and special character of historic towns.' Any local transport infrastructure proposals in the Green Belt need to take into account the importance of preserving the openness of the Green Belt, paragraph 90.

The historic village of Coton is a small, historically primarily agricultural village with its origins in the early medieval period. The core of the village is arranged along the



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Whitwell Way, a linear route running east-west through the village, past the twin focal points of the Church of St Peter and the adjacent moated site which surrounds the present rectory. The presence of this archaeological feature probably indicates the presence of a small and moderately prosperous manorial site in the medieval period. There is a minor road from Grantchester that runs through the village from the south, joining the A1303 north of the settlement. To the west of the historic core of the village is an area of twentieth century housing, built on land south of Whitwell Way. The significance of Coton is principally related to its historic, architectural and archaeological interests as an example of a small rural settlement of moderate prosperity, set in the Cambridgeshire countryside to the west of Cambridge.

To the north west of the village, the landscape rises towards the A1303, and the countryside is presently of a relatively open character allowing long views from public rights of way across the village towards Cambridge and, in the distance, the Suffolk countryside beyond, including glimpses of Coton and the Church of St Peter amongst the trees. Immediately north-east of the village is the Coton Orchard, an area of fruit trees evident on historic maps from the beginning of the twentieth century. Both these areas of landscape, with their different agricultural uses, contribute to the still largely rural character of the setting of Coton and its conservation area. This is particularly appreciated in views north west from the village across the landscape, and is also appreciated when travelling along the northern route into the village past the orchard.

The construction of the new linear route with associated hard infrastructure and signage, and the introduction of regular vehicular movement and noise, through the village's presently rural surroundings, will detract from the appreciation of the village within its setting. It will introduce an element of urbanising development into the landscape to the northwest, north east and on the present northern approach to the village, which is presently a relatively narrow country lane, enclosed by natural hedges. There will also be the loss of a part of the century old Coton Orchard, which contributes considerably to the setting and character of the village, especially on its north side. Either of the routes to the north-west would be partly screened by the existing reservoirs, but harm would nonetheless be caused by the inherent change to the generally rural, open landscape in this location.

We consider that both the pink and blue route would cause harm to the significance of the Coton Conservation Area and the Church of St Peter, owing to development in their settings. The harm would be of a moderate level. In planning policy terms, this would be within the 'less than substantial' range, which would need to be weighed against the public benefits of the proposal. The alignment of the blue route and the southern M11 bridge option may represent marginally less harm, as it would not bisect the Coton Orchard in as harmful a location, allowing it to retain more integrity and link



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with the present garden centre. The blue route also runs further from the American Cemetery, thus minimising the potential for harmful impacts on this heritage asset.

We consider that, the harm associated with either of the options for Route C could be minimised or avoided subject to a robust mitigation strategy to ensure that the route appears as a rural feature in an existing landscape. In the long views north and west from the village, mitigation would need to present the appearance of a mature and substantive agricultural field boundary. For example, planting could be used to screen the busway, this would be most successfully achieved by using an appropriate mix of native species, including appropriate hedgerow trees such as dogrose, hawthorn, hazel, crab apple and dogwood. Environmental and ecological benefits should also be incorporated in any mitigation strategies. Any intersection with Cambridge Road will need to be sensitive and will require careful consideration would also to minimise the visual intrusiveness of the busway on this road.

Route C also has the potential for harm as it runs through the West Cambridge conservation area and near to two Grade II listed buildings on Grange Road. The potential exit points for the busway would need to be carefully designed to avoid or minimise the harm to the character of the conservation area or the settings of these listed buildings in either of the potential locations. At this stage it is difficult to comment as to how harmful such a route could be as the harm could vary greatly depending on the final detail of the proposal.

Waterworks Park and Ride Site

We consider that this site has the potential to cause low level of harm to the significance of Coton Conservation Area and the Madingley Hall Park and Garden owing to development in their setting. The harm to the former relates to the further urbanisation of the existing rural setting the village owing to the presence of the associated buildings, CCTV and signage that may be visible in longer views, and the potential for harm to Madingley Park relates principally to the potential for additional light pollution visible at night, rather than any direct visual impacts.

Mitigation of this site would be key to minimising those harmful effects. For instance, the site would need to present the appearance of woodland/shelterbelt to avoid and minimise the urbanising of the landscape. The present suggested line of trees along its boundary would likely be inadequate to achieve this effect. In order to minimise the impact of street lighting, this would need to be specified to be of a type that directed all light downwards, minimising sky-glow, and other infrastructure should be designed to avoid being visible in longer views.

Scotland Farm Park and Ride Site

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We consider that this site has the potential for a low level of harm to the Madingley Park Registered Park and Garden, and Madingley Hall. The harm would be related to the potential for visually intrusive light pollution caused by the additional lighting that may be required. As above, these effects would need to be minimised through an appropriately robust scheme of soft landscaping and dense tree planting around the perimeter of the site, and the specification of lighting types that would direct light downwards with minimal associated sky glow.

Policy Considerations

Paragraph 128 of the National Planning Policy Framework requires applicants to describe the significance of any heritage assets, including any contribution made by their settings, affected by a proposal. Paragraph 129 contains a requirement for local planning authorities to identify and assess the significance of heritage assets affected by a proposal (including development in their setting), and take that assessment into account when considering the impact of the proposal on the heritage asset, to avoid or minimise conflict between the heritage asset's conservation and any aspect of the proposal. Paragraph 132 of the NPPF sets out that, when considering the impact of a proposed development on the significance of a heritage asset, great weight should be given to the asset's conservation. It goes on to state that the more important a heritage asset, the greater that weight should be. The policy makes clear that, in addition to direct physical impacts, the significance of a heritage asset can be harmed or lost through development within its setting. As heritage assets are an irreplaceable resource (paragraph 126) any harm identified as being caused by the proposed routes will require a clear and convincing justification. Where harm is judged to be less than substantial to the significance of the heritage asset, paragraph 134 requires that this harm should be weighed against the public benefits of the proposal.

Conclusion

To conclude, we consider that all three potential routes and their sub-options are likely to cause harm to heritage significance, either to the American Military Cemetery or to the significance of the village of Coton. Prior to the determination of a final option for this busway therefore, we strongly recommend that detailed heritage impact assessments (HIA) covering all of the route and parking site options should be carried out in order to meet the requirements of paragraphs 128 and 129 of the NPPF. The HIAs should be used to explore the significance of the designated and non-designated heritage assets that would be affected by the proposed routes and park and ride sites, and subsequently determine the harm that would be caused to that significance by the proposals. They should also determine whether and to what extent that harm can be mitigated and, if so, used to explore and inform appropriate mitigation measures.

Next Steps

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Thank you for involving us at the pre-application stage of Phase 1 of the Cambridge to Cambourne bus way. At present, we consider that there remains considerable work to be undertaken to fully assess and describe the impact of the various proposed routes and park and ride sites on the heritage assets identified. Your scheme may benefit from our continued engagement; if so, we would welcome the opportunity to continue our Extended Pre-application discussions to see if our concerns can be addressed. If you would like to discuss this option further, please do contact me.

Yours sincerely



Edward James
Historic Places Advisor, East of England
E-mail: 

**CAMBRIDGE TO CAMBOURNE (BUS ROUTE)
Pre-application Advice**

List of information on which the above advice is based

Better Bus Journeys - Phase 1 Consultation Pack and associated maps/photo montages



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