ATKINS

Member of the SNC-Lavalin Group

Waterbeach to Cambridge Public Transport Study

Strategic Outline Business Case

Greater Cambridge Partnership

21 May 2021

Notice

This document and its contents have been prepared and are intended solely as information for Greater Cambridge Partnership and use in relation to Waterbeach to Cambridge Public Transport Study

Atkins Limited assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

This document has 185 pages including the cover.

Document history

Document title: Strategic Outline Business Case

Document reference: Strategic Outline Business Case

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 1.0	Working Draft for Client Comment	LI/AB	SA/LB	GJ	GH	16/07/2020
Rev 2.0	First Issue for Client Comment	LB/AT	AB	SA	GH	26/03/2021
Rev 3.0	Third Client Issue	LB	AB	SA	GH	07/05/2021
Rev 4.0	Fourth Client Issue	LB	AB	SA	GH	20/05/2021

Client signoff

Client	Greater Cambridge Partnership
Project	Waterbeach to Cambridge Public Transport Study
Job number	5192922
Client signature/date	

Contents

Tables

Figures

Executive summary

Introduction

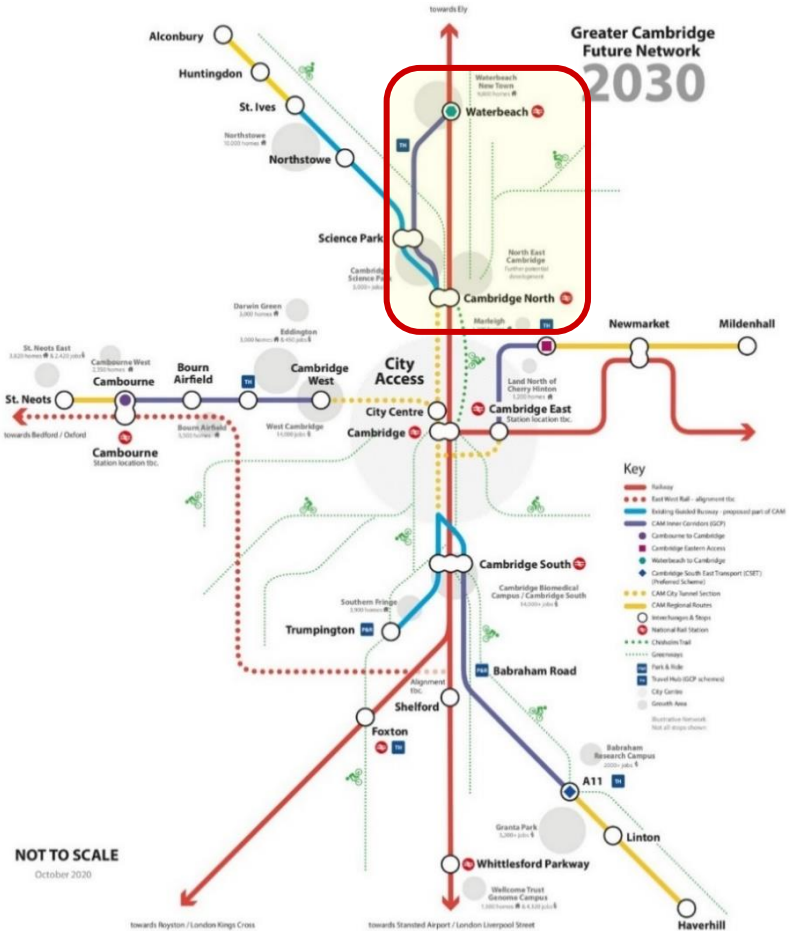
The Waterbeach to Cambridge Public Transport Study explores options to deliver a high-quality, segregated public transport route between Waterbeach New Town and Cambridge. Investment in public transport and associated active travel infrastructure is required to allow new housing and jobs to be accommodated without increasing traffic levels within this corridor and throughout the Greater Cambridge area. The study demonstrates a need for a public transport route which links with other emerging Greater Cambridge Partnership (GCP) projects in order to improve the overall transport network.

Greater Cambridge Partnership network

The GCP programme has been developed using an extensive evidence base to support sustainable economic growth and the accelerated delivery of the Local Plan. It will enable a broader transformation in the way Greater Cambridge moves and travels, supporting the transition to zero carbon and creating a more inclusive economy. The GCP's vision for a future travel network is particularly important in achieving a green recovery from the Covid-19 pandemic, with sustainable transport options vital to enable communities to access work, study and other opportunities the city-region has to offer.

To create a more sustainable network for the future, reduce congestion, improve air quality and reduce carbon emissions, a significantly higher share of trips need to be made by public transport and active travel modes than at present. Figure ES1 sets out the proposed future sustainable transport network for Greater Cambridge and how this will be substantially enhanced over the next decade, forming a cohesive network throughout Greater Cambridge and further afield.

Figure ES1 – Greater Cambridge Partnership Network



**Waterbeach to Cambridge scheme shown in the red box.*

The proposed scheme

The Waterbeach to Cambridge Public Transport Study area forms part of the wider A10 Ely to Cambridge Corridor, which is one of the key radial routes into Cambridge from the north of the City. The corridor provides the main access into the city from the north east and consists of the single carriageway A10 between Ely and the A14.

The Waterbeach to Cambridge scheme is part of the GCP's transport programme, investing devolved City Deal funding in a comprehensive package of initiatives to tackle the congestion Greater Cambridge faces now and enable it to grow in the future.

The scheme seeks to deliver a new high quality, segregated public transport route between the new town at Waterbeach, the proposed development at north east Cambridge, and onward into Cambridge. The scheme will be deliverable as a free-standing scheme but consideration will be given to other planned infrastructure within the corridor, including proposals to dual the A10, relocation of Waterbeach Station, Waterbeach Greenway, Mere Way active travel route, and Cambridge Autonomous Metro.

New routes will be served by modern, electric vehicles to limit air pollution and noise, complemented by travel hubs to encourage park and ride journeys and end-to-end space for active travel options like walking and cycling.

Strategic Outline Business Case summary

The Strategic Outline Business Case (SOBC) is the first of three stages in the Business Case development process, preceding the production of an Outline Business Case and finally a Full Business Case. Each Business Case is typically divided into five separate cases as follows:

- **The Strategic Case** describes the need for intervention and the case for change. The Strategic Case for this project demonstrates a strong case for change within the study area to:
  - accommodate the planned housing and employment growth at Waterbeach new town and north east Cambridge;
  - support local policies and strategies which identify a clear need to reduce congestion in order to enable the additional sustainable growth to be accommodated within the study area;
  - transform public transport options in this area into a high-quality, reliable and fast travel option along the route for a wide range of people which will make sustainable journeys more attractive to existing and future users;
  - provide a more resilient public transport network which is not dependent on the A10, which provides access to education, jobs and leisure trips which is currently reliant on a congested highway network;
  - enable quicker, more frequent and more reliable public transport journeys offering benefits to local people from Waterbeach and Milton, as well as further afield including Ely;
  - serve different markets to existing public transport, such as rail (as the infrastructure will provide operators with greater service flexibility); and
  - provide safe and direct active travel connections between residential and employment areas.
- **The Economic Case** describes the economic (including environmental, reliability and safety) benefits of the scheme options, determining if investment in the network would provide value for money. The Economic Case demonstrates that all four route options considered at this stage are expected to provide significant transport, environment and health benefits. The Western and Revised Central route options perform better because they are expected to generate benefits with a monetary value which exceeds the estimated costs; whereas the Revised A10 and Revised Eastern corridor options are expected to generate lower value benefits than their costs.
- **The Financial Case** describes the financial profile of the preferred scheme options and an overview of how the scheme will be funded, through public and private sector sources. The current construction cost estimates for the four options range between £47.8 million and £196.4 million:
  - Western: £54.2 million;
  - Revised Central: £55.4 million;
  - Revised A10: £196.4 million; and
  - Revised Eastern: £47.8 million.

- **The Commercial Case** provides evidence on the commercial viability of the options and the procurement strategy to be used to engage the market. GCP will provide the infrastructure and bus operators will provide the services. In terms of infrastructure, it is likely that the scheme would employ a relatively conventional highway-type construction.
- **The Management Case** describes the 'deliverability' of the options. GCP has a recognised track record of developing transport projects through to construction. The aim is to gain the required approval so that construction of this scheme may commence in 2025/2026.

Conclusions

There is a strong Strategic Case for the provision of a new, high quality, segregated public transport route with associated active travel infrastructure between the Waterbeach New Town and Cambridge. There is also public support for intervention. The SOBC sets out the basis to move forward to the next stage of the project and the delivery of an Outline Business Case for the provision of such infrastructure.

The technical work undertaken to date assesses the various merits of various route options, and on the basis of feedback from the public consultation, the SOBC sets out the case to take forward a Western Route option and a Revised Central route option as the preferred options to be reviewed in the next stage of the project.

1. Introduction

1.1. About the study

Atkins has been commissioned by the Greater Cambridge Partnership (GCP) to undertake a study to explore the options to deliver the most effective public transport connections between the proposed New Town north of Waterbeach (also referred to as Waterbeach New Town) and North East Cambridge (NEC).

The objective of this study is to identify interventions in the corridor that contribute to local policy objectives to ensure that employment and residential growth can be accommodated without increasing motor traffic levels within Cambridge and the study area. The intention is to progress a Waterbeach to Cambridge Public Transport Scheme along this preferred corridor. The study includes preparation of a Strategic Outline Business Case (SOBC) (this document) for this emerging scheme, which follows on from the Options Appraisal Report (OAR).

1.2. Study area

The study area was determined by GCP and is shown in Figure 1-1. The study also takes account of schemes across a wider area where these could affect the selection of options within the study area.

1.3. Purpose of a SOBC

The SOBC is the first phase in the Business Case process. This document "*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 decision"*[1] The need for change is evidenced in the Strategic Case (Chapter 2) and summarised in Section 7.1.

An economic appraisal has been provided in line with WebTAG guidance and proportional to this stage of assessment. Given the amount of uncertainties in the study area (such as the A10 upgrade scheme and proposed development, both committed and aspirational), the value for money assessment is considered to be indicative and subject to change as the study progresses, but does indicate the relative performance between options under the current set of assumptions.

The Financial, Management and Commercial Cases have also been provided in line with WebTAG guidance. These cases are considered to be minor at the stage and are included to give an initial indication into cost, management strategies and procurement strategies.

With the above in mind, the primary aim of this document is to demonstrate the need for the scheme which is supported by initial economic assessment.

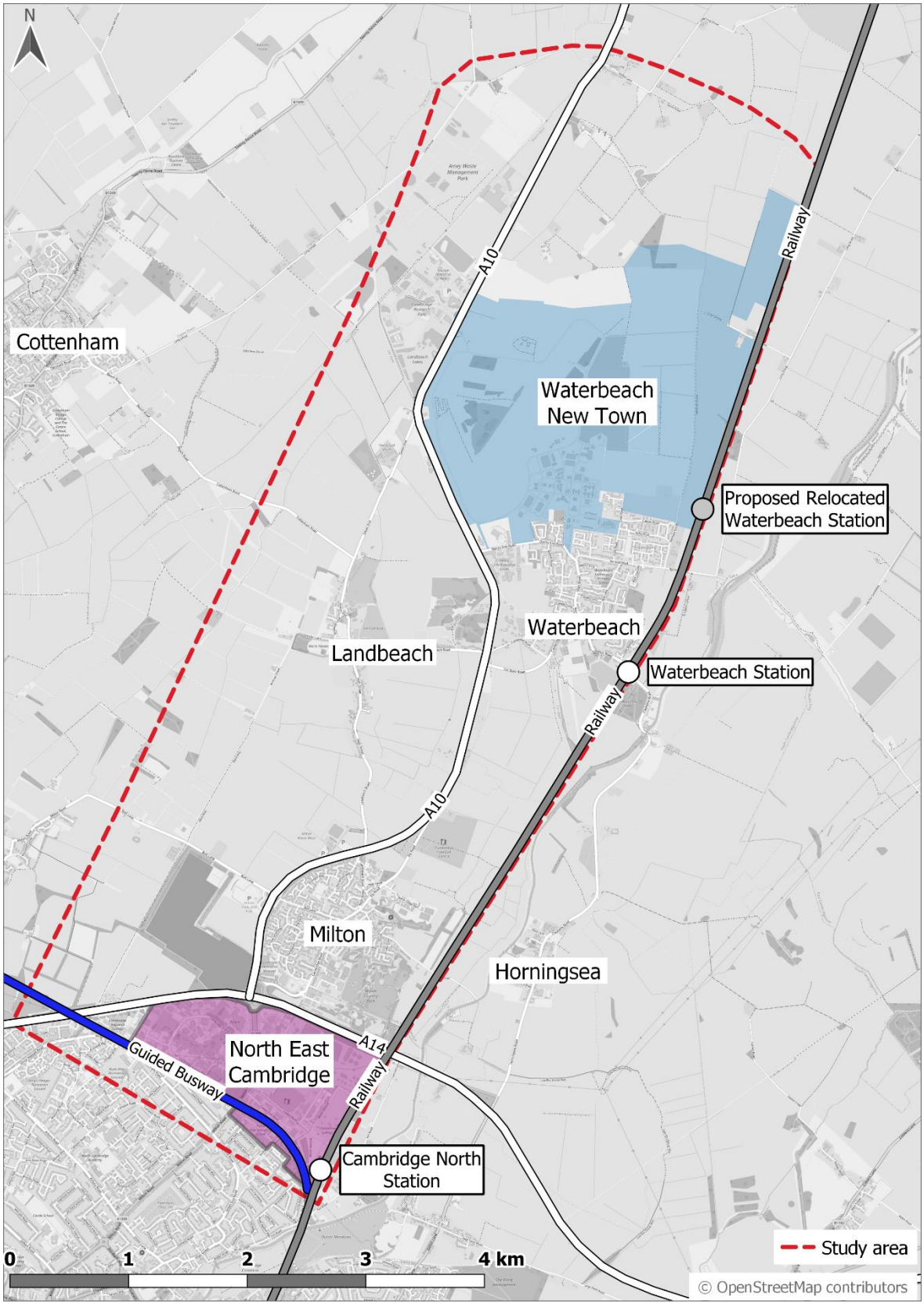
1.4. Structure of this report

The remainder of this report is as follows:

- Chapter 2 outlines the Strategic Case;
- Chapter 3 outlines the Economic Case;
- Chapter 4 outlines the Financial Case;
- Chapter 5 outlines the Commercial Case;
- Chapter 6 outlines the Management Case; and
- Chapter 7 provides conclusions and recommended next steps.

[1] Department for Transport (2013) *The Transport Business Cases.* Page 7.

Figure 1-1 - Study area



2. Strategic Case

This Chapter sets out the Strategic Case for the scheme. The objective of the Strategic Case is to provide evidence that an investment is needed, either now or in the future. At SOBC stage, the Department for Transport (DfT) document '*The Transport Business Cases*'[2] requires that the Strategic Case should contain:

- a business strategy outlining the context for the Business Case (Complete);
- a section identifying the problem to be solved (Complete);
- a section describing the impact of not changing from the existing conditions (Complete);
- the objectives that will solve the problem identified (Complete);
- the measures that will define successful delivery of the objectives (Complete);
- the scope of the project and what is out of scope (Complete);
- high level internal and external constraints (In outline);
- internal and external factors upon which the successful delivery of the project depends (In outline);
- main stakeholder groups and their contribution to the project, noting any potential conflict between stakeholders (In outline); and
- the options identified to solve the problem and an evaluation of their impact on the proposal's objectives and wider policy objectives (In outline).

2.1. Business strategy

2.1.1. The role of the Greater Cambridge Partnership

The Greater Cambridge Partnership is the local delivery body for a City Deal with central Government, bringing powers and investment, worth up to £500 million over 15 years. The aim of the City Deal Fund is to:

- deliver improvements in infrastructure, supporting and accelerating the creation of 44,000 new jobs, 33,500 new homes and 420 additional apprenticeships[3]; and
- enable growth in the Greater Cambridge area, by investing in infrastructure to sustainably unlock housing and jobs, which would encourage economic development.

The GCP has developed an assurance framework which establishes the responsibilities, processes and principles that will underpin delivery of the City Deal transport schemes. The Greater Cambridge authorities will prioritise projects that will deliver against four key strategic objectives:

- *"to nurture the conditions necessary to enable the potential of Greater Cambridge to create and retain the international high-tech businesses of the future;*
- *to better target investment to the needs of the Greater Cambridge economy by ensuring those decisions are informed by the needs of businesses and other key stakeholders such as the universities;*
- *to markedly improve connectivity and networks between clusters and labour markets so that the right conditions are in place to drive further growth;*
- *to attract and retain more skilled people by investing in transport and housing whilst maintaining a good quality of life, in turn allowing a long-term increase in jobs emerging from the internationally competitive clusters and more university spin-outs."* [4]

[2] The Transport Business Cases, Department for Transport, Table 2.1 – Contents of the Strategic Case. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/85930/dft-transport-business-case.pdf

[3] Greater Cambridge Partnership (2021) *Our Vision* https://www.greatercambridge.org.uk/ [Accessed 03.03.2021]

[4] Greater Cambridge Partnership (No Date) *Greater Cambridge City Deal* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/321722/Greater_Cambridge_City_Deal_Document.pdf [Accessed 15.04.2021]

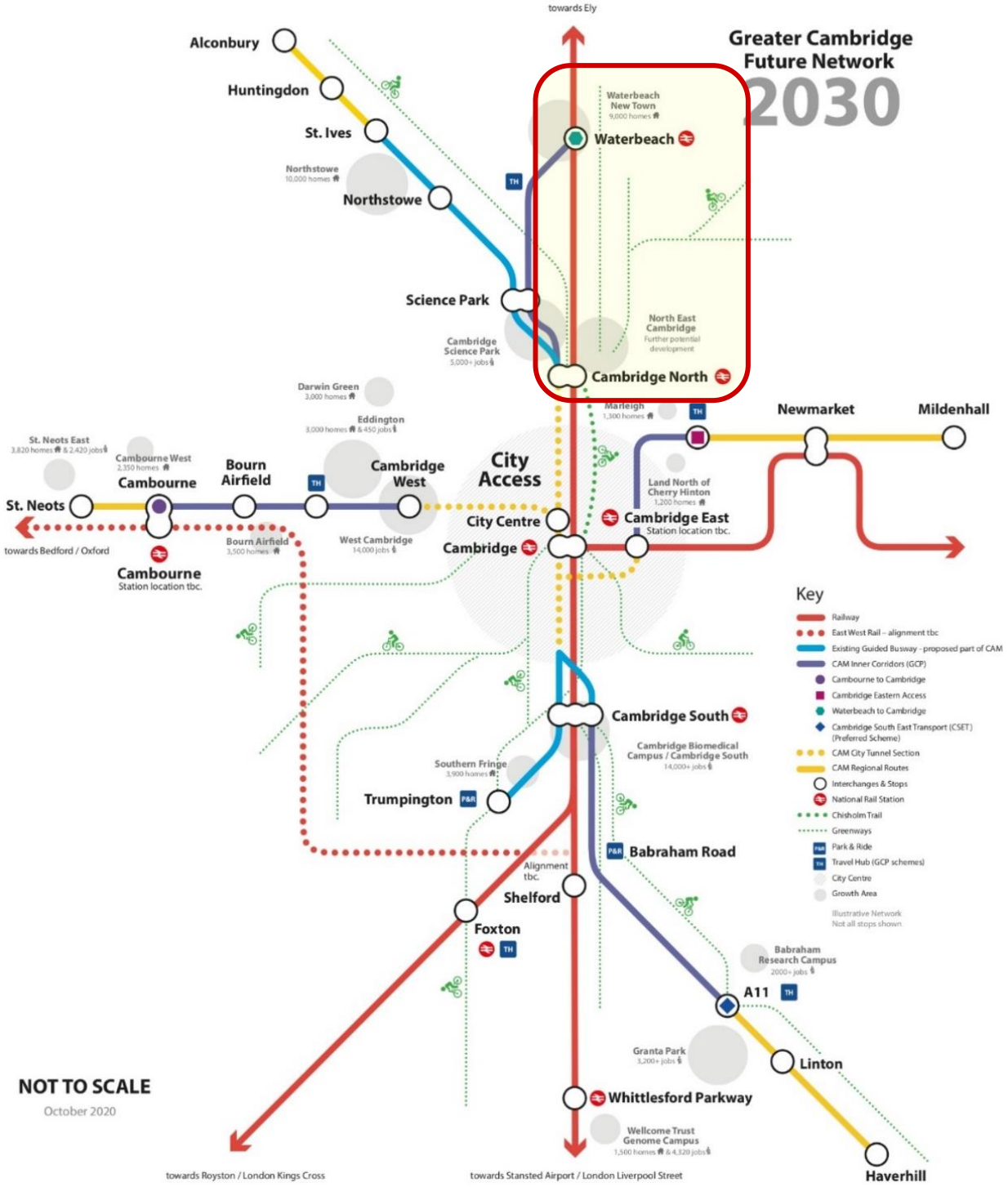
This SOBC, and in particular this Strategic Case, demonstrates that the proposed Waterbeach to Cambridge Public Transport Scheme supports all four strategic objectives.

Greater Cambridge Partnership Network

The GCP programme has been developed using an extensive evidence base and is designed to support sustainable economic growth and the accelerated delivery of the Local Plan, as well as enabling a broader transformation in the way Greater Cambridge moves and travels, supporting the transition to zero carbon and creating a more inclusive economy. The GCP's vision for a future travel network is particularly important in achieving a green recovery from the Covid-19 pandemic, with sustainable transport options vital to enable communities to access work, study and other opportunities the city-region has to offer.

To create a more sustainable network for the future, reduce congestion, improve air quality and reduce carbon emissions, significantly more people need to travel by public transport, cycling and walking with significantly fewer people travelling by car. Figure 2-1 sets out the future sustainable transport network for Greater Cambridge and how this will be substantially enhanced over the next decade, forming a cohesive network throughout Greater Cambridge and further afield.

Figure 2-1 - Greater Cambridge Network (2030) Network Map[5]



**Waterbeach to Cambridge scheme shown in the red box.*

[5] Greater Cambridge Partnership (No Date) *Maps* https://greatercambs.filecamp.com/s/N0QSzHzFpL1mWoXC/fo [Accessed 15.04.2021]

2.1.2. GCP objectives

Greater Cambridge Partnerships overarching objectives

The GCP has set out three overarching objectives to provide a direction and framework for investment. These provide the basis upon which to develop options between Waterbeach New Town to NEC. These objectives are as follows:

- **Capacity**: Provide the public transport capacity to accommodate the projected increase in travel demand associated with housing and employment growth in the period up until 2026;
- **Connectivity**: Improve accessibility to jobs and opportunities by public transport and active travel modes through a reduction in journey times and increased ease of interchange; and
- **Communities**: Contribute towards the creation of safe and attractive communities by reducing emissions, severance and the dominance of traffic, improving personal security and road safety.

These objectives reflect current national, regional and local policy and GCP schemes should endeavour to support all three objectives. The proposed Waterbeach to Cambridge Public Transport Scheme supports these objectives, as the scheme would improve public transport capacity within the corridor, connect communities with jobs by quicker, more frequent and more reliable public transport journeys, and improved new and existing communities, including Waterbeach and Waterbeach New Town by reducing emissions, car trips and ensuring the proposed routes are as safe as possible.

Study objectives

The objectives of this study objectives set by GCP at the project inception are as follows:

1. To identify a variety of deliverable options which will improve the reliability, safety, capacity, and speed of sustainable transport connections between the proposed Waterbeach New Town and north east Cambridge. Measures should have the aim of reducing the number of vehicles driving into Cambridge and could include:
    - segregated rapid transit options;
    - bus priority measures;
    - improvements to park and ride provision; and
    - interchange capacity – between car, bus, rail, CAM, walking and cycling.
2. To identify measures that allow for the relocation of Waterