MOTT MACDONALD

Cambourne to Cambridge Better Public Transport Project

Non-technical Summary

December 2019

Contents

Executive summary

Greater Cambridge is one of the most successful and fastest growing economies in the UK. The pace of economic growth is unlikely to slow which will lead to population growth and, if not supported by improved public transport infrastructure, increased congestion.

As such, Greater Cambridge would be unable to achieve its full potential without investment in infrastructure and housing, which would otherwise act as a bottleneck on growth.

The Cambourne to Cambridge better Public Transport (C2C) project will connect to a wider public transport network to enable people to travel for employment and education, and, by encouraging modal shift to public transport via a congestion free alternative to the car, will facilitate sustainable development at key strategic economic and housing sites.

It will provide a new or significantly improved public transport route between Cambourne and Cambridge including:

- Improvements that avoid traffic congestion.
- A new Park and Ride.
- New high-quality cycling and walking facilities.

The shortlisted Park and Ride locations following an assessment in 2017 were Waterworks and Scotland Farm.

The development of the route alignment has been split into two phases:

- Phase 1 is Madingley Mulch Roundabout to Grange Road.
- Phase 2 is Cambourne to Madingley Mulch. Roundabout.

For Phase 1, a short-list of four options were appraised against each other, using the following methodology:

- Multi Criteria Assessment aligned to scheme objectives;
- Value for Money appraisal using transport modelling outputs and scheme costs;
- Assessment of associated Wider Economic Impacts relating to GVA benefits and land value uplift;
- Reflecting public consultation feedback.

For Phase 2 a short-list of six options were appraised against each other, using the same methodology applied to Phase 1 options.

For each Phase 2 option, the recommended option for the completed Phase 1 option appraisal was included.

This resulted in a single recommended route option (Phase 1 and 2) and a single preferred Park and Ride location being identifed. The preferred option is an off-road route from Cambourne to Grange Road with a Park and Ride at Scotland Farm which is presented in an Outline Business Case (OBC).

The options which were appraised are as follows

Table 1: Phase 1 and Phase 2 Options Description

	Option	Park and Ride location	Development
Phase 1	**Low Cost a (optimised on-road)**	Waterworks	An on-road scheme with a Park and Ride at the Waterworks site, near to Madingley Mulch roundabout. Provides Eastbound public transport lane along the existing A1303 between Madingley Mulch roundabout and High Cross along with short sections of Westbound public transport lanes where possible. Changes at M11 Junction 13 to provide an additional lane of traffic on the A1303 and a new pedestrian/cycle bridge over the M11. Changes to the Northbound M11 off-slip to allow both traffic lanes to turn right towards Cambridge.
	Low Cost b (optimised on-road)	Scotland Farm	As Low Cost a but with a Park and Ride positioned at the Scotland Farm site, just off Scotland Road to the north of the A428.
	Do Something 1a (off-road from Madingley Mulch Roundabout to Grange Road	Waterworks	An off-road scheme between Madingley Mulch roundabout and Grange Road with a Park and Ride at the Waterworks site. From this point this scheme provides a new, fully segregated public transport route to Grange Road where journeys will continue to the city centre and other destinations. Provides a new bridge over the M11 where the public transport route passes through the West Cambridge site and joins to Grange Road using the former Rifle Range Track adjacent to the University of Cambridge Rugby ground.
	Do Something 1b (off-road from Madingley Mulch Roundabout to Grange Road	Scotland Farm	As Do Something 1a but with a Park and Ride positioned at the Scotland Farm site, just off Scotland Road to the north of the A428.
Phase 2	**Option 1a (off-road)**	Waterworks	An off-road scheme with a Park and Ride at the Waterworks site. Provides new fully segregated public transport route from Cambourne to Long road. Proposed new junction with St Neots Road near Bourn roundabout and alterations to the roundabout at A428 Hardwick interchange.
	Option 1b (off-road)	Scotland Farm	As Option 1a but with a Park and Ride positioned at Scotland Farm and alterations to the roundabouts at the A428 Hardwick interchange.
	Option 2a (junction improvements)	Waterworks	An on-road scheme with a Park and Ride at Waterworks site. Provides minor junction alterations at A428 Hardwick interchange and Bourn roundabout. Off-road though Bourn airfield to Cambourne.
	Option 2b (junction Improvements)	Scotland Farm	As Option 2 but with a Park and Ride at Scotland Farm.
	Option 3a (public transport lanes)	Waterworks	An on-road scheme with a Park and Ride at Waterworks site. Provides inbound and outbound public transport priority lanes from Bourn roundabout to Long Road and minor junction alterations at A428 Hardwick interchange and Bourn roundabout. Off-road though Bourn airfield to Cambourne.
	Option 3b (public transport lanes)	Scotland Farm	As option 3 but with Park and Ride at Scotland Farm.

During the optioneering stage, significant public and stakeholder engagement has taken place. This engagement has included:

- Formal Public Consultations in 2015, 2017 and 2019.
- Busway user research
- Stakeholder Workshops
- Local Liaison Forum meetings
- Local Liaison Forum Technical Group Workshops
- Community Drop in Sessions
- Environmental Working Groups

Consultation has led to various changes and alternatives being considered, including the inclusion of the "Tidal" On-Road Public Transport Lane during the 2017 Consultation that was assessed as part of Phase 1 options assessment. Whilst this suggestion was eventually dropped in favour of more preferable options, the opportunity for stakeholders to comment and engage has led to a number of positive interventions. These include:

- **Madingley Road Cycling** – During consultation in 2017, a number of respondents highlighted the desire for improved cycling facilities along Madingley Road, from the West Cambridge Site to Lady Margaret Road. This led to this area of public transport lane being re-assessed and removed from the on-road options and replaced with cycling improvements. Whilst not being taken forward as part of this scheme, GCP is taking these planned to be delivered in advance of completion of the C2C scheme.
- **West Cambridge Site** – During assessment of the Phase 1 off-road routes it was assessed that the most suitable alignment through West Cambridge would be alongside the footway / cycleway that runs along the southern part of the site. Stakeholders at the University highlighted the location of scientific equipment in a nearby building that was sensitive to vibration and electromagnetic interference. As such further assessment was done into the potential impacts and the route was amended to run along side Charles Babbage Road instead. Discussion with West Cambridge and the consultants working on the plans for this area are ongoing with a view to provide the most suitable, fast and reliant route through the site with minimal disruption to the proposals.
- **Coton Village** – the alignment around Coton village has been the subject of much discussion throughout the life of the project. Recent discussions have resolved to move the route away from the existing properties on Cambridge Road, such that no property will be any closer to the proposed route than it currently is from the existing highway. The alignment will also be refined following the OBC to better reflect the wishes of local landowners in terms of severance to their land, as well as discussions with stakeholders such as the National Trust as part of the Environmental Working Group meetings.
- **Dry Draton** – Responses from locals in the Dry Drayton area highlighted a desire for improved pedestrian and cycle access to the Scotland Farm Park and Ride site. This has been noted and will be investigated following approval of the OBC. The residents have also expressed a concern regarding rat-running traffic travelling through the village to gain access to the Scotland Farm Park and Ride site. These concerns will also be investigated and traffic calming measures will be proposed if it is felt to be suitable.
- **Cambourne Travel Hub** - Residents in Cambourne as well as the Town Council have highlighted the possible creation of a Travel Hub in Cambourne. This has been discussed with the Town Council and is subject to ongoing discussion and development following approval of the OBC. This development will include identifying a suitable area to locate a hub and what features it could include. These might be items such as drop off areas, taxi bays, cycle parking and information facilities.
- **Adams Road / Rifle Range** – During Phase 1 options assessment, the Rifle Range track was assessed as being the most suitable route for the off-road options to link from West Cambridge to Grange Road. Engagement has highlighted the concern regarding impact on the West Fields throughout the scheme development, as well as highlighting land access issues from existing landowners. As such the route was reassessed and the suggested route was amended to follow Adams Road in order to minimise the impact on the Green Belt and remove these access issues. It was also felt this provided better future-proofing for the potential Cambridgeshire Autonomous Metro alignment which could leave the section through the West Fields as redundant.
- **Waterworks Park and Ride** – During consultation the location of the Waterworks Park and Ride site has been the subject of intense discussion. Many concerns were raised about its position on the sloping hillside and therefore regarding its visibility from other areas. The original design of the Waterworks site was reconfigured to utilise space between the A428 and St Neots Road for part of the Park and Ride site, shifting the footprint further north, up the slope to minimise the visual impact.

- **St. Neots Road** – Concerns have been raised regarding positioning an off-road route between the A428 and St Neots Road, particularly in areas adjacent to existing properties as it would require the removal of existing vegetation that is acting as a visual screen to the A428. Designs have been revised to shift the proposed route to allow a planting buffer to be reinstated following construction, and commitments given to investigate the requirement for new or improved noise barriers in these areas.

Engagement will continue as the scheme progresses through design development and the Environmental Impact Assessment to finalise the route alignment and identify potential mitigation that is required throughout the scheme.

It is currently anticipated that between 20 and 25% of the scheme costs will be contributed by developers. Furthermore, there is an expectation that developers of Cambourne West and Bourn Airfield will implement the sections of the scheme through those sites which could potentially further reduce the need for City Deal Phase 2 funding.

It is recommended that the GCP Executive Board should, for Phase 1, proceed to develop an off-road route from Madingley Mulch roundabout to Grange Road and for Phase 2, proceed to develop an off-road route from Cambourne to Madingley Mulch. The recommended preferred Park and Ride location is Scotland Farm.

C2C Key Benefits

Journey Times

(AM Peak inbound 08:00-09:00)

- C2C Preferred Option - 31 minutes
- Do Minimum - 50 min.

Demand

(AM peak average hourly bus passengers two-way – East of Madingley Mulch)

- C2C Preferred Option - 863 passengers
- Do Minimum - 370 passengers

Wider Economic Benefits

- £458m in Land Value Uplift
- £102.8m additional GVA per annum
- £676.1m in additional GVA over 30 years

Capacity

(AM Peak 08:00-09:00, two way)

- C2C Preferred Option - 1,520 capacity
- Do Minimum - 570 capacity

Service Frequency

- C2C Preferred Option - 6 buses per hour - direct express service, plus 2 buses per hour local service
- Do Minimum - 3 bus per hour - non-express service

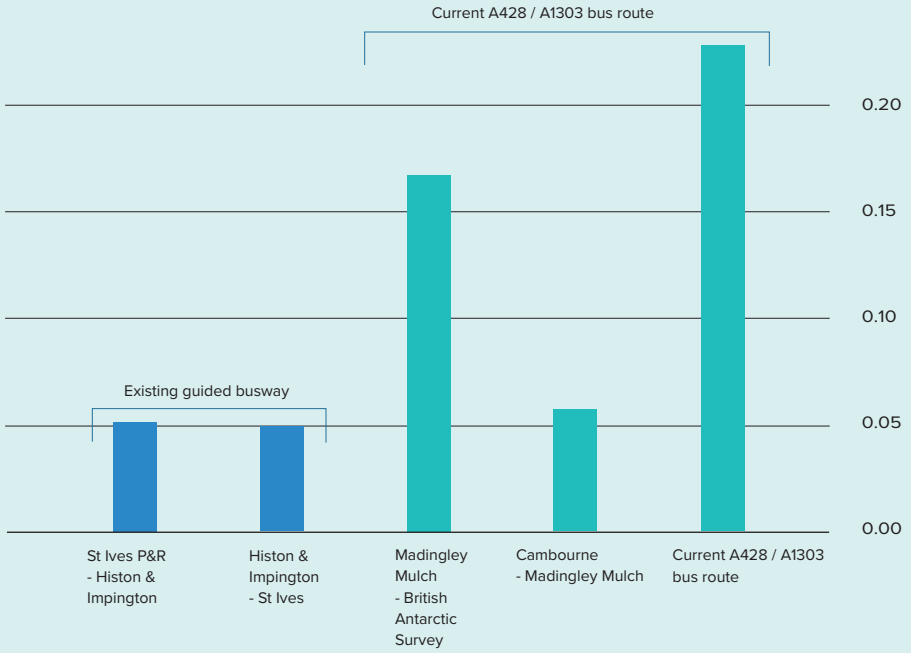
Value for money

- Total Local BCR of 3.48 (additional GVA over 30 years against scheme costs)

Reliability

Reliability Ratios which are based on a statistical analysis of historic journey time data show that the existing Cambridge Busway performs better than non-busway routes, meaning that the segreated infrastructure is delivering journey times that are more consistent.

Two sections of the A428/A1303, from Madingley Mulch to Drummer Street, are among the worst performing sections comparing fully segretead busways, to where there are bus lanes or buses running on highway.



1. Introduction

The Cambourne to Cambridge Better Public Transport Project aims to deliver high quality public transport (HQPT) through the provision of quick, frequent and reliable public transport services.

Purpose of the report

This report summarises development of the OBC for A428 Cambourne to Cambridge (C2C) Better Public Transport project.

It provides a summary of the option assessment work undertaken as part of the development of the OBC, since the presentation of the Strategic Outline Business Case (SOBC) in October 2016 and the End of Stage report in 2017. It presents a single scheme between Cambourne and Cambridge and single Park and Ride location for agreement to proceed to Transport and Works Act Order submission.

Background

The pace of economic growth is unlikely to slow which will lead to population growth and, if not supported by improved public transport infrastructure, increased congestion. As such, Greater Cambridge would be unable to achieve its full potential without investment in infrastructure and housing, which would otherwise act as a bottleneck on growth.

The recent report prepared by the Cambridge and Peterborough Independent Economic Review (CPIER) in September 2018 concluded the following:

"We also find evidence that, right across these economies, growth is higher than official figures suggest. Examination of employment growth in individual companies suggests firms are increasing employment at a rate greater than that captured by ONS (Office of National Statistics) data; similarly, turnover growth is strong.

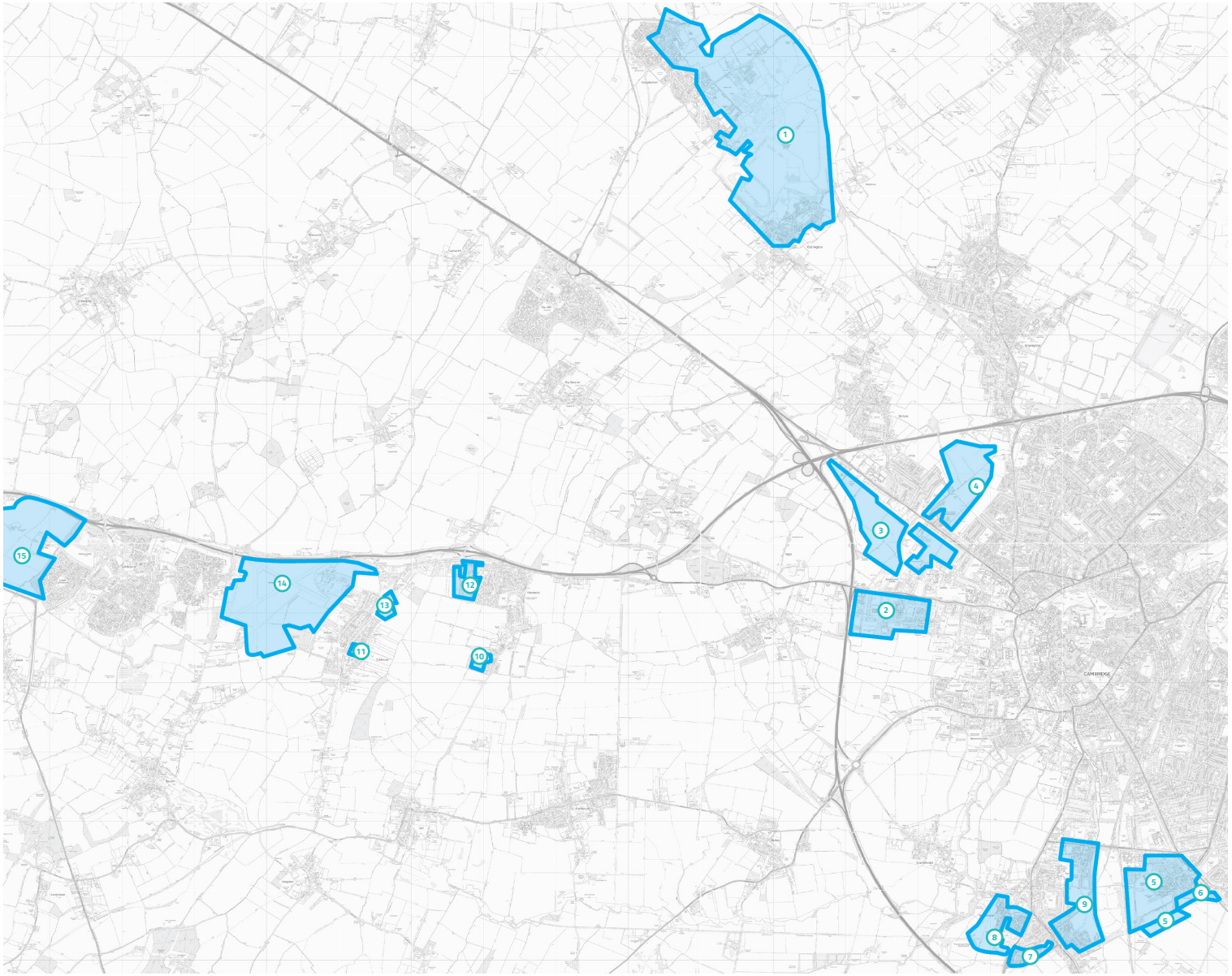
There are strategic risks to the area if it cannot get the major infrastructure improvements it needs, and previous delays in bringing forward and delivering schemes must not continue."

Investments in transport infrastructure are critical to ensuring that already high congestion levels and poor reliability issues are addressed, enabling the next wave of innovation led growth. The C2C project contributes towards addressing a transport constraint on growth by linking key employment and housing sites together, and with the city centre. Particularly with regards to the following developments:

- Cambourne West.
- Bourn Airfield.
- Eddington.
- West Cambridge.
- City centre growth and wider growth as shown in figure 1.

Figure 1: Future development sites

Site numbers	Site name	Dwellings/jobs
1	Northstowe	10,000 dwellings
2	West Cambridge	10,000 jobs
3	North West Cambridge	3,000 dwellings 4,000 jobs
4	Darwin Green	2,780 dwellings
5	Cambridge Biomedical Campus (CBC) and Extension to CBC (Local Plan Proposal)[1]	14,000+ jobs
6	Bell School	347 dwellings
7	Glebe Farm	316 dwellings
8	Trumpington Meadows	1,200 dwellings
9	Clay Farm	2,300 dwellings
10	Hardwick - West of Grace Crescent	98 dwellings
11	Highfield Caldecote - Highfields Road	71 dwellings
12	Hardwick - St Neots Road	155 dwellings
13	Highfields Caldecote - Land East of Highfields Road	140 dwellings
14	Bourn Airfield (Local Plan Proposal)	3,500 dwellings
15	Cambourne West - (Resolution to grant planning Permission	2,350 dwellings



1. The SCDC and CaCC Local Plans were adopted on 27 September 2018 and 18 October .

Context

The C2C project will connect to a wider public transport network to enable people to travel for employment and education, and by encouraging modal shift to public transport via a congestion free alternative to the car, will facilitate sustainable development at key strategic economic and housing sites.

The C2C project is being promoted by the Greater Cambridge Partnership (GCP), which is the local delivery body for a City Deal with central Government, bringing powers and investment to Cambridge and Greater Cambridgeshire, worth up to £1 billion over 15 years.

Through investment in transport and infrastructure, the GCP will bring forward schemes to connect people to places of employment and allow communities to grow sustainably in the coming years, by creating better and greener transport networks, reducing congestion and making better use of limited road space by prioritising sustainable transport.

As such, to meet this growing demand, the role of the C2C project as defined in the business case is as follows:

"To connect existing and new communities along the A428/A1303 to places of employment, study and key services to enable the sustainable growth for Greater Cambridge. We will deliver this through improved, faster and more reliable High Quality Public Transport (HQPT) services, together with high quality cycling and walking facilities serving a new Park and Ride site to the west of Cambridge."

The recently published Cambridgeshire and Peterborough Independent Economic Review found evidence that, across the regional economy, growth is higher than official figures suggest. Examination of employment growth in individual companies suggests firms are increasing employment at a rate greater than that captured by ONS data; similarly, turnover growth is strong. There are, however:

"major doubts as to how well the area is set up to cope with future growth, particularly where the strain is already evident."

National infrastructure commission (NIC)
The 2017 NIC report on the Cambridge – Milton Keynes – Oxford Growth Corridor has concluded that improvements in east-west transport connectivity along the corridor are necessary to underpin the area's long term economic success, and alleviate the areas:

"chronic under-supply of homes which could jeopardise growth, limit access to labour and put prosperity at risk".

It estimates that infrastructure investment could support the delivery of up to one million new homes in a broad corridor between Oxford and Cambridge. This level of development will inevitably place additional pressure on the A428/A1303 and surrounding routes. Calling for city-scale transport infrastructure to enable growth, the NIC focuses on:

"maximising the opportunities associated with the development of East West Rail and the Oxford-Cambridge Expressway – integrating mass rapid transit with these schemes to enable effective first/last mile connectivity, in a way that enhances the value of these strategic infrastructure projects"

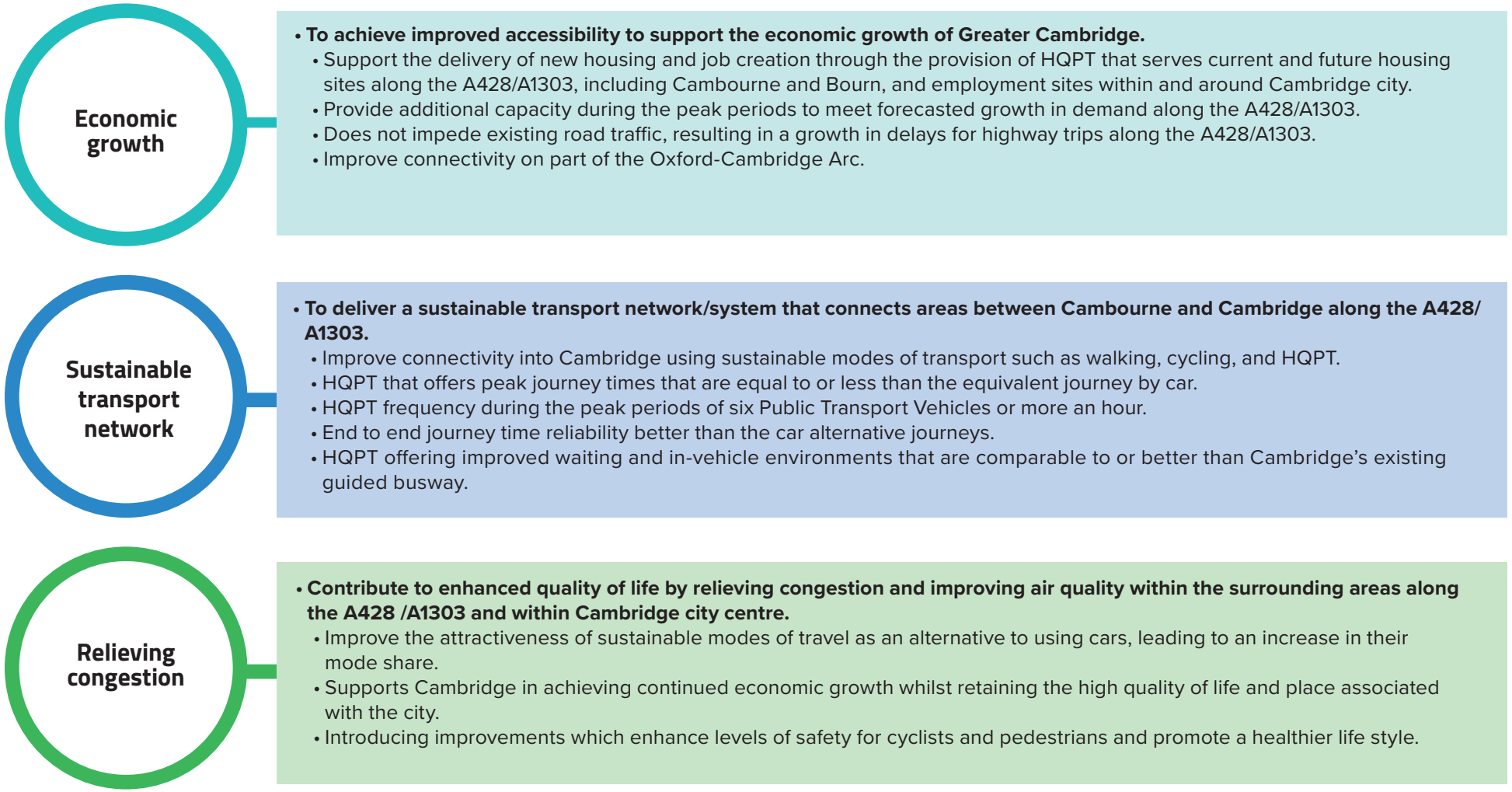
The NIC has identified the Cambridge – Milton Keynes – Oxford arc as a national priority stating that its world-class research, innovation and technology can help the UK prosper in a changing global economy. Submissions made as part of the NIC's call for evidence on the corridor emphasised that congestion is becoming a threat to economic investment and quality of life as well as increasing levels of air pollution. Growing congestion in these towns and cities will limit people's ability to access employment in the arc's key towns and cities. The development of public transport and active travel options could make more efficient and effective use of road space in the arc's key cities, reducing the amount of road space required per person and enabling a greater volume of journeys using the existing transport networks. The NIC states that:

"It is greatly encouraging, therefore, that the local authorities in each of the arc's key towns and cities are working to bring forward ambitious, evidence-based proposals for improving the effectiveness of city-scale transport based on the concept of mass rapid transit (MRT)".

Project Objectives
The C2C project will provide improved public transport links - connecting people to places of employment, study and key services - and help existing and new communities along the A428/A1303 grow sustainably in the coming years.

By providing new travel choices, and alternatives to the car, the C2C project is intended to manage growing congestion on the A428/A1303, ensuring people have good access to employment opportunities thereby helping to secure Cambridge's continued economic success. Objectives of the C2C project are shown in Figure 2.

Figure 2: Project objectives



Cambourne to Cambridge Project

The study area for the C2C project is located on the A428/A1303 route, between Cambridge city and Cambourne which provides a connection to St Neots. The scheme will service communities within the study area including the following:

- Cambourne
- Bourn Airfield (future development site)
- Highfields Caldecote
- Madingley
- Hardwick
- Coton.

The project is made up of three core elements:

- A **new or existing public transport route**, with public transport priority measures between Cambourne and Cambridge, that avoids general traffic congestion.
- A **new Park and Ride** site.
- **New high-quality cycling and walking facilities**.

Various options have progressed through a series of assessments and refinement, including three public consultations. The short-listed options were presented in a SOBC in September 2016, with work being progressed towards the selection of a recommended scheme and the development of an OBC.

This document provides a summary of the development of the OBC.

The OBC uses the five key cases required by Government for major investments:

- The **Strategic Case** sets out the case for change.
- The **Economic Case** demonstrates the value for money of the scheme including the impact on the economy.
- The **Commercial Case** considers how the scheme would be commercially viable, procured and attractive to the market.
- The **Financial Case** outlines how the costs and the scheme are to be funded/financed, including future maintenance and operational costs.
- The **Management Case** sets out how the scheme would be managed to minimise risk and maximise outcomes.

Would routes be designed to minimise the environmental impact?

Yes – Environmental impacts have been considered throughout the optioneering stages and whichever option is selected would be subject to further rigorous environmental assessment. This would aim to:

1. Avoid any adverse effects where possible.
2. Minimise adverse effects which cannot be avoided through intelligent design and suitable mitigation measures..
3. Only if the previous are not achieved then seek to compensate for any adverse effects which cannot be adequately mitigated on-route.

The results of this assessment would be reported in an environmental impact assessment (EIA) as a part of a TWAO submission.

Would the introduction of a new public transport route create ecological benefits?

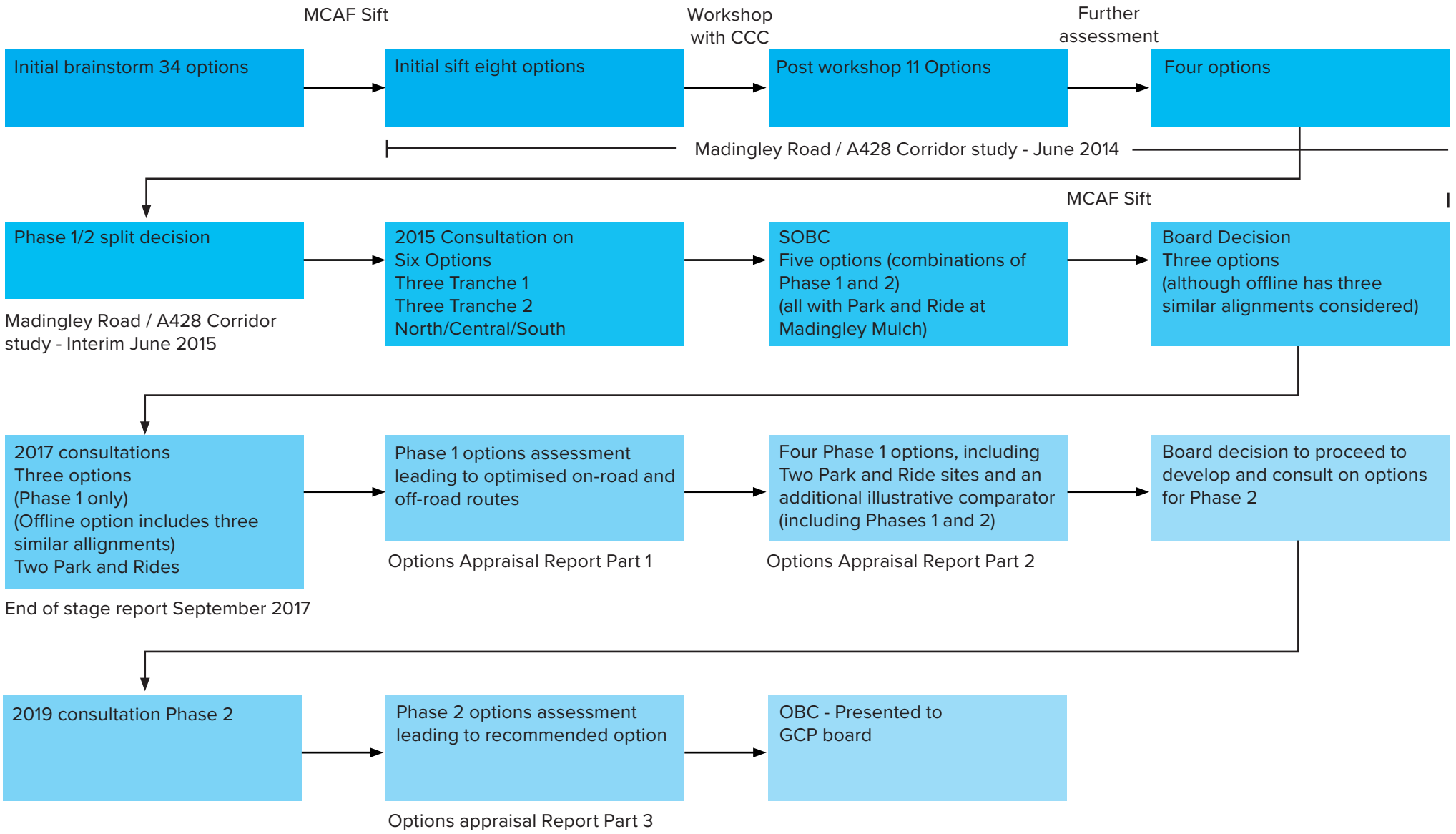
The off-road route option would apply a 'green lane' design treatment along its length to enhance biodiversity through the creation of habitats. This could be through the planting of new trees and hedges along the route. Landscaping at the Park and Ride site will be put in place in order to reduce any potential visual impacts.

Work on developing plans for the C2C project began in 2014, with the project being prioritised for funding from the City Deal by the GCP in 2015. Since then, the project has undergone significant development to generate options that address challenges to sustainable economic growth whilst harnessing the opportunities to connect local communities to employment opportunities in Greater Cambridge and the region.

Options have been identified and evaluated including those that use the existing highway, a new alignment or hybrids which use both existing and new alignments.

The project has been informed by a number of public consultations and engagement with stakeholders. Designs have been created or amended in response to this engagement and feedback received.

Figure 3: C2C project development process



2. The Project

The need for the project

Based on current evidence and policy, the key underlying drivers for the need for change along the A428/A1303 route and for investment in the C2C scheme are:

- The A428 is a nationally important route and forms part of the nationally strategically important Oxford-Cambridge Arc which was highlighted in the 2017 and 2019 Budgets and subsequent studies as a priority for growth.
- Large population growth is likely to require the delivery of significant additional housing, much of which is planned to be located to the West of Cambridge along the A428/A1303 route.
- Employment is growing rapidly within Cambridge, notably in destinations on the edge of the city such as West Cambridge and the Biomedical Campus to the South with a need to provide effective transport connections from existing and future settlements.
- The demand generated by the growth in housing and employment will generate ever greater levels of demand for travel in and around Cambridge thereby exacerbating current congestion issues.
- Car ownership in Cambridge is high, with 85% of households having access to a car compared to the national average of 74%.
- The current rail network does not serve movements along the A428/A1303 route.
- The existing A428/A1303 is inadequate for walking and cycling as a mode of transport into Cambridge.
- Congestion on the route means that current bus services are unable to offer an attractive alternative to private car.
- Without intervention, those living and working in the new developments could become locked into a cycle of car dependency and low use of other modes exacerbating capacity issues along the route.

Spending - Can't the money for an off-road route be allocated to other transport solutions?

The Greater Cambridge Partnership (GCP) Executive Board, at its meeting on January 2015, prioritised the Cambourne to Cambridge project as the highest priority according to economic impact and need for delivery.

This is an overall package of improvements incorporating other public transport schemes including cycling, and the city centre access project.

Current transport network review

Analysis of the A428/A1303 has identified congestion pinch points along the route particularly east of Madingley Mulch roundabout along the A1303.

Main issues that have been identified through the current network analysis are:

Severe congestion along the A428 transport route.

Lack of connections to transport interchanges, limiting options to travel sustainably.

Poor public transport provision along the route buses offer no competitive advantage over private cars in terms of journey times.

Current Park and Ride site is reaching capacity and congestion on the highway network results in passengers experiencing difficulties accessing the site.

There have been high number of serious and slight accidents along the A428/A1303 between 2012-2017.

Car dependency along the route and demand for car travel is causing congestion and delay, this could restrict growth aspriations.

Growth in traffic causes an increase in noise.

The historic environment has been degraded by the increased traffic volumes.

Cambridge city centre has poor air quality which will only be exacerbated by reducing future travel demand.

Current exhaust emissions could impact the important flora in Madingley Wood – a site of special scientific interest (SSSI).

Current problems continued:

Large population growth is likely to require the delivery of significant additional housing, much of which is planned to be located to the West of Cambridge along the A428/A1303 route.

The A428 is a nationally important route and forms part of the nationally strategically important Oxford-Cambridge Arc which was highlighted in the 2017 Budget as a priority for growth.

Employment is growing rapidly within Cambridge, notably in destinations on the edge of the city such as West Cambridge and the Biomedical Campus to the South with a need to provide effective transport connections from existing and future settlements.

The demand generated by growth in housing and employment will generate ever greater levels of demand for travel in and around Cambridge, exacerbating current congestion issues.

The existing A428/A1303 is inadequate for walking and cycling as a mode of transport into Cambridge.

Congestion on the route means that current bus services are unable to offer an attractive alternative to private car.

Without intervention, those living and working in the new developments will become locked into a cycle of car dependency and exacerbating capacity issues along the corridor.

Car ownership in Cambridge is high, with 85% of households having access to a car compared to the national average of 74%.

The rail network does not serve the movements along the A428/1303 corridor.

Existing buses do not provide reliable journey times.

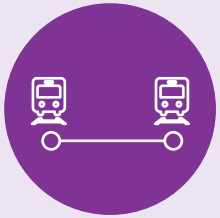
The C2C project therefore offers:

The opportunity to build on the success of the existing Park and Ride site, by creating more capacity and public transport priority infrastructure that will benefit new and existing bus services.

The ability to achieve growth through the use of sustainable modes of transport on this corridor, a frequent, quick and reliable HQPT service with supporting measures is required.

The creation of safe cycling and walking routes.

A reduction in accidents achieved through managing congestion.



Improved connectivity to Cambridge city centre and the rail links there, and encouragement of further growth and development to the western areas of Cambridge.

Journey times (including the walking element at either end of the trip and waiting time) comparable with those of the private car

Addresses some of the environmental challenges through a reduction in congestion.

Improved connection on a section of the Oxford - Cambridge Arc.

Alignment with planning and policies

A review has been conducted to ensure that the options assessed align with published policy. The review takes into account national, regional and local policies, including:

- City Deal Objectives.
- Transport Strategy for Cambridge and South Cambridgeshire – 2014
- Cambridgeshire Long Term Transport Strategy – 2015
- The Third Cambridgeshire Local Transport Plan – 2011-2026
- South Cambridgeshire Local Plan – 2018
- Cambridge Local Plan – 2018
- Mayor's Interim Transport Strategy Statement – 2018
- Cambridgeshire Transport Delivery Plan (TDP) 2019

What is the effect of the scheme on the greenbelt?

The off-road route lies mainly in Green Belt land.

An assessment of the key planning policy considerations relating to the off-road option concluded that the project's social and economic benefits and the transport objectives were strongly supported by both local and national planning policy. However, this needs to be weighed against the impact in environmental terms, particularly accounting for the location of large parts of the proposed route being situated within the Cambridge Green Belt.

The impacts on the Green Belt will continue to be assessed as the project proceeds.

Stakeholder engagement

Stakeholder and public involvement is important in the process for option appraisal and assessment. Extensive community and stakeholder engagement has taken place using a range of methodologies. Although the optioneering process is not based solely on popularity, gathering and then reflecting public and stakeholder support and views are a key factor in option selection. As such the robust public consultation has informed and shaped the scheme and optioneering process which has led to the strategic option.

Public and stakeholder involvement has taken place at every major stage in the optioneering process. It has allowed transparency between the emerging major transport scheme and the public, providing key stakeholders and communities the opportunity to raise any concerns and compile direct feedback on the proposals.

Furthermore, research with communities located in proximity to the project has provided an understanding of transport users' needs and the impact that a high quality public transport scheme could have on their travel behaviour.

Table 2 summarises when public consultation has taken place along with the outcomes and impact on scheme development. Stakeholder engagement has been ongoing including discussions with land owners, developers and statutory and non-statutory bodies e.g. Highways England.

Table 2: Consultation to date

Consultation activity	Outcome/impact on scheme development

2015 public consultation	• The majority of respondents agreed that better bus services are needed, most preferred elements of a potential scheme included:
	  • An on-road bus lane in bound from Madingley Mulch roundabout into the city centre.
	  • A bus priority route from Madingley Mulch roundabout to Bourn Airfield along the old A428.
	  • A bus only route between Cambourne and Bourn Airfield.
	• Alternative options and modifications were taken for further assessment.

2016 Local Liaison Forum (LLF) established	• Continuous engagement with LLF throughout scheme history. • New route option suggested and taken forward for further appraisal work. • Meetings with LLF held in February 2017, September 2017, November 2018, June 2019 and November 2019.
December 2016 stakeholder workshop consultations	• Local stakeholder workshop – 8 December 2016. • Cambourne Workshop – 14 March 2017. • Local planning authority workshops – January 2017 – May 2017. • The start of a formal dialogue between GCP, statutory consultees and local stakeholders.
July – August 2017 busway user research	• Speed, reliability of journey and frequency of service are key service elements which motivate people to use the service, this has assisted in informing the specification of the proposed scheme. • When informed of the potential new bus service between Cambourne and Cambridge, around a third of respondents indicated a fair to strong likelihood of using it.
August 2017 stakeholder workshop consultations	• Utilising feedback from the workshop, the Park and Ride locations were narrowed down. This led to further evaluation and two sites: Waterworks and Scotland Farm. These were presented for public consideration in the 2017-18 consultation.
December 2017 - January 2018 public consultation and focus groups (Phase 1 options)	• 40% of respondents preferred Option B, an on-road tidal public transport lane. • 33% of respondents preferred Option C, an off-road public transport route. • 18% of respondents preferred Option A, an on-road tidal eastbound Public Transport lane. • Bi-directional bus lanes and an optimised on-road option to include both inbound and out bound bus priority were taken forward for further consideration. • The bus lane was removed from the on-road option and cycle provisions were included and formed part of the do minimum option.
March 2018 stakeholder workshops	• No preference was shown for a preferred on-road or off-road solution from the options presented. • There was a preference for a separate cycle and pedestrian walkway on the on-road option so the pedestrian bridge was taken forward in the 'Low Cost' options. • The consultees suggested that the proposed bus lane from High Cross junction be removed from the on-road option. As such this has been proposed to be included in a 'Low Cost' option.

Consultation activity	Outcome/impact on scheme development
February 2019 - March 2019 public consultation (Phase 2 options)	• 48% of respondents preferred Option 1, an off-road segregated route. • 20% of respondents preferred Option 3, an on-road route with public transport priority lanes. • 19% of respondents preferred Option 2, an on-road route with junction improvement. • 63% of respondents preferred a Park and Ride at the Scotland Farm Site. • 17% of respondents preferred a Park and Ride at Waterworks. • Concerns about rat running through Dry Drayton if Park and Ride was located at Scotland Farm. • Future-proofing for CAM was also important.
2019 Workshops with local liaison forum "technical group"	• Eight workshops covering subjects including modelling, wider economic impacts and environmental scoring and mitigation and development. • Publication of technical notes "explore 'quick-win' options along Madingley Hill". Viable projects avoid land take and significant environmental impact and minimise input from, or impact on, third parties, restricting options to a short section of public transport lane, extension of cycling improvements and review of signal timings. • Publication of technical note providing further clarification on why a northern alignment via Girton was previously discounted. Papers available on the LLF Cambourne to Cambridge section on the GCP website.
June 2019 established non motorised access and landscape and ecology working groups	• Working Groups used to inform the scheme design with stakeholders including the National Trust and CPPF.
July 2019 community drop-in sessions	• An opportunity for the public to see proposed features to protect and potentially enhance biodiversity, ask questions of the project team and share views. • St Neots Rd residents sharing feedback on points including line of sight for driveways and potential to move the route closer to noise barrier at the narrowest point.
August 2019 ongoing	• Continuing stakeholder engagement at public meetings including regular presentations to council committee groups and Parish Council meetings from the project's inception and ongoing correspondence and meetings with landowners and business owners.
2019 continuing stakeholder engagement	• Two local events and meetings with North Newnham Residents' Association and CamCycle in relation to Adams Road route option.

3. Option development

Option development and appraisal since October 2016 has been undertaken in three stages:

Stage 1 – Stage 1 assessed the options that were presented as part of the 2017 public consultation, taking into account responses from the consultation and stakeholder engagement to arrive at the highest scored on-road route and the highest scored off-road routes.

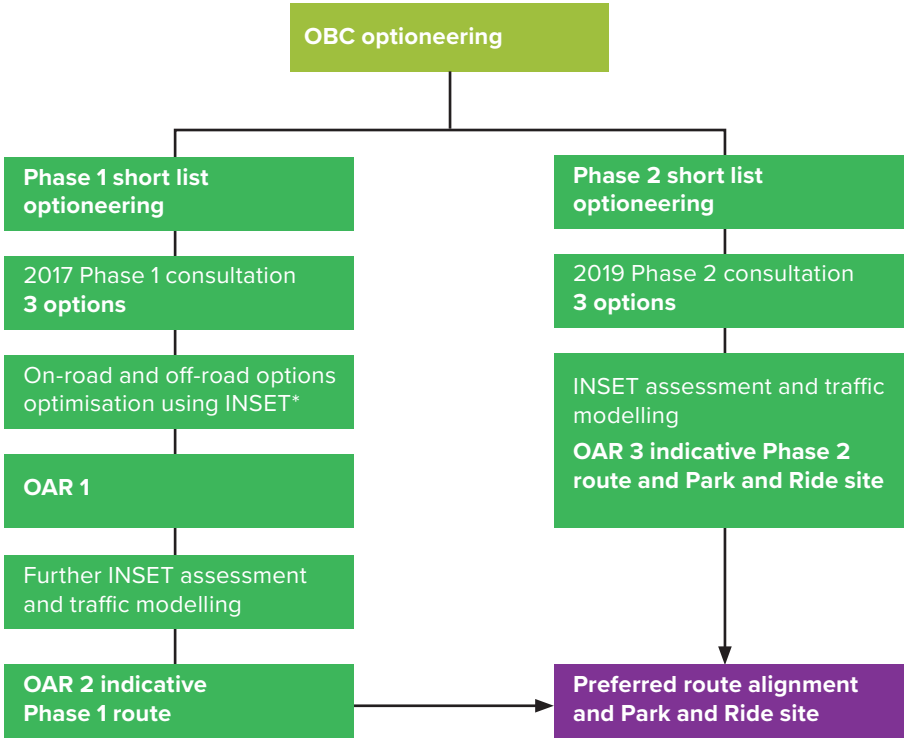
Summarised in Options Assessment Report Part 1 (OAR1)

Stage 2 – The shortlisted on-road and off-road options were appraised against each other to arrive at a recommended Phase 1 option. An illustrative comparator, which included both off-road Phase 1 and 2 options was also assessed and showed that there was benefit to implementing the full scheme from Cambourne.

Summarised in Options Assessment Report Part 2 (OAR2)

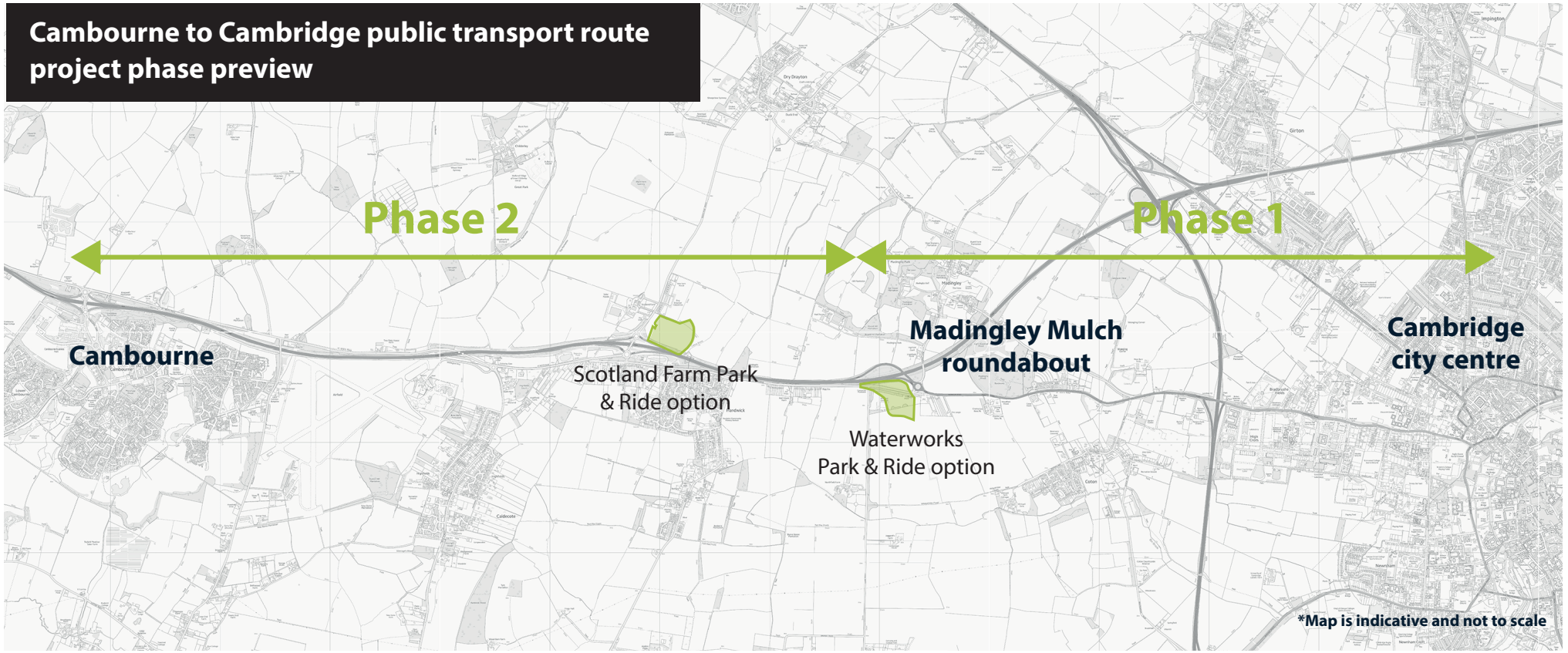
Stage 3 – The Phase 2 options and Park and Ride Locations were appraised against each other to arrive at a single route alignment (Phase 1 and 2) and a preferred Park and Ride location recommended.

Summarised in Options Assessment Report Part 3 (OAR3)



* INSET is a multi-criteria tool used to assess and score scheme options against a range of criteria to identify the best performing option.

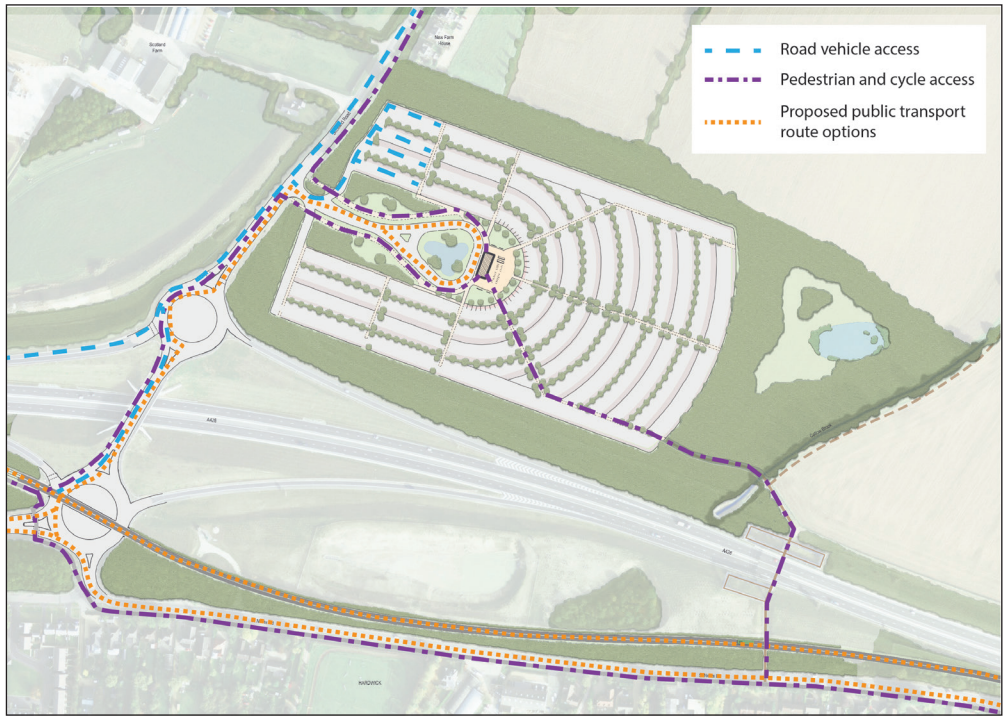
Phase 1 and 2 split



Source: Consultation leaflet, 2017-2018, (© Crown Copyright. All Rights Reserved. OS License Number 100023205.2018)

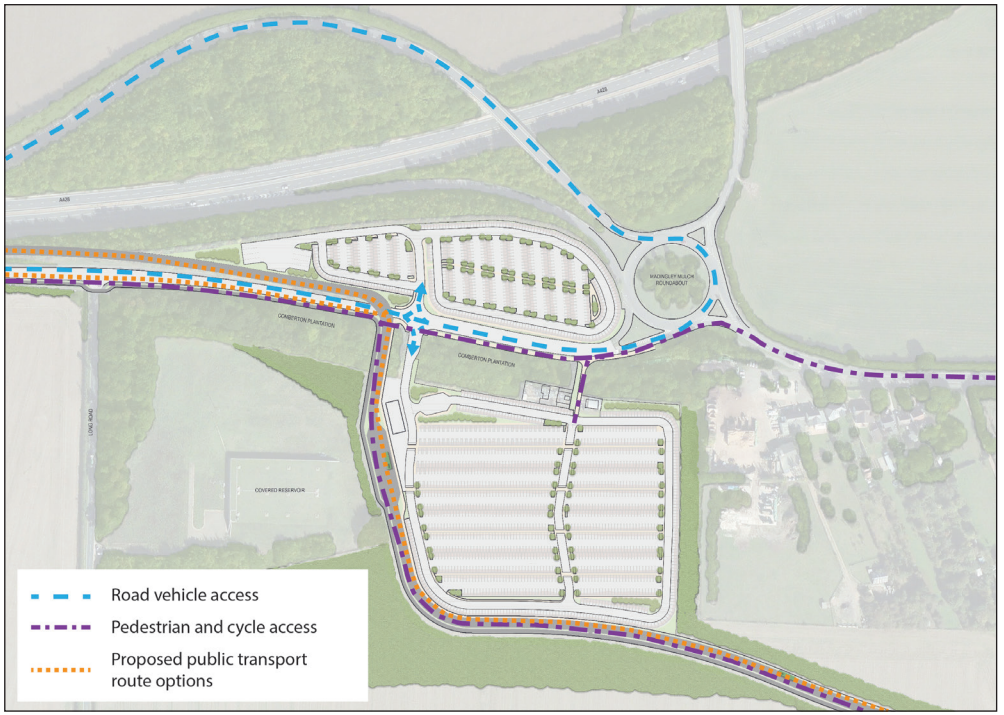
Park and Ride locations

Scotland Farm Park and Ride



A key element of the C2C project is the inclusion of a new Park and Ride site. The initial long list of options for the location of the new Park and Ride site were developed and assessed using a multi-criteria assessment tool based on the key drivers of the scheme. These were considered as part of an independent assessment conducted by Mott MacDonald in conjunction with the main route options development.

Waterworks Park and Ride



More detail can be found in the Mott MacDonald Report: Cambourne to Cambridge Better Public Transport Park and Ride Study published on the project website.

The study resulted in two options being taken forward for further assessment: Waterworks and Scotland Farm.

Stage 1 (OAR Part 1)

Stage 1 – assessed the options that were presented as part of the 2017 public consultation, taking into account responses from the consultation and stakeholder engagement to arrive at the highest scored on-road route and the highest scored off-road routes.

Photo montage and cross section illustrating how Route A could look:

Photo montage and cross section illustrating how Route B could look:

Photo montage and cross section illustrating how Route C could look:

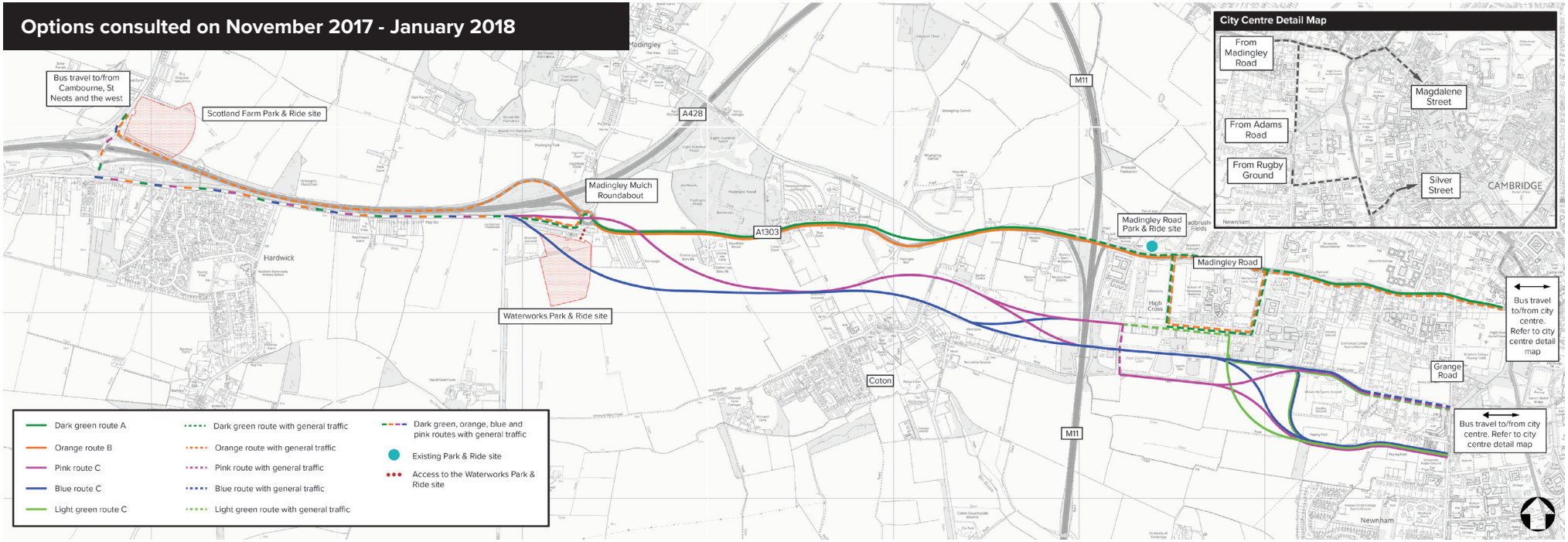
Option visualisations produced as part of the 2017 consultation documentation illustrate how each option could look when implemented.

Stage 1 – Definition of preferred on-road and off-road option

Stage 1 definition of the three options consulted in 2017 were as follows:

- **Option A:** An on-road option which includes the introduction of an inbound bus lane on Madingley Road between Madingley Mulch roundabout and Lady Margaret Road.
- **Option B:** An on-road tidal bus lane on Madingley Road running between Madingley Mulch roundabout and the new entrance to Eddington (High Cross).
- **Option C:** An off-road public transport route running between Madingley Mulch roundabout and Grange Road, Cambridge.

Figure 4: November 2017 - January 2018 consultation options



Source: Consultation leaflet, 2017-2018, (© Crown Copyright. All Rights Reserved. OS License Number 100023205.2018)

Further option assessment summary

The three options presented as part of the public consultation were then assessed to arrive at a specific route alignment for both an on-road and off-road option.

Table 3: Development of options Stage 1

Option	Development
Option A	• Option A and Option B were assessed against each other using Mott MacDonald's in-house investment sifting and evaluation tool (INSET) to arrive at a preferred on-road option. • The findings of the INSET assessment have concluded that the on-road option is Option A. • However, a potential "optimisation" of the route has been explored to reflect the aspiration in Option B for some improvements to outbound traffic, and a need to further consider the operation of Junction 13 of the M11.
Option B	• Option A and Option B were assessed against each other using INSET to arrive at the highest scoring on-road option. • Option B did not score as high as option A. The need for gantries was a significant reason for the differences in scores. Although, this was not in the original proposal by the LLF gantries were included for safety and operational purposes.
Option C	• Option C was split into the pink, blue and (through West Cambridge) development light green routes. These represented different alignment routes for Option C. • The route was broken down into five areas and assessed using INSET to arrive at a recommended specific route alignment. • The recommended off-road specific route alignment is substantially the "Blue" route through Madingley Mulch, and adjacent to Coton Village and the light green route through West Cambridge, and the former Rifle Range track past the Rugby Ground to Grange Road.

Why are gantries needed on Option B?

Gantries are required to operate the tidal public transport lane by indicating the direction of traffic flow and ensure the safety of vehicles using the route. In practice it would not be acceptable for a relatively lightly used public transport lane to be unsigned as to the direction of traffic. Any other central 'tidal' lane in the UK has involved integrated gantries.

"Optimised" on-road option

This optimisation of Route A reflected the aspiration in Option B for some improvements to outbound traffic, and a need to further consider the operation of Junction 13 of the M11.

The optimisation was modelled to assess the impact of the following changes highlighted in figure 5:

1. Carriageway widening for 200m of west bound bus lane on the approach to Madingley Mulch Roundabout.
2. Signalisation of Cambridge Road Junction.
3. Change to M11 junction 13 to allow two right turn lanes from off-slip.
4. Park and Ride access relocated to Eddington Avenue, additional eastbound and westbound bus lane and bus gate at approach to High Cross junction.
5. Removal of public transport lane from West Cambridge development to Storeys Way.
6. Signalisation of Grange Road Junction .

Apart from Cambridge Road and Grange Road junction signalling, which showed no benefit when modelled, all the other optimisations were included in the final on-road option Low cost a and b.

As a result of the optimisation process and stakeholder engagement, past the junction with High Cross/ Eddington Avenue the proposed public transport lane has been removed from the scheme and cycling improvements are recommended for further consideration by GCP.

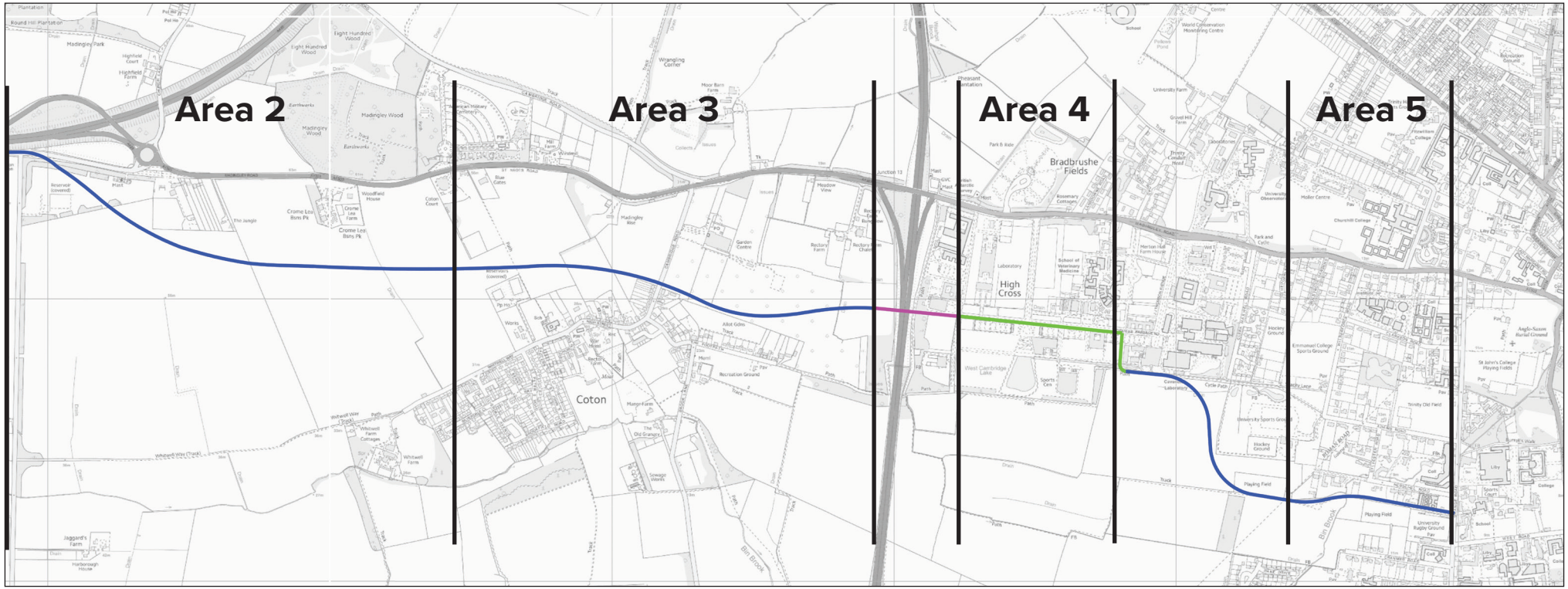
Figure 5: Optimised on-road option

Table 4: Assessment of specific route alignment by area

Area	Route section	Details
Area 1 Cambourne	N/A	An illustrative comparator option was considered as part of the overall assessment of the scheme at this stage.
Area 2 Madingley Mulch	Blue	• Blue route is less costly and disruptive to build. • Blue route is segregated from other traffic, pedestrians, and cyclists. • Public transport vehicles and a future CAM will be able to run more quickly through the section
Area 3 Coton Village	Blue	• Blue route is better aligned for a CAM stop to serve Coton. • Blue route lower in landscape so less visible from Coton Village and Red Meadow and can be encompassed into the field edge with landscaping mitigation. • New cleaner public transport vehicles on the Blue Route will be no nearer the houses than the existing buses on Cambridge Road. • Blue route has less of an impact on landowners. • Blue route has less impact on the orchard and juicing business on site. • Blue route invites less expansion of urban infill.
Area 4 West Cambridge	Light Green Segregated	• The initial green route had shared running through the west Cambridge site along Charles Babbage Road. However, through the development of the scheme it has been discovered that there is sensitive laboratory equipment in close proximity to the blue route. With this taken into consideration the Light green route becomes preferable.
Area 5 Former Rifle Range Track/Adams Road	Former Rifle Range Track (along access track adjacent to Rugby Club)	• Former Rifle Range Track allows for segregated rapid transit infrastructure, providing a quick and reliable route. • Former Rifle Range Track provides additional cycling and walking capacity to support West Cambridge. • Former Rifle Range Track has least impact on residents and most benefits to cyclists passengers and pedestrians.

Figure 6 below shows the final recommended specific route alignment following the assessment of each area.

Figure 6: Phase 1 recommended specific route alignment

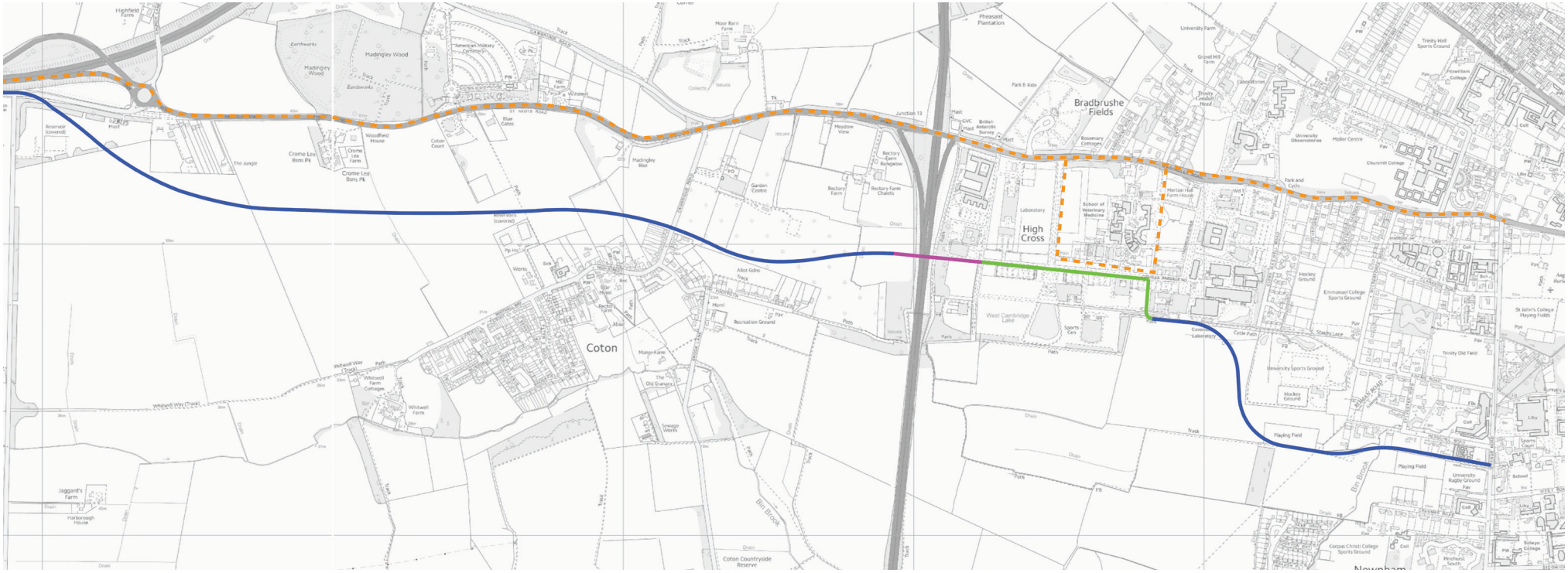


Stage 1 summary

Following the assessment it was concluded that the recommended on-road route would be the "Optimised" Route A, which includes some outbound public transport priority and removal of the inbound public transport lane east of High Cross/Eddington Road junction. It was proposed that enhanced cycling and walking facilities should be provided in this area, which will be taken forward as a separate scheme.

The recommended off-road route was the blue route through Madingley Mulch and adjacent to Coton Village, the light green segregated route through West Cambridge and the former Rifle Range Track leading to Grange Road.

Figure 7: Optimised on-road, Do Something 1



Stage 2 (OAR Part 2)

Stage 2 –The shortlisted Phase 1 options were combined with a Park and Ride location, appraised against each other to arrive at a recommended Phase 1 option. An illustrative comparator, which included both off-road Phase 1 and 2 options was also assessed and showed that there was benefit to extending the route to Cambourne.

The results of this assessment are presented in the following sections. A summary of the options assessed is shown below:

- Do Minimum – Committed schemes (schemes which already have planning permission or other approval and are considered to be definitely going ahead).
- Low Cost a – Recommended optimised on-road Phase 1 + Park and Ride at Waterworks.
- Low Cost b – Recommended optimised on-road Phase 1 + Park and Ride at Scotland Farm.
- Do Something 1a – Recommended off-road Phase 1 Madingley Mulch Roundabout to Grange Road + Park and Ride at Waterworks.
- Do Something 1b – Recommended off-road Phase 1 Madingley Mulch Roundabout to Grange Road + Park and Ride at Scotland Farm.
- Illustrative Comparator – Off-road Phase 1 and Phase 2 Cambourne to Grange Road Park and Ride at Waterworks for comparative purposes.

Figure 8: Illustrative comparator (Phase 2)

Stage 2 - Summary

Assessment of the six Phase 1 options concluded that the recommended option was “Do Something 1”. However, based on the assessment of the illustrative comparator which proposed interventions from Cambourne to Long Road, it was concluded that in order to meet the scheme objectives and deliver wider economic impacts associated with connecting new housing to employment, both Phase 1 and 2 would need to be implemented.

Choice of a recommended Park and Ride location was deferred until Phase 2 option assessment had been undertaken.

Option development following conclusion of Stage 2

Respondents in the 2018 public consultation “were concerned about the impact development of this project would have on the environment, in particular along the West Fields and in the Green Belt.”

In 2017 LDA produced a report on the impact of various Phase 1 alignments on the Green Belt, including various routes through the West Fields. In 2019 an addendum was produced to this report to revisit the conclusions based on the final route choice. The addendum concluded that the “Rifle Range track” option would still have a damaging impact on the Green Belt and that this could be reduced by using a route along Adams Road. In light of this, additional information from stakeholder consultations and an update to the INSET scoring for the Adams Road and Rifle Range options it was concluded that the Adams Road option should become the recommended route.

Respondents in the 2018 public consultation “were opposed to the development of the off-road route due to the environmental impact on the Green Belt and wildlife sites located around Coton.”

The LDA addendum also concluded that there was little difference between the two off-road options in terms of impact to the Green Belt. Therefore, based on feedback from residents we will be developing a route which is further away from Coton but also is sympathetic to the land packages created by the alignment and future development in this area.

Responses taken from the Greater Cambridge Partnership Cambourne to Cambridge Better Bus Journeys: Phase One Summary Report of Consultation Findings available on the GCP website.

Stage 3 (OAR Part 3)

Stage 3 – The Phase 2 options and Park and Ride locations were appraised against each other to arrive at a single route alignment (Phase 1 and 2) and a preferred Park and Ride location recommended.

Three options for Phase 2 were developed and combined with the two Park and Ride locations to generate 6 options. These options were assessed and modelled using the same criteria as used for the Stage 2 options and the results were used to form a recommendation for the full scheme.

The results of this assessment are presented in the following sections. A summary of the options assessed is shown the tables and images below:

Table 5: Phase 3 options

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

Figure 9: Phase 2 Option 1

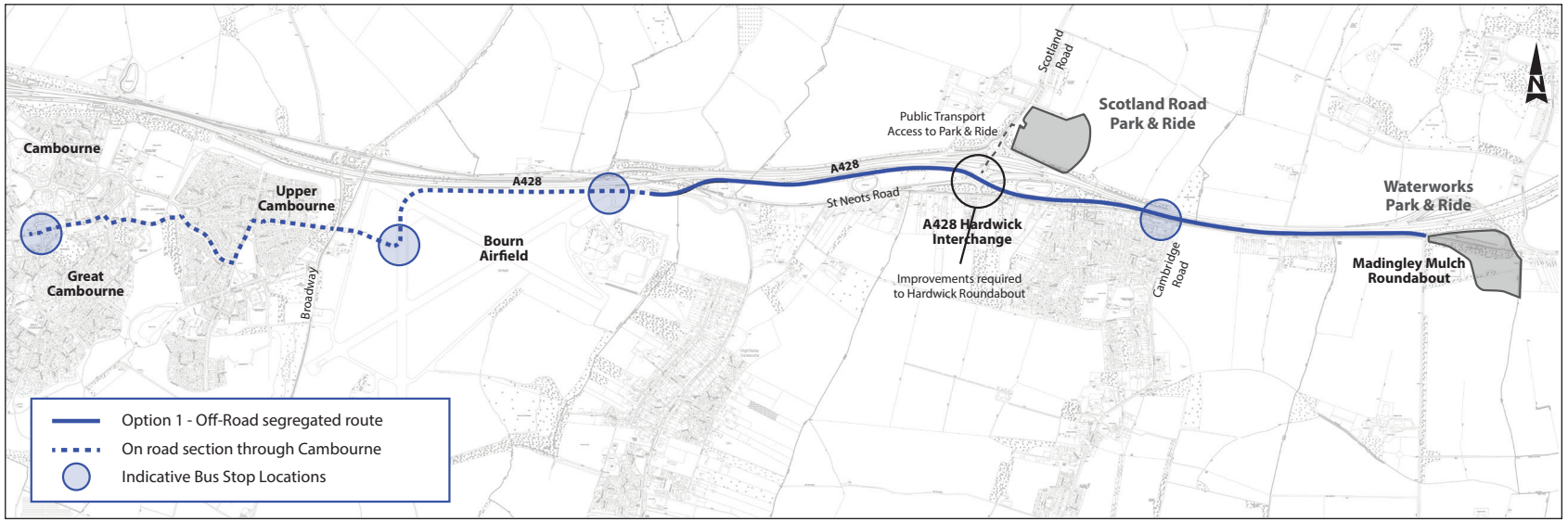


Figure 10: Phase 2 Option 2

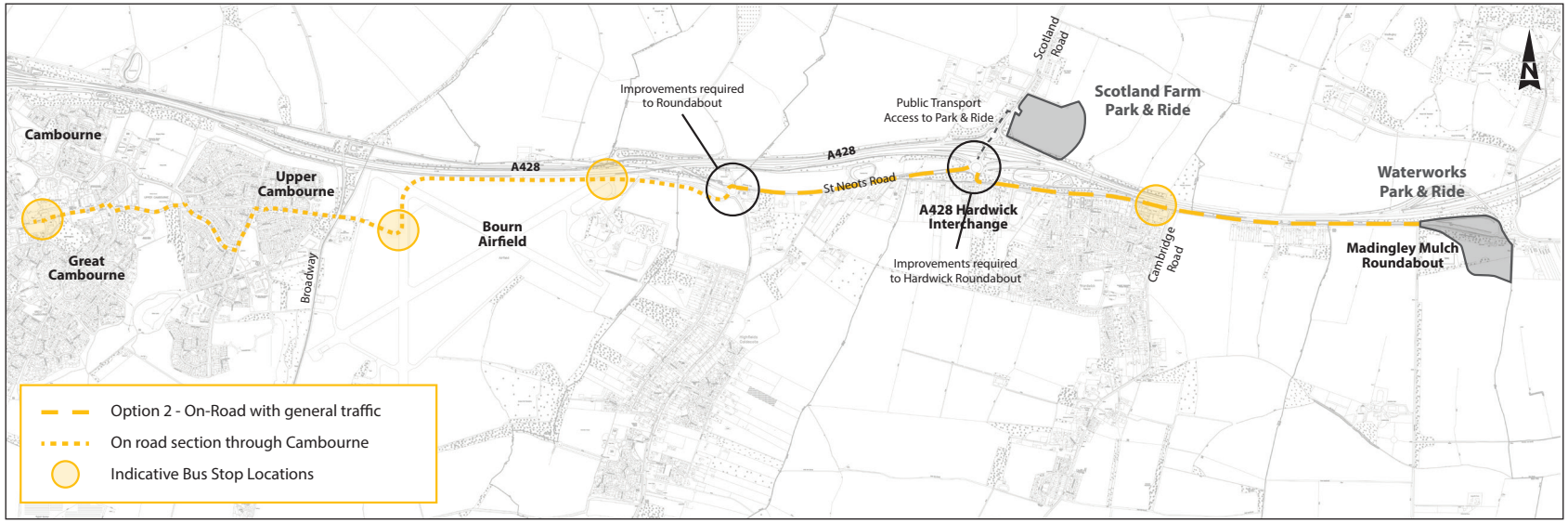
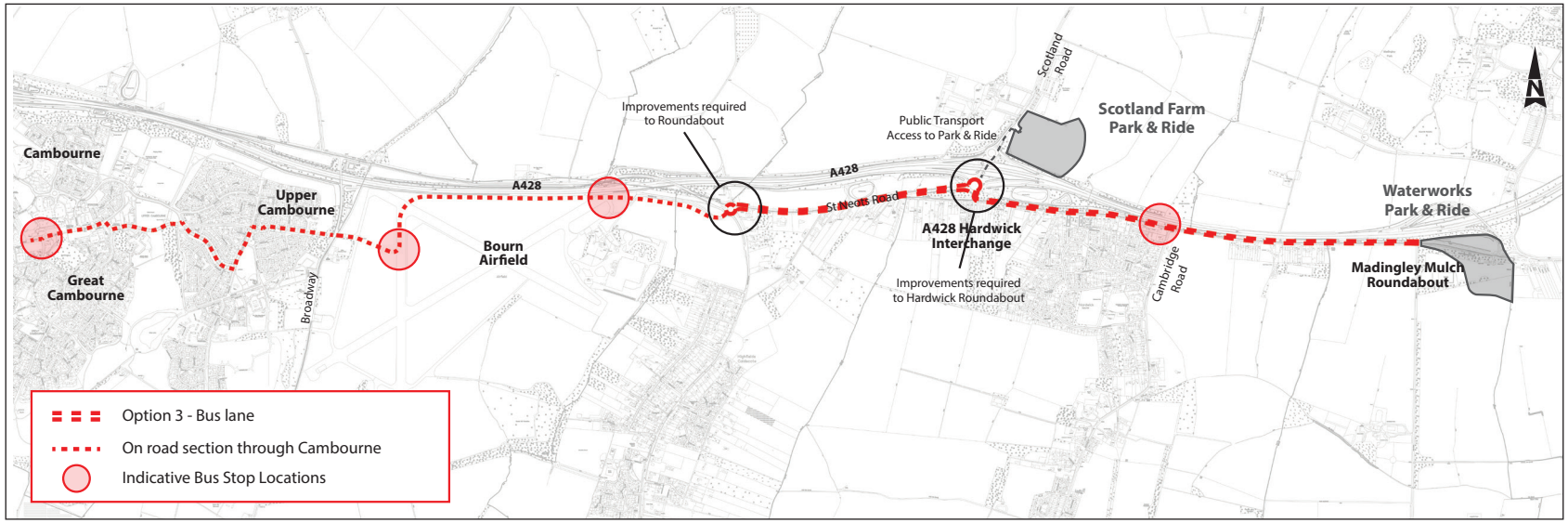


Figure 11: Phase 2 Option 3



Each of the Phase 2 options have the same off-road route through Bourn Airfield to Cambourne. The different levels of intervention are from Bourn roundabout to Long Road.

4. Option assessments

This chapter presents the results of the assessments that were undertaken during Stages 2 and 3 of the C2C option development.

The assessments can be summarised to two different methods. The first method used was a multi-criteria assessment. The tables below list the criteria and scoring that was produced for Phase 1 during Stage 1 of the assessment and the scoring for the options including both Phase 1 and 2 during Stage 3 of the assessment.

The second method uses traffic modelling data to produce a Benefit / Cost Ratio for the options, providing an initial value for money assessment.

Wider Economic Impacts are also assessed as part of this work and the results of this are also presented on the next page. The third step compared the options based on their Wider Economic Impacts.

Key

Colour	Score	Colour	Score
	1		5
	2		6
	3		7
	4		

INSET

Table 6: INSET assessment RAG summary

		Phase 1 (Stage 2)					Phase 1 and 2 (Stage 3)					
		Do Minimum	Low Cost a	Low Cost b	Do Something 1a	Do Something 1b	Option 1a	Option 1b	Option 2a	Option 2b	Option 3a	Option 3b
1. Policy fit	Cambridgeshire LTP3											
	Highways England Road Investment Strategy											
	Greater Cambridge and Peterborough SEP											
	Greater Cambridge City Deal											
	South Cambridgeshire Draft Local Plan											
	Cambridge City Draft Local Plan											
2. Contribution to economic growth	Labour market and activity											
	Supporting house construction											
	Business investment and growth											
	Cambridge positive image											
	Future potential growth post 2031											
	Capacity											
3. Contribution to improved transport network	Reliability of journey											
	Route flexibility - Links into existing bus routes											
	Walking and cycle connectivity											
	Impact on existing traffic											
	Journey times											
	Service frequency											
	Mode share											
	Connectivity to Park and Ride											

Key

Colour	Score	Colour	Score
🔴	1	🔵	5
🟠	2	🔵	6
🟡	3	🟣	7
🟢	4		

		Phase 1 (Stage 2)					Phase 1 and 2 (Stage 3)					
		Do Minimum	Low Cost a	Low Cost b	Do Something 1a	Do Something 1b	Option 1a	Option 1b	Option 2a	Option 2b	Option 3a	Option 3b
4. Contribution to quality of life	Environment impacts - Landscape impact	🟢	🟠	🟠	🟠	🟠	🟠	🟠	🟠	🟡	🟠	🟡
	Environment impacts – Noise	🟢	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡
	Environment impacts - Air quality	🟢	🔵	🔵	🔵	🔵	🟢	🟢	🟢	🟢	🟢	🟢
	Environmental impacts - CO_2 emissions	🟢	🟢	🟢	🟢	🟢	🟡	🟡	🟡	🟡	🟡	🟡
	Environmental impacts – Biodiversity	🟢	🔴	🔴	🟠	🟠	🟠	🟠	🟠	🟠	🟠	🟡
	Environmental impacts – Heritage	🟢	🟠	🟠	🟠	🟠	🟠	🟠	🟠	🟠	🟠	🟠
	Environmental impacts – Green Belt	🟢	🟡	🟡	🟠	🟠	🟢	🟢	🟢	🟢	🟢	🟢
	Safety	🟢	🟡	🟡	🟠	🟠	🟢	🟢	🟢	🟢	🟡	🟡
	Accessibility	🟢	🔵	🔵	🔵	🔵	🟣	🟣	🟣	🟣	🟣	🟣
5. Scheme deliverability	Scheme cost	🟢	🟡	🟡	🟠	🟠	🟠	🟠	🟡	🟡	🟠	🟠
	Engineering feasibility - construction method	🟢	🔴	🔴	🟠	🟠	🟢	🟢	🟢	🟢	🟢	🟢
	Land acquisition required	🟢	🟡	🟡	🟠	🟠	🟠	🟠	🟡	🟡	🟠	🟠
	Impact on local road network during construction	🟢	🔴	🔴	🟠	🟠	🟠	🟠	🟡	🟡	🔴	🔴
	Future-proofing	🟢	🟢	🟢	🟣	🔵	🟣	🟣	🔵	🔵	🔵	🔵
	Legislative powers	🟢	🟡	🟡	🟠	🟠	🟠	🟠	🟢	🟢	🟢	🟢
	Scheme maintenance and renewals	🟢	🔴	🔴	🔴	🔴	🟠	🟠	🟠	🟠	🔴	🔴
6. Stakeholder support	Public acceptability	🟢	🔵	🔵	🔵	🔵	🔵	🟣	🔵	🔵	🟢	🔵
		4.00	**4.22**	**4.24**	**4.70**	**4.68**	**5.00**	**5.03**	**4.43**	**4.51**	**4.84**	**4.86**

Source: Mott MacDonald

Table 7: INSET assessment results

Phase 1

Option	Score	INSET scoring summary ranks
Do Minimum	4.00	Ranked 5th
Low Cost a	4.22	Ranked 4th
Low Cost b	4.24	Ranked 3rd
Do Something 1a	**4.70**	**Ranked 1st**
Do Something 1b	4.68	Ranked 2nd

The INSET assessment results show the off-road routes as the best performing options in Phase 1.

Phase 2

Option	Score	INSET scoring summary ranks
Option 1a	5.00	Ranked 2nd
Option 1b	**5.03**	**Ranked 1st**
Option 2a	4.43	Ranked 6th
Option 2b	4.51	Ranked 5th
Option 3a	4.84	Ranked 4th
Option 3b	4.86	Ranked 3rd

The INSET assessment results from the multi criteria assessment showed that the best performing option against the full range of criteria aligned to the scheme objectives was Option 1b – Segregated off-road option with Park & Ride at Scotland Farm.

The result of the consultation questionnaire also showed that 48% of the respondents preferred Option 1, 39% preferred Option 2 and 20% preferred Option 3. As well as the route options the Park and Ride site location was consulted on and the results showed that 63% of the respondents preferred Scotland Farm with only 17% preferring Waterworks.

Source: Mott MacDonald

Benefit cost ratio

Table 8: Summary of economic impacts (£'000s)

Benefit (£'000s)	Phase 1				Phase 1 and 2 *					
	Low Cost a	Low Cost b	Do Something 1a	Do Something 1b	Option 1a	Option 1b	Option 2a	Option 2b	Option 3a	Option 3b
Transport user benefits (PVB)	2,213	2,604	23,411	18,990	56,972	63,014	59,175	59,951	57,764	66,572
Wider economic impacts (PVB)	323	380	3,388	2,753	687	730	714	723	697	803
Total PVB	**2,537**	**2,985**	**26,799**	**21,742**	**57,659**	**63,744**	**59,889**	**60,674**	**58,461**	**67,375**

Table 9: Benefit/cost ratios

Benefit	Phase 1				Phase 1 and 2 *					
	Low Cost a	Low Cost b	Do Something 1a	Do Something 1b	Option 1a	Option 1b	Option 2a	Option 2b	Option 3a	Option 3b
Initial BCR	0.03	0.03	0.19	0.15	0.31	0.32	0.35	0.33	0.31	0.34
Adjusted BCR	0.03	0.04	0.22	0.17	0.31	0.33	0.36	0.34	0.32	0.35

* The Phase 2 figures combine the recommended off-road Phase 1 route and the Phase 2 options.

Wider Economic Impacts

The proposed scheme would significantly improve East-West connectivity and presents an opportunity to support Cambridge's growing population and workforce in conurbations to the west of the city, whilst managing the growing travel demand. The C2C project would help to connect such growing communities, whilst enabling them to evolve and access the increasing number of jobs and opportunities in the city and on its periphery.

Option assessment summary

When taking into consideration the potential Wider economic impacts of an off-road option vs. an on-road option, it is clear that an off-road option could deliver significant benefit at both at a national and local level. This further highlights the importance and need for investment in C2C in order to deliver economic growth both to the region and nationally.

Figure 12: Summary

Strategic Case:
Local GVA benefits over costs = local BCR – 3.48

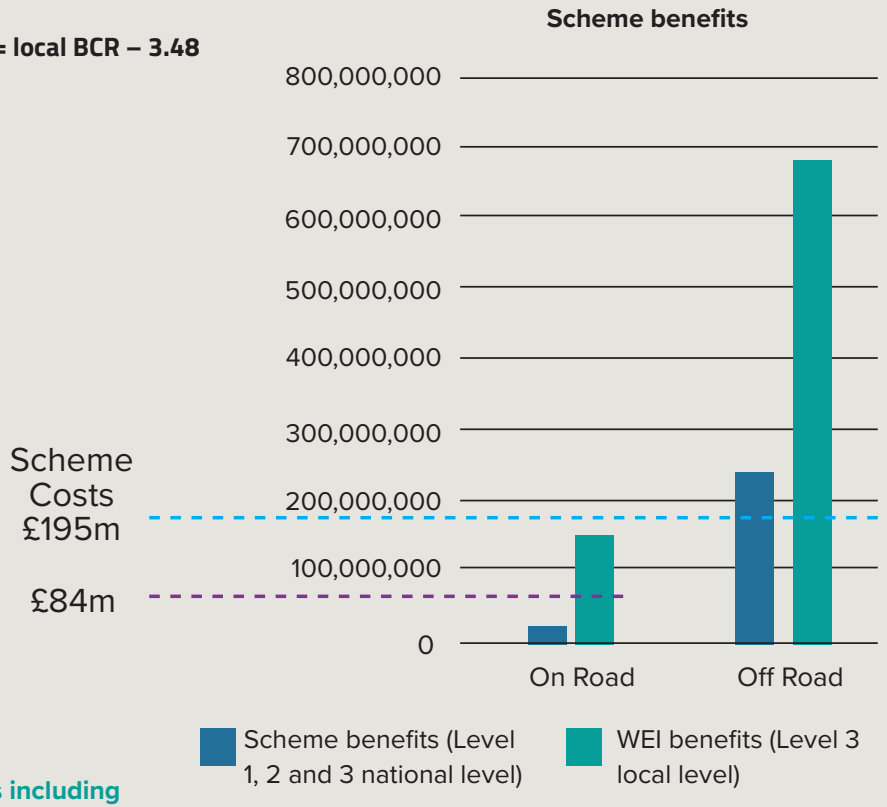
Level 1 = Conventional transport benefits >> Provides initial BCR

Level 2 = Wider economic impacts related to transport scheme (ie not land-use changes) >> Provides adjusted BCR

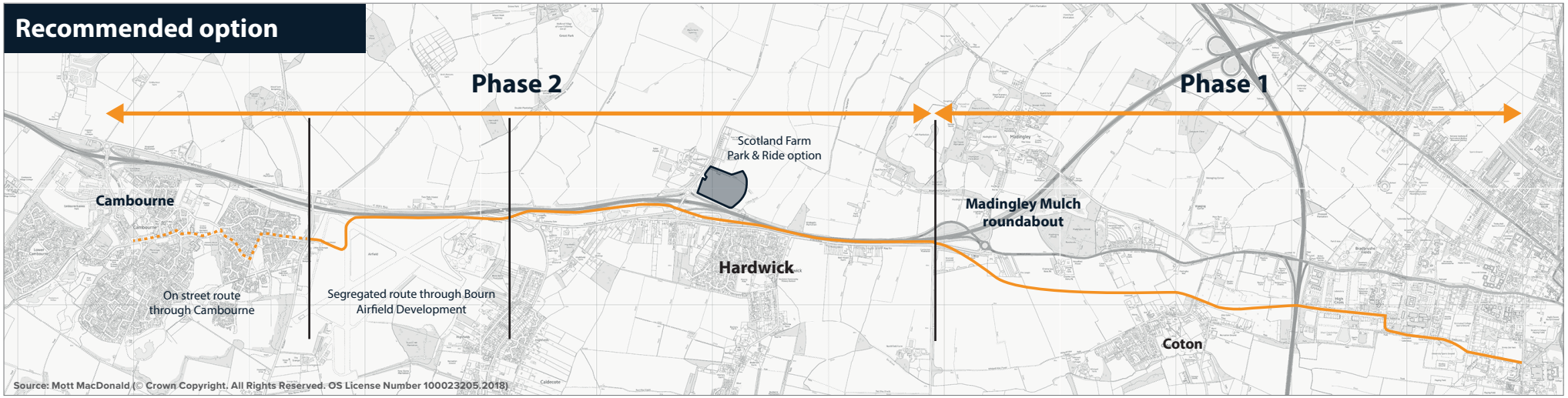
Level 3 = Wider economic impacts associated with land-use changes.
National level
>> Guides assessment of strategic case

Level 3 = Wider economic impacts associated with land-use changes (additional GVA over 30 years)
Local level
>> Guides assessment of strategic case

Costs are present value costs including capital and operating costs



Final preferred option is:



Summary of stage 3

Taking into account the results of the multi criteria assessment, consultation feedback and comparison of an off-road versus on-road solution with regards to WEI, Option 1b–Off-road segregated with Scotland Farm Park and Ride is the best performing option and therefore is recommended to be taken forward as the preferred option.

The strategic economic benefits of the scheme are as follows:

- The total attributable proportion of remaining jobs (mainly B-use jobs relating to research and development, and light industry) to be created over 2016-2031 by a fully segregated scheme from Cambourne to Cambridge would be in the region of **975 jobs**.
- The C2C project would support around **£102.8M of GVA per annum**, equivalent to **£676.1m of GVA over a 30-year time horizon**.
- **£287.8m** in land value uplift

Over and above these benefits, the delivery of major new developments such as Bourn Airfield (3,500 houses) are dependent on the provision of suitable access as enabled by this scheme and Cambourne West.

Journey times / Reliability

The table below shows the anticipated journey times of the recommended route from the start of the route in Cambourne to city centre (Parker Street), compared to a "Do Minimum" scenario which consists of only committed schemes and excludes the C2C scheme:

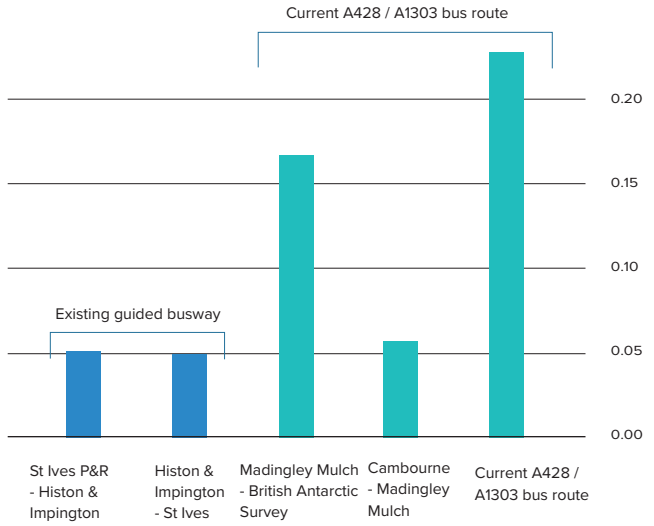
Travel times in the interpeak are roughly similar with and without the scheme, although there is a slight increase as the buses have to route off the busway into the new Park and Ride site before re-joining the busway.

The main benefit is in the AM peak with buses being more reliable and a journey savings time of 18 minutes and 41 seconds.

Table 10: City Centre Journey Times

	Journey Times (mm:ss)		
Option / Destination	**AM**	**Interpeak**	**PM**
City Centre			
Do minimum	49:57	26:28	33:26
Recommended	31:13	27:42	31:05

The Reliability Ratios show that the Busway sections perform better than the non-busway sections which is the expected result, meaning that the infrastructure is delivering journey times that are more consistent.



5. Key Considerations

In this section the key factors that need to be addressed from the recommended route and Park and Ride site are discussed in summary. Once a preferred scheme is formally approved by the GCP then a full Environmental Impact Assessment (EIA) will be undertaken to meet the requirements of the planning process. This EIA process will include:

- Production of a scoping report for stakeholders to comment on the proposed scope and method for assessment of environmental impacts.
- Development of the scheme design through an iterative impact assessment that includes public consultation on emerging design features to mitigate impacts on the environment.
- Production of the final environmental statement to support the planning process.

To date the appraisal of options has been undertaken in accordance with the Department for Transport's WebTAG guidance. This has included input from specialists in the following topics:

- Landscape and townscape
- Air quality
- Carbon/greenhouse gases
- Biodiversity
- Heritage

In addition a review of the potential impact of the options on the Green Belt was undertaken by an independent organisation for GCP.

Landscape and townscape issues

The route alignment between Cambourne and Madingley lies in the Western Claylands Landscape Character Area (LCA). The landscape is mainly rural and open, with a series of residential settlements to the south of the St Neots Road and A428. The field pattern tends to be large-scale and field boundaries are generally formed by hedgerows with hedgerow trees.

The A428 dual carriageway runs east/west through the centre of the study area, severing the landscape north and south of the road. Woodland belts lining the A428 and associated slip roads and roundabouts reinforce the strong linear character of the road.

Within Cambourne the route will be on existing roads and along a short section of new road between Sterling Way and Broadway. In Cambourne the impact on townscape is negligible as the route will be using existing highways.

The new road section to Broadway will be along the existing cycleway, it will be shielded from view by the boundary fences of private residences and there are not likely to be any long distance views of the scheme. The route would be landscaped where practical to soften the impact of the infrastructure on local views.

Where the scheme crosses Bourn Airfield it will become a part of the new proposed development. Landscaping plans for that development include bunding to minimise views from the south, and the route would be largely parallel to the A428 along the northern boundary of the airfield. The impact on the new landscape of the housing development would be negligible as it would fit into the new townscape as part of the new infrastructure required for that development.

From Bourn Airfield to Scotland Farm the route would be close to and parallel to the existing A428. The design will ensure it is not visible from nearby residences through use of low bunds and appropriate planting. Buses using the route would be visible but the road itself would not. The impact on the landscape would be neutral largely – especially as planting became established.

From Scotland Road the route will be between St Neots Road at Hardwick and the A428. This will result in the loss of vegetation shielding the A428 from residences between Cambridge Road and Long Road (this is a section about 1km long, of which 500m have residences facing the road). There will be opportunities to include new planting between the residences facing St Neots Road and the bus route which, over time, will reduce the visual impact of the busway. Improved acoustic barriers along this section would also reduce the amount of visible traffic on the A428, but the overall impact on the local landscape will be moderate adverse. As this area is within a highway corridor the impact on the wider landscape is neutral to minor adverse.

Between Madingley and Coton there are parcels of land on either side of Madingley Road that are subject to covenants held by the National Trust to protect the landscape in the area but the landscape is not designated in any other manner.

As the route crosses the open landscape from the Waterworks site at Madingley down to Coton it would have an impact on the pattern and tranquility of this rural landscape. There will be long views of the route from the south (Red Meadow Hill) and there will be views of parts of the route from the local public footpaths and from the A1303. The route will be designed to be as level as possible across the hill so it will be in a shallow cutting for much of this area.

The excavated materials will provide for the creation of small bunds adjacent to the route as well. The final alignment is still to be defined in this area, and consultation with key stakeholders continues to identify an optimum route that minimises the landscape impacts between Madingley and Coton. With appropriate design features and planting it is considered the impact will be moderate adverse initially, improving over time to be minor adverse – but the final assessment will be confirmed in the EIA process.

Park and Ride Site - Scotland Farm

The scheme would reduce tranquility and would alter the pattern of the landscape at Scotland Road Farm where a car park would replace part of an arable field. The scheme would increase light levels in the open landscape north of the Scotland Farm site. Landscape mitigation planting would reduce the landscape and visual impacts of the proposed scheme.

Heritage issues

The heritage assets in the area comprise three types: registered gardens, listed structures (built heritage) and archaeology. There are also two conservation areas designated in the area, Coton Village Conservation Area and the West Cambridge Conservation Area.

There are no direct impacts on any listed buildings or other protected sites from the route. However, there are a number of listed buildings which could have their setting affected by the route of which the most significant are:

- St Peters Church in Coton.
- The American Cemetery on Madingley Hill.

There are a number of other listed buildings in Coton Village reflecting the value of the village setting defining it's conservation area status. Along Grange Road there are a few other listed buildings which are important in defining the setting of this part of the West Cambridge Conservation Area.

There are only two listed structures west of Madingley, (one in Hardwick and one on the eastern edge of Cambourne) neither of which is particularly close to the proposed route and whose setting is not likely to be impacted by the route in that area.

The setting of the Coton listed buildings and conservation area is likely to be impacted by the introduction of the new infrastructure through the rural edge of the village. This indirect impact will reduce over time with the introduction of new planting to soften the visibility of the new route.

By refining the precise alignment and design of the route the impact could be further minimised and this refinement will take place during the EIA phase of the project. The recommended route has little impact on the setting of the American Cemetery as this is on the opposite side of the A1303 and the route is not visible from the cemetery. There is little physical change to the highways network when the route enters the Cambridge suburbs and so it is not going to affect the conservation area setting or the listed buildings in the area of Grange Road.

There are no scheduled monuments along the route, or close to the route. Desk based research has identified the potential for buried archaeology along the route, although nothing has been identified to date that is considered to be of sufficient value to require changes in the proposed design.

Further works prior to construction (trial trenching) will be undertaken to confirm the presence of archaeology along the route and the design will include a full archaeological scheme of investigation agreed with the county archaeologist as part of the EIA process. The final design of the scheme shall seek to preserve the historic setting of the landscape as much as possible, this may include recreating some hedgerows along boundaries which have been lost where agreement with landowners and stakeholders determines this is appropriate to do.

Ecology

The route avoids all sites protected for ecological purposes except where it crosses the City Wildlife Site on the eastern side of the M11. This narrow protected site has relatively poor value scrub which would be impacted by the loss of about 110m of scrub where the route crosses it. There are known protected species near the impacted area but they are not resident on or adjacent to the scheme and measures will be put in place to prevent their harm during construction or operation of the route.

The remainder of the route impacts on habitat of value as it crosses Coton Orchard and around the Waterworks site at Madingley. There are also a number of trees that will be lost along the St Neots Road section east of Hardwick village, although the majority of the trees are relatively young (<30years) and the habitat has limited value in that area. The belt of Tree Preservation Order (TPO) trees around the Waterworks site will have some loss where the route cuts through the TPO belt.

The precise location of the route will be aligned, where possible, to minimise the loss of any trees of value (as defined by the arboricultural survey undertaken in 2018).

Surveys are ongoing for a range of protected species but to date no protected species roosts or hibernation sites are likely to be lost from the route.

A biodiversity net gain assessment has been carried out on the initial design of the scheme, which showed that with the mitigation opportunities that exist along the route there is potential for significant net gain to be derived from the project. The final net gain assessment will be completed during the EIA to take into account the final proposed mitigation and habitat creation along the route, the results will be reported in the environmental statement.

Opportunities to improve biodiversity include:

- Increasing species rich hedgerows in the area by planting new hedgerows as part of the Non motorised User (NMU) route.
- Improving existing hedgerows which may be species poor by additional planting along the hedgerows.
- Increasing chalk grassland or other semi-improved grassland habitat along the route through planting adjacent to the route and in fields severed by the route that are no longer viable for agriculture .
- Providing habitats suitable for invertebrates and reptiles where existing populations are of local or regional value.
- Providing nesting boxes for barn owls in appropriate locations.
- Increasing woodland/scrub by planting in areas where this provides visual barriers to the scheme (eg around the edge of Coton, around the Scotland Road Park and Ride site and in field corners along the route).

Water resources

The route crosses no main rivers and has no direct impact on any users of surface or groundwater in the area. There are no source protection zones (defined around public water supplies from groundwater) crossed by the route. The route has no impact on any flood zones and will not impact on the Bin Brook on Adams Road as on this section the route will not affect the existing highway and drainage network. Drainage along the route will be designed to incorporate sustainable urban drainage wherever possible and measures to introduce elements of natural flood management will be considered as well.

Air quality

Nitrogen dioxide (NO_2) is the key health-related pollutant of concern from road traffic. The highest pollutant concentrations associated with road traffic can be found in congested urban areas. NO_2 concentrations on busy roads in Cambridge are generally higher than in surrounding areas, especially within a rural setting. Emissions of particulate matter (both PM10 and PM2.5) from road vehicles are also a concern for public health but generally these pollutants are emitted at much lower rates compared to oxides of nitrogen (NO_x) and as such have less of an impact on ambient pollutant concentrations.

Thus, where concentrations of NO_2 are low and road traffic is the primary source of emissions, such as the area between Cambourne and Cambridge, the concentration of particulate matter (PM10/PM2.5) would also be low. If the NO_2 levels are within the air quality objectives then PM10 and PM2.5 are also likely to be within air quality objectives. As such, local authorities do not tend to monitor PM10 and PM2.5 in as many locations as NO_2 as NO_2 monitoring equipment provides a good proxy for potential areas of exceedances of PM objectives, using relatively low cost equipment.

PM levels are a growing concern in heavily congested areas such as city centres. NO_2 levels are predicted to reduce as the number of hybrid and electric vehicles grow whereas such vehicles still emit particulates albeit in very small quantities. Where there is no current traffic related NO_2 exceedances of ambient air quality objectives, it is unlikely that there would ever be a traffic related PM10 or PM2.5 exceedances of ambient air quality objectives unless the traffic levels increased very dramatically.

The air quality along the route is generally well within government defined limits for good air quality. There are no long term air quality monitoring locations in the route west of Cambridge city limits as the good air quality does not justify such monitoring by South Cambs District Council (SCDC). Defra have modelled the air quality across the UK and this modelling confirms that air quality is good quality. Within Cambridge the City Council have a defined Air Quality Management Area around the city centre. The western limit of the AQMA is along Grange Road. Poor air quality in the city is largely due to vehicle traffic, so any scheme that seeks to reduce the number of vehicles entering the city centre should bring benefits to air quality. Air quality from exhaust emissions tends to drop rapidly away from the source of emissions, so alongside roads the air quality impact from traffic is negligible beyond 200m.

Along the route itself the number of buses that will operate are not sufficient to create a poor air quality risk. However, during the EIA the air quality implications of the scheme will be modelled to consider the changes in traffic more widely and along the route itself. The modelling will identify if there are sensitive receptors (including residential buildings and schools) that could experience poor air quality as a result of the scheme. Where possible mitigation measures will be included to manage such impacts (eg. Moving the route further away from a sensitive receptor, or putting traffic calming measures into an area to reduce traffic flow).

Noise

Noise from road vehicles is generated from tyre noise on the road surface itself, the noise of the engine and other mechanical parts. Modern buses of the type that will use the route, including electric or hybrid vehicles which operators will be encouraged to use, will generate very low noise levels, and the majority of the noise is likely to be from the tyres on the road. The number of vehicles using the route will be relatively low so noise will be intermittent and short in duration at any point along the route. However, this will be a new noise in many places, and so there will be some impact from noise on nearby receptors. Along the majority of the route there are no receptors as the route is across agricultural land. However, around Coton there will be some noise from the scheme near to existing properties.

In this area noise abatement measures will be included in the design such as low earth bunding or acoustic fencing. The precise nature of the mitigation will be agreed with stakeholders during design development. In other areas there are existing noise sources but the route will be near residences or commercial properties. This is the case along St Neots Road in Hardwick and along the new section of route in Cambourne between Sterling Way and Broadway. Along St Neots Road the A428 dual carriageway is a major source of road noise which will dominate the noise environment in the area.

The new route will remove trees along the A428 boundary which residents are concerned will increase noise levels. In reality impacts on noise may be marginal but GCP is committed to providing an improved acoustic barrier along this section of route to ensure that residences along St Neots Road do not experience any deterioration in noise levels. There is an opportunity to increase the length of the current noise barrier along the A428 and GCP will liaise with Highways England on what can be achieved.

In the short section of new route in Cambourne (about 400m long) between Sterling Way and Broadway there will be appropriate acoustic barriers installed on either side to minimise noise impacts on residential properties that back onto the route.

Along Adams Road and in Cambourne the route will be on existing roads where the level of bus traffic will not create any significant change in the noise levels experienced.

The EIA will carry out noise modelling along the route and for sensitive receptors on the wider network that experience changes in traffic that could affect noise.

Greenhouse gases

Government has commitments to achieve reductions in carbon (and other greenhouse gases) which require a step change in transport using conventional vehicles. The scheme is a key part of the strategy to achieve such modal shift by providing high quality public transport. In creating this option for travel there will be some embedded carbon implications of any construction works. Therefore one element of the design decision will be to minimise the carbon footprint of the construction works.

In determining the guidance mechanism there are opportunities to select an option that requires less material to construct the appropriate road surface and this will be factored into the decision. During operation the carbon footprint of the scheme will be further minimised by requiring operators to use vehicles that achieve minimum standards in CO_2 emissions. Operators will also be encouraged to consider alternative hybrid or electric powered vehicles to reduce the greenhouse gas emissions from the scheme even further.

Opportunities and constraints

Opportunities map

1. Acoustic barriers to reduce noise impacts on residences
2. Environmental mitigation as set out in the Bourne airfield planning application
3. Enhance habitat
4. Traffic calming measures and cycleway access
5. Planting to minimise visual intrusion to neighbours
6. Park and ride lighting to minimise light pollution
7. Design to minimise visual intrusion
8. Micro siting through TPO block to minimise impact
9. Micro siting of route to avoid buried archaeology
10. Improve planting mix in existing hedgerow
11. Planting along routes to chalk grasslands mix. Increasing habitat and opportunities for improved connectivity for specices movement.

    Design to incorporate low bunds to minimise visibility.

    No fencing along route boundary defined by ditch/suds drainage. Scheme design re-introduces smaller field parcels similar to historic landscaping patterns.
12. Drainage along route to be fully SuDS compliant
13. New improved hedgerow
14. Increased access by connection of NMU to PROW
15. Planting to provide additional screening
16. Meadow planting
17. Planting to screen route from village
18. Planting between route and housing here to screen properties
19. Screening & habitat enhancement
20. Improved access by connecting NMU to Prow

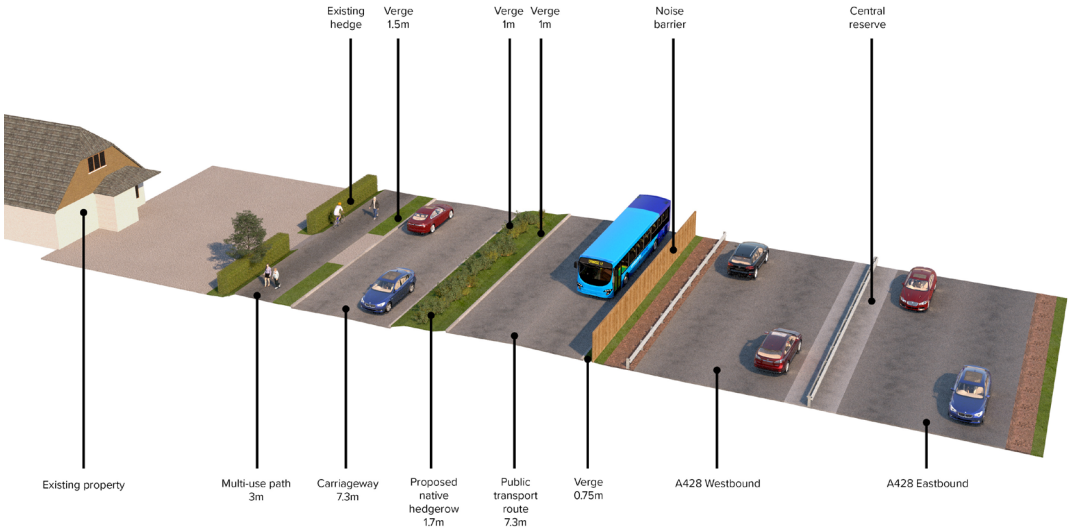
Constraints map

1. Existing cycle path in close proximity to residential areas
2. Some protected species in Bourn Airfield area
3. Lighting and noise impacts on residences
4. Potential buried archaeology
5. Potential increased traffic through Dry Drayton
6. Tree preservation Orders in this area
7. Noise and visual impacts on residences
8. Bat roost potential
9. Buried archaeology (geophysical)
10. Public right of way
11. American Cemetry, grade 1 registered park and garden
12. St Peters Church, grade 1 listed building
13. Coton Orchard
14. City wildlife site
15. High badger activity

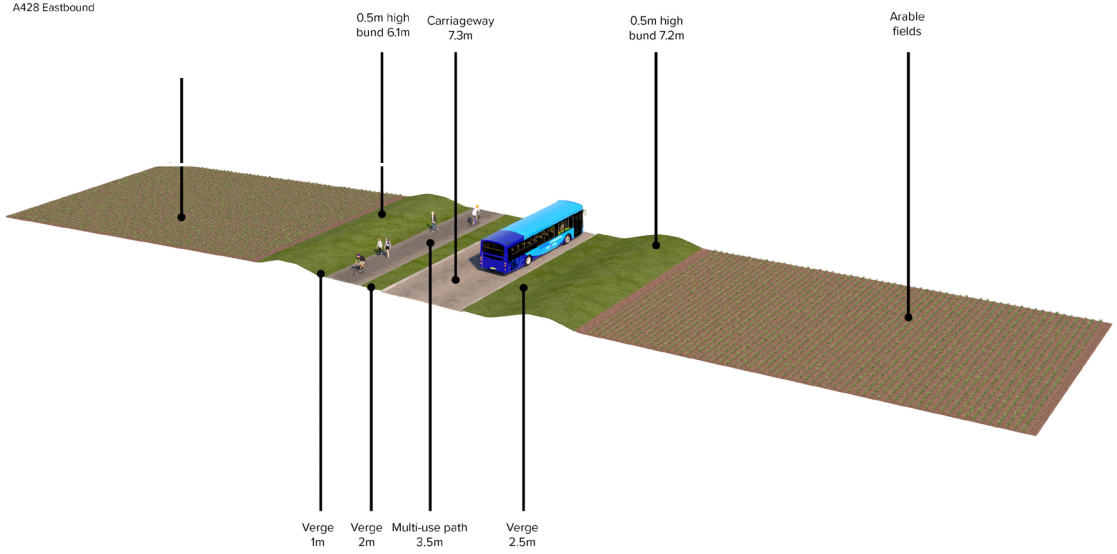
Cross sections

Please see the indicative cross sections for Hardwick and Phase 1 below and Coton, West Cambridge and Adams Road on pages 56 and 57.

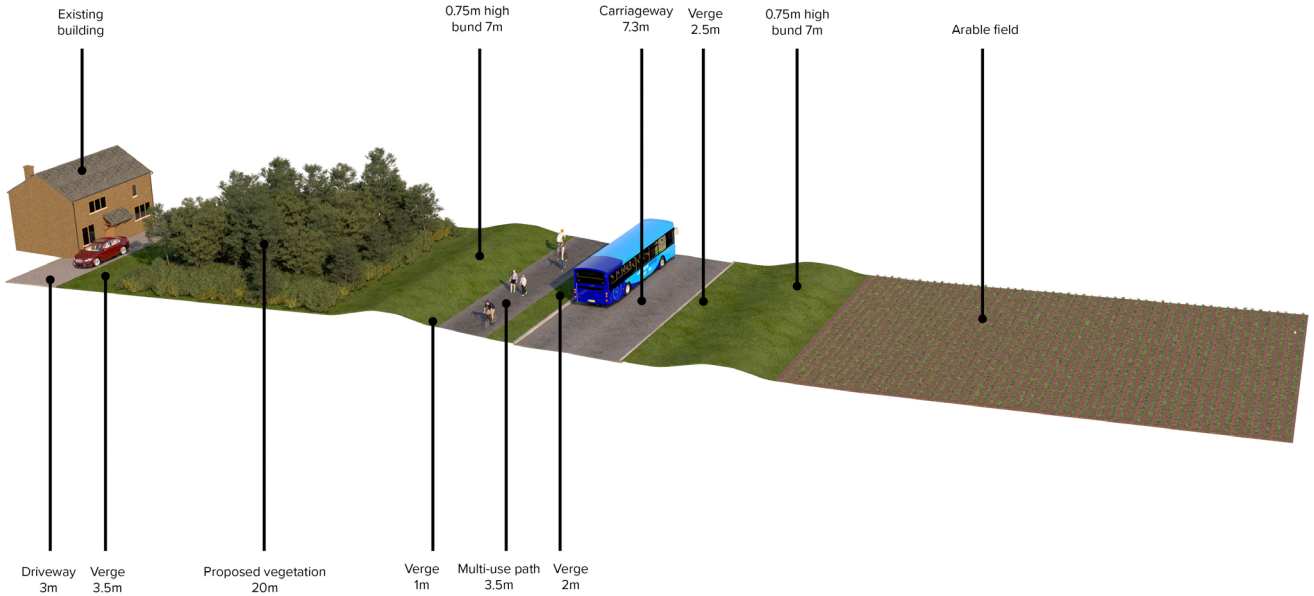
Hardwick indicative cross section



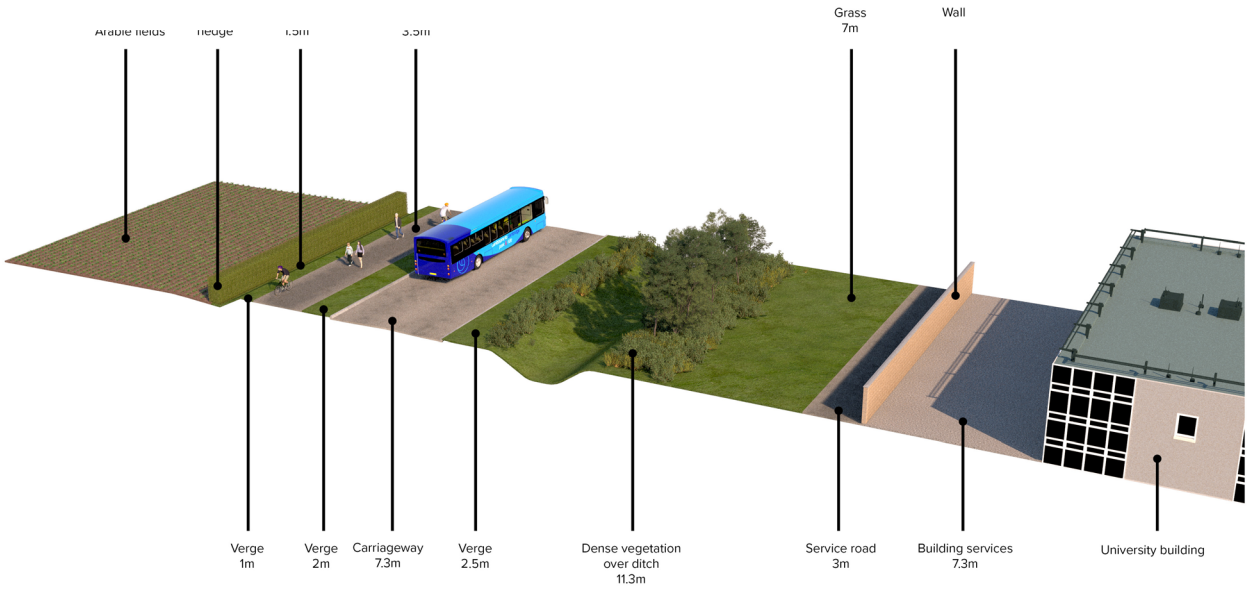
Phase 1 indicative cross section



Coton indicative cross section



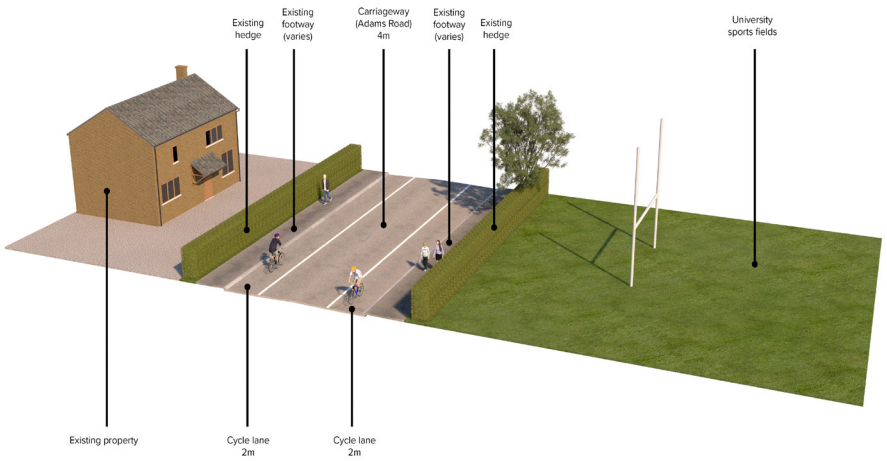
West Cambridge indicative cross section



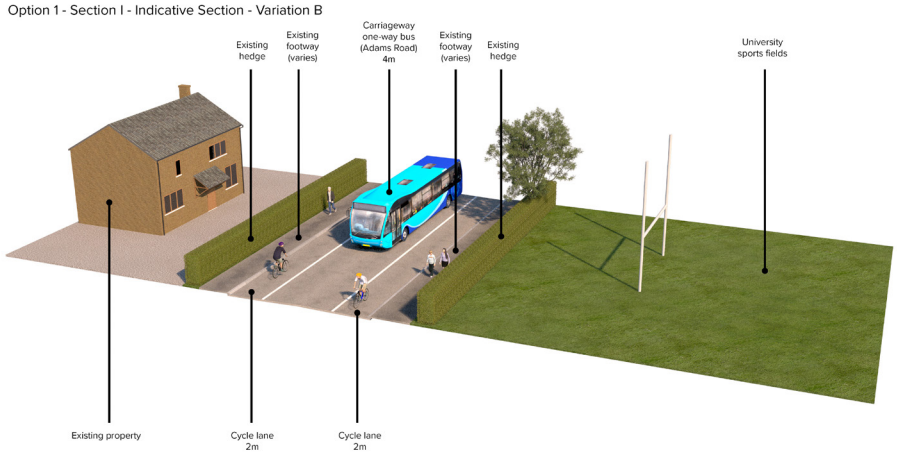
Adams Road Indicative cross section

The layout for Adams Road is still being discussed with residents and cycle groups but the cross-sections show one potential approach using advisory bus lanes.

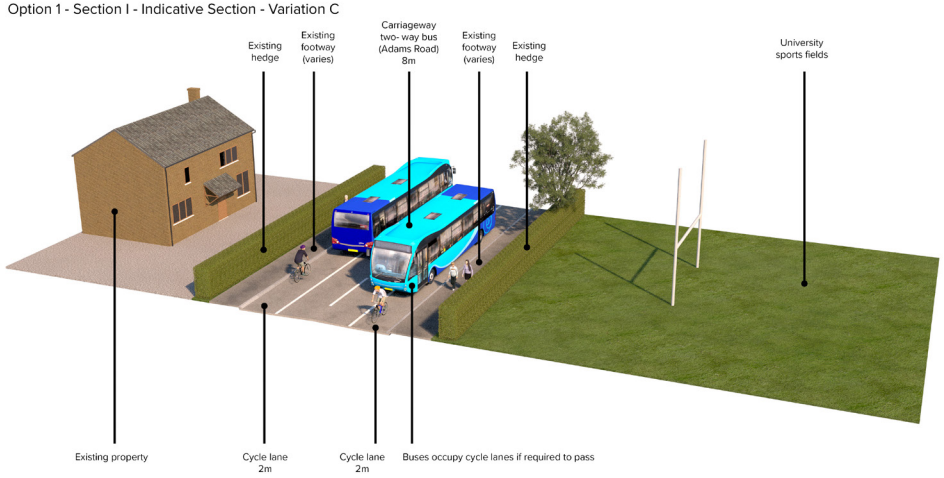
Option 1 - Section I - Indicative Section - Variation A



Option 1 - Section I - Indicative Section - Variation B



Option 1 - Section I - Indicative Section - Variation C



Onward bus routes

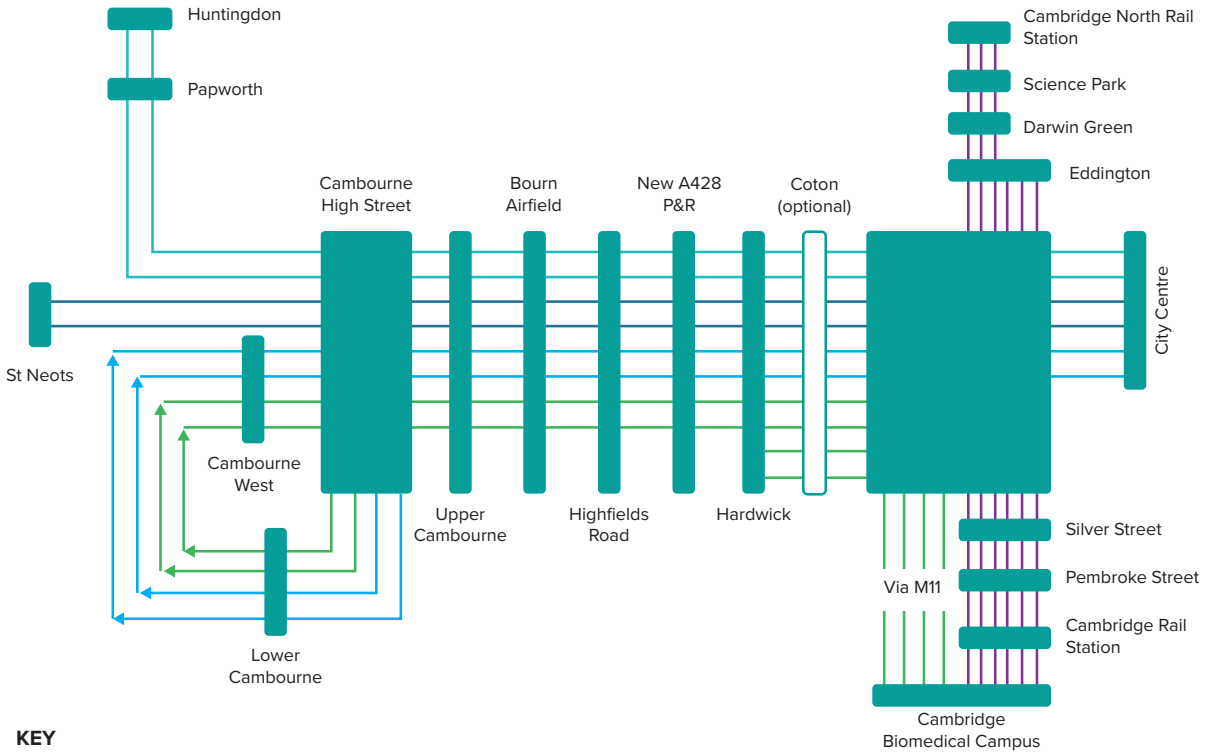
The current bus strategy has three direct express services as follows;

- Cambourne to Cambridge City Centre at 10-minute interval service (six buses per hour).
- Cambourne to Biomedical Campus at 30-minute interval service (two buses per hour).
- A428 Park and Ride site to Biomedical Campus at 30-minute interval service (two buses per hour during peak periods).

The routes are based on realistic service numbers and anticipated demand. Although it should be noted that these are proposed routes only and have not been agreed with the route operators.

Existing bus services would have the option of using the new public transport route, providing they comply with clean vehicle standards. For example, the X5 would be likely to use the new route. The Citi 4 has been assumed to continue to serve existing stops on the A1303.

Complementing radial route schemes, the GCP's City Access project is seeking to introduce measures to reduce car usage, free up road space and improve the city environment for better public transport.



KEY

Huntingdon - Papworth - Cambourne - Cambridge City Centre (two buses per hour).

St Neots - Cambourne - Cambridge City Centre (two buses per hour).

Cambourne - Cambridge City Centre (two buses per hour).

The above routes combine to provide six buses per hour (10-minute headway) between Cambourne High Street and Cambridge City Centre.

Cambourne - Cambridge Biomedical Campus (two buses per hour between Cambourne High Street and Cambridge City Centre).

Planned enhancement of existing "universal" route Cambridge Biomedical Campus - Eddington (six buses per hour) with extension to Darwin Green, Cambridge Science Park and Cambridge North Rail Station (three buses per hour).

Land and property

Land and property would be acquired or used for the project in a number of different ways, including:

- Temporary use of land and property.
- Permanent acquisition of land and property.
- The safeguarding and survey of land and property.
- Permanent acquisition of rights over land and property.

Temporary use of land and property is required where it is needed for construction purposes, but not for the future operation of the project. Permanent acquisition of land and property is required for both the siting of the permanent structures, equipment and its operation and maintenance, it is also required for landscaping and mitigation measures, including those of drainage, environment and severance.

The land required to accommodate the various options assessed is proposed to be the following:

- Land that is required for the construction of the project, for the construction and safeguarding of works to be carried out, together with all construction work sites and working areas.
- Land which will need to be acquired for the permanent structures and equipment associated with the project, or land over which rights will be required to maintain, operate and safeguard its operation.

The project would seek to minimise land take, whilst ensuring that the extent is sufficient for the purposes of the construction and operation of the Project, including working areas and work sites. As the project progresses the amount of land required will further be defined and further assessment work will be required to inform the land and property requirements for the scheme.

All property interests will be identified as the scheme is developed and any further land interest identified will be incorporated within the existing stakeholder engagement.

Technical guidance

GCP is currently pursuing technological guidance systems, with an idea of moving away from a physical guidance system for C2C. This is being considered for a number of reasons including the restrictions of a physical guidance system impacting future proofing. GCP are working with the CPCA to ensure the C2C scheme is aligned with the emerging proposals for CAM.

Mott MacDonald, on behalf of the GCP undertook a market sounding exercise in October 2018 to determine market interest and the availability of technological guidance solutions for deployment on the Cambridgeshire Rapid Transit schemes.

The report concluded that both kerb guidance and optical guidance achieve most or all of the guidance requirements for the C2C project and should be developed/investigated further.

Wider Scheme Impacts

Community impacts

Community impacts also known as social and distributional impacts are assessed in order to confirm whether or not any specific social groups are particularly disadvantaged by transport investment. A full SI and DI assessment has been undertaken for the recommended scheme.

> "Inadequate public transport presents a distinct barrier for school leavers making important decisions about where to go and what to do next.
>
> For those students who do not have access to a car and/or a lift, or the financial support to utilise taxi's – it is the (lack of) transport links between Cambourne and Cambridge that leads in shaping the decisions that they make regarding their post 16 education."
>
> **Cambourne Village College**

Social Impact Appraisal

SI appraisal covers the human experience of the transport system and its impact on social factors. The eight social impacts considered are:

- Accidents
- Physical activity
- Security
- Severance
- Journey quality
- Option values and non-use values
- Accessibility
- Personal affordability

The initial appraisal has found that the scheme will deliver a broadly positive benefit within relevant impacts, with only severance anticipated to result in potentially adverse impacts. The anticipated assessment scores for the social appraisal can be seen below.

Table 11: Social impacts – Summary assessment scores

Impact area	Score
Accidents	Slight beneficial
Physical activity	Moderate beneficial
Security	Neutral
Severance	Slight beneficial
Journey quality	Slight beneficial
Option values and non-use values	Large beneficial
Accessibility	Slight beneficial
Personal affordability	Neutral

Distributional Impact Appraisal

A DI appraisal considers the variance of transport intervention impacts across different social groups, seeking to identify those social groups that would be adversely or beneficially disproportionately impacted by the intervention. A DI appraisal is comprised of three stages; an initial screening stage, assessment of impacts and appraisal of the impacts. The eight distributional impacts are as follows:

- User benefits
- Noise
- Air quality
- Accidents
- Security
- Severance
- Accessibility
- Affordability

The scheme has been assessed as mostly generating positive impacts across the social groups identified. The exception is severance which may see slight adverse impacts.

Table 12: Summary distributional impact screening results

Impact Area	Score	
User benefits	Most deprived quintile	Slight beneficial
	Second most deprived quintile	Slight beneficial
	Third most deprived quintile	Moderate beneficial
	Second least deprived quintile	Moderate beneficial
	Least deprived quintile	Large beneficial
Noise	Neutral (scoped out)	N/A
Air quality	Neutral (scoped out)	N/A
Accidents	Children	Moderate beneficial
	Young Adults	Large beneficial
	Older people	Moderate beneficial
Security	Neutral (scoped out)	N/A
Severance	Children	Moderate beneficial
	Older people	Moderate beneficial
	Those with a LTHD	Slight beneficial
	Households with no car access	Slight beneficial
Accessibility	Most deprived quintile	Neutral
	Second most deprived quintile	Moderate beneficial
	Third most deprived quintile	Moderate beneficial
	Second least deprived quintile	Moderate beneficial
	Least deprived quintile	Large beneficial
	Children	Moderate beneficial
	Young adults	Large beneficial
	Older people	Moderate beneficial
	Those with a LTHD	Slight beneficial
	BAME residents	Large beneficial
	Households with no car access	Slight beneficial
	Households with dependent children	Moderate beneficial
Personal affordability	Neutral (scoped out)	N/A

Other Schemes

There are a number of schemes around Cambridge at various stage of development. These include;

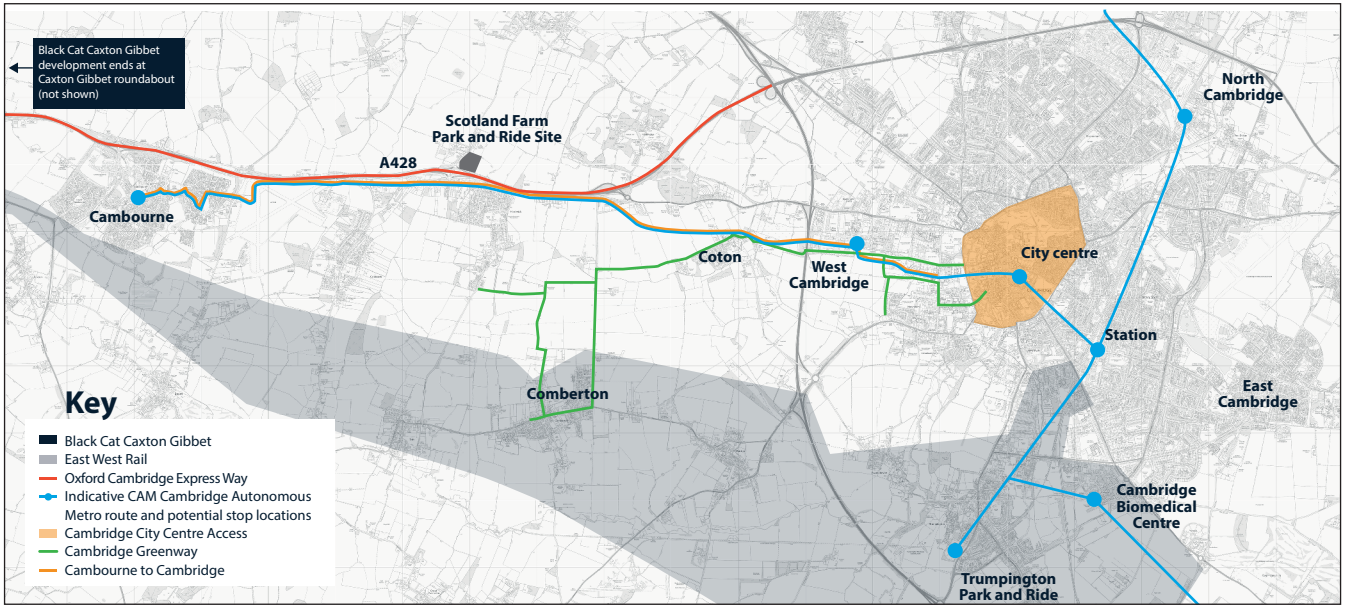
- Black Cat Caxton Gibbet
- East West Rail
- Oxford Cambridge Express Way
- CAM
- Cambridge City Centre Access
- Cambridge Greenway

Impact of the schemes on C2C

Black Cat Caxton Gibbet - This scheme complements the C2C project as it creates quicker, more reliable access to St Neots from Cambourne with the potential to extend the bus scheme via the existing A428 or to gain additional patronage from the St Neots area.

East West Rail - This scheme may complement the C2C project as one option is for a new proposed station at Cambourne, which could be used to create a multimodal Interchange location. This could lead to an increase in public transport use in general which is part of the aspirations of C2C. Conversely, there is a risk that people from Cambourne would use the train instead of the new C2C route. This may be offset by use of public transport to access rail services, and will be a limited impact because the railway will not serve intermediate developments. C2C scheme is planned for completion by 2024 in order to tackle the existing and worsening issues of congestion along the A1303 and to serve developments such as Bourn Airfield and West Cambridge. GCP would work with EW Rail to complement a potential station at Cambourne for last mile journeys by bus.

Oxford Cambridge Express Way - GCP has written to and met with Highways England to put the case for work to upgrade to Girton Interchange and enable movement between west and south. They expect to hear more on funding decisions for the second Roads Investment Strategy. Should funding be allocated, the timings for any improvements are yet to be determined and would take some time to complete. The C2C scheme is planned for completion in 2024 in order to connect growing communities and tackle worsening congestion along the A1303.



CAM - This scheme complements the C2C project as it would provide significant improvement in journey time and connectivity. The Cambridgeshire and Peterborough Combined Authority has backed the need for rapid progress and classified the Cambourne to Cambridge scheme as an essential first phase of plans for a future Cambridgeshire Autonomous Metro (CAM) network. CAM would provide a high-quality, tram-like system; it is a flexible form of public transport that can run both over or underground. CAM proposes a network of routes using tunnels under the city from 2029. The GCP will continue work closely with the Combined Authority to align plans going forward.

Cambridge City Centre Access - Investment in infrastructure is already underway. The C2C scheme proposes a segregated public transport route with end-to end walking and cycling provision and park and ride facility. City centre improvements will benefit the users of the C2C scheme either through improved journey times for public transport or better connectivity for pedestrians and cyclists.

Comberton Greenway - This scheme complements the C2C project as it also develops improved pedestrian and cyclist routes with a segregated path past the proposed bus route. It could also be used to create circular routes with the C2C to be used for pleasure and alternative pedestrian and cycling routes away from the bus route.

6. Delivering the scheme

Update on option costs

An assessment of affordability, overall scheme costs and funding certainty has been undertaken. It outlines how the costs and the scheme are to be funded/financed, including future maintenance and operational costs.

Scheme costs have been developed based upon the latest designs. The scheme cost is considered affordable and proportionate to the scale of the issues identified and the predicted benefits of the scheme.

Base cost estimates have been produced, these include preparation costs, the design, construction, land acquisition, inflation and other costs.

Costs for Scotland Farm Park and Ride site could increase if a segregated access were to be required to allow for future CAM vehicles. At present the access is with general traffic from Scotland Road but a segregated access could require a new structure over the A428.

Table 13: Base costs

Cost item	Adjusted for risk costs
Construction	£103,100,825
Design	£16,496,131
Project management	£12,133,979
Environmental mitigation	£1,742,827
Statutory undertakings	£1,100,000
Land costs	£11,114,447
Inflation	£14,800,382
Total	**£160,488,591**

Maintenance and operating costs

The potential financial costs of ongoing maintenance include:

- General inspection of the public transport route and regular maintenance/replacement
- Replacement of asphalt to footways, maintenance tracks and new highway works
- General street cleaning
- Landscaping maintenance
- Gully cleaning
- Replacement of street lighting fittings e.g. ticket vending machines
- Maintenance of stop fittings
- Maintenance of traffic signals
- Maintenance of toilet building at Park and Ride site

There are peaks and troughs with the maintenance as some of the works are carried out as part of annual highway maintenance, others such as planning and resurfacing is carried out periodically as and when the top surface reaches the end of its design life.

Operating costs and transport infrastructure have been included in the maintenance costs outlined above.

Funding

The total estimated scheme costs for the emerging strategic scheme of £160.5M are deemed affordable based on successfully securing funding from the City Deal.

Management Case

Cambridgeshire County Council (CCC) has delivered a number of large-scale transport projects across the County in recent years including:

- Milton Park and RideLonstanton and St Ives Park and Ride
- The Cambridge Core Travel Scheme
- The Addenbrokes Access Road
- The Cambridgeshire Guided Busway
- The Ely Southern Bypass

The successful delivery of these projects demonstrates CCC's ability and experience in delivering major infrastructure projects.

The C2C project has a number of factors it is dependent on to ensure its success and so the scheme design and delivery takes the following dependencies into account:

- Delivery of housing and employment sites allocated in the South Cambridgeshire Local Plan
- The emerging CPCA Policy
- The City Access Strategy
- Oxford and Cambridge Arc
- Emerging technologies

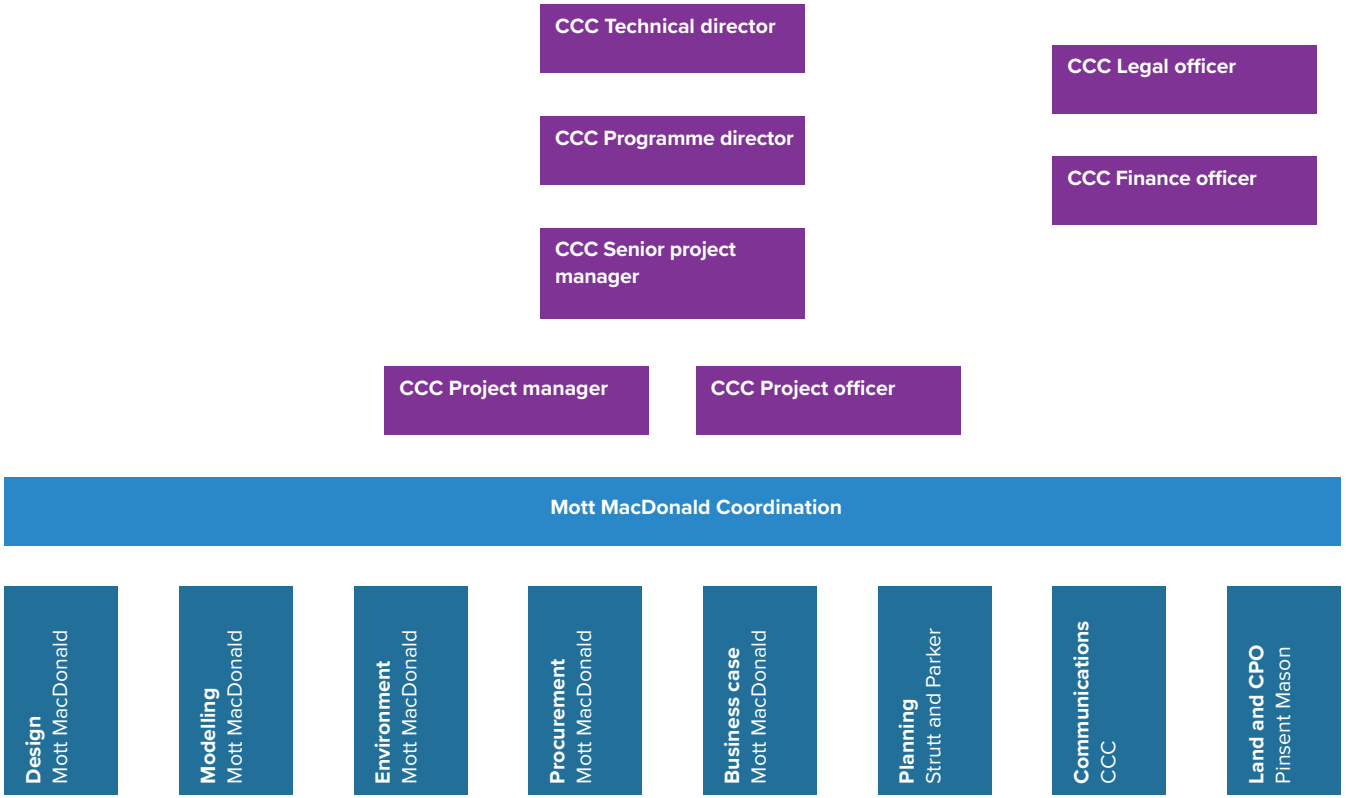
The delivery of C2C is overseen by the Greater Cambridge Partnership (GCP), who are the scheme promoters. The partnership of councils, businesses and academia seek to work together to grow and share prosperity and improve quality of life for the people of Greater Cambridge.

The GCP has a public facing, decision-making Executive Board, giving the opportunity of the general public to pose questions to be discussed in regular meetings. The GCP Executive Board is advised and informed by a Joint Assembly which is made up of 15 members offering broad expertise from councillors, businesses and academic stakeholders.

The GCP Transport Projects Board is responsible for governing all major schemes being delivered as part of the City Deal.

The project management team will manage the delivery of C2C ensuring technical and financial control and is accountable to the Project Board and ultimately the GCP Executive Board. The management of the C2C scheme is based on methodologies from the DfT and PRINCE2 and the GCP Executive Board and Joint Assembly oversees issues of key risks and issues.

The project management team structure is illustrated below:



To support the Project Board and project team in their roles, a Local Liaison Forum (LLF) of locally elected Members and stakeholders has been formed. For the varying level of project decisions that are made in relation to the scheme, the Project Manager has authority to determine which of the following categories they fall into:

- Key Decision – responsibility of GCP Executive Board
- Scope Changing Decisions – responsibility of GCP Executive Board
- Major Decision Within Scope – responsibility of the Project Board
- Project Management Decisions – responsibility of the Project Manager

The scheme will be progressed through the GCP's standard approval processes, with all decisions made by management with the appropriate level of authority depending on the type of decision being made. The management of risk and uncertainty will be key to the successful delivery of the scheme, as it will identify threats to project delivery and enable effective risk management actions to be assigned. A risk management strategy has been developed and reviewed at key stages of project development.

Public and stakeholder consultation is essential to ensure that the various aspirations of the general public and key stakeholders are taken into account throughout development and delivery of the project and to manage the communication and flow of information relating to the scheme. A Stakeholder Engagement and Communication Plan has been developed, guided by the principles of the City Deal wide communication strategy. The strategy outlines how the project will ensure that all internal and external stakeholders are informed of relevant project information. The purpose of the strategy is to ensure that accurate and timely messages about the project are disseminated to a range of identified stakeholder groups.

Monitoring and evaluation is an essential part of any infrastructure project. It provides an opportunity to improve performance by reviewing past and current activities, with the aim of replicating good practice in the future and eliminating mistakes in future work. The C2C project follows the enhanced monitoring practice and will be monitored against a set of measures in terms of key stages of the scheme.

Way forward

The high-level project milestones to date and moving forward are shown in Figure 19. This will be subject to ongoing review and approval by the GCP board.

Figure 13: Key milestones

Step 1: Work needed to establish project

- Agree the scope of project
  2014
- GCP Executive Board approval
  2014

Step 2: Work needed to identify outline concepts

- Options generation and initial sifting
  Q2 2014
- Further options assessment
  Q2 2015
- Stakeholder consultation on options
  Q1 2016
- Strategic Outline Business Case
  Q3 2016
- GCP Executive Board approval
  Q3 2016

Step 3: Work needed to identify a recommended option

- Further options assessment
  Q3 2017
- Further stakeholder consultation
  Q1 2018
- Business Case Update - Phase 1 recommended option
  Q4 2018
- GCP Executive Board approval
  Q4 2018
- Develop Design
  Q1 2019
- Stakeholder consultation
  Q1 2019
- Outline Business Case
  Q4 2020
- GCP Executive Board approval
  Q4 2020

Step 4: Work needed to achieve FBC and statutory approvals

- TWAO application
  Q3 2020
- Objection management
  Q1 2021
- Public Inquiry (if required)
  Q1 2021
- Secretary of State Decision
  Q4 2021
- GCP Executive Board approval
  Q4 2021
- Procurement
  Q1 2022
- Full Business Case
  Q1 2022
- GCP Executive Board approval
  Q2 2022

Step 5: Work needed to achieve final design scheme for approval

- Final designs
  Q1 2022
- GCP Executive Board approval
  Q2 2022

Step 6: Work needed to construct the scheme and hand over to a final operator

- Scheme construction
  Q2 2022
- Hand over
  Q4 2024
- Scheme opening
  Q4 2024

Next steps

The next step of the project would be the design development and full Environmental Impact Assessment (EIA) of the preferred option leading to a Transport Works Act Order (TWAO) submission in Q3 2020. This would include the following activities:

- Ongoing discussions and design development for the alignment from West Cambridge to Grange Road
- Reviewing the alignment through Coton to respond to stakeholder concerns regarding alignment and proximity to residents.
- Confirmation on the proposed environmental mitigation including, planting that can be achieved along St Neots Road.
- Discussion with Cambourne Town Council on the proposed travel hub in Cambourne.
- Ongoing research and assessment regarding the proposed guidance system.

Glossary

BCR: Benefit Cost Ratio, is an indicator of the overall value for money of a project or proposal.

CAM: Cambridgeshire Autonomous Metro.

Committed schemes: Schemes that are outside the control and scope of the proposed project being put forward and are due to be delivered during the forecast period.

Conservation area: An area designated under Section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990 as being of special architectural or historic interest and with a character or appearance which is desirable to preserve or enhance.

Countryside: The rural environment and its associated communities.

DI: Distributional Impacts: considers the variance of transport intervention impacts across different social groups.

Effect: The consequence of the scale of any change to the baseline environment, i.e. impact, on the environmental receptor, taking account of its particular value or sensitivity.

Environment: Our physical surroundings including air, water and land.

EIA: Environemntal Impact Assessment: A formal, structured process of evaluating the likely environmental impacts of a proposed scheme, considering inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.

FBC: Full Business Case: The culmination of the final phase is the full business case, made up of five cases:

- Strategic case.
- Economic case.
- Financial case.
- Commercial case.
- Management case.

An investment committee will consider the full business case then make a recommendation to ministers. Ministers will decide whether a proposal should proceed to implementation.

GVA: Gross Value Added: A measure of the economic productivity of an area.

HQPT: High Quality Public Transport: A system that provides high levels of speed, reliability and capacity, enabling quick, frequent and reliable journeys.

Heritage asset: A building, monument, site, place, area or landscape of historic value.

Illustrative comparator: The option which has been presented at this stage of the business case for comparative purposes.

INSET: Investment sifting and evaluation tool. Mott MacDonald's evaluation tool used in the optioneering process. INSET is an enhancement and expansion of EAST.

Landscape: The appearance of land, including its shape, form, ecology, natural features, colours and elements and the way these components combine. In towns 'townscape' describes the same concept.

Landscape character: The distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement. It creates the particular sense of place of different areas of the landscape.

Landscape feature: A prominent eye-catching element, for example, wooded hilltop or church spire.

Landscape sensitivity: The extent to which a landscape can accept change of a particular type and scale without unacceptable adverse effects on its character.

Land use: The primary use of the land, including both rural and urban activities.

LLF: Local liaison forums provide for regular dialogue between the project team and members of the local community during the course of any major transport project, ensuring interested parties are kept informed and can continue to have their say outside of formal consultation processes.

Multi Criteria Assessment Framework (MCAF): Multi-criteria assessment framework used in the optioneering assessment process.

Methodology: The specific approach and techniques used for a given study.

Mitigation: Measures, including any process, activity or design to avoid, reduce, remedy or compensate for adverse landscape and visual effects of a development project.

Modal shift: A shift from one transport type to another e.g. road travel to rail travel.

Movement: People and vehicles going to and passing through buildings, places and spaces. The movement network can be shown on plans, by space syntax analysis, by highway designations, by figure and ground diagrams, through data on origins and destinations or pedestrian flows, by desire lines, by details of public transport services, by walk bands or by details of cycle routes.

Outline Business Case (OBC): Is the second phase of the process which reconfirms the conclusions of set out in the strategic outline business case (SOBC). The OBC focuses on the detailed assessment of the options to find the best solution.

Preferred option: Option chosen based on assessment results and with board approval.

Project: Public transport improvements connecting Cambridge with towns and villages to the west. Including infrastructure to be delivered as part of this scheme as well as the City Centre Access Scheme and other developments.

Receptor: Something that makes up the environmental baseline e.g. humans or other biological species, elements of the physical environment including water, air, soil, assets that make up the cultural heritage of an area.

Recommended option: Option chosen based on assessment results prior to board approval.

Former rifle range track: Access track adjacent to Cambridge Rugby Club.

Scheme: Public transport infrastructure delivered between Cambourne and Grange Road as part of this business case/planning application.

SI: Social Impacts: Covers the human experience of the transport system and its impact on social factors.

Strategic Outline Business Case (SOBC): This sets out the need for intervention (the case for change) and how this will further ministers' aims and objectives (the strategic fit). It provides suggested or preferred ways forward and presents the evidence for a decision.

Sustainable/sustainability: The principle that the environment should be protected in such a condition and to such a degree that ensures new development meets the needs of the present without compromising the ability of future generations to meet their own needs.

Transport Appraisal Guidance (TAG): The DfT's Transport Appraisal Guidance (often referred to as WebTAG) .

Visual impact: Change in the appearance of the landscape as a result of development. This can be positive (i.e. beneficial or an improvement) or negative (i.e. adverse or a detraction).

Wider Economic Impacts (WEI): improvements in economic benefits that are acknowledged, but which are not typically captured in traditional cost-benefit analysis.

MOTT MACDONALD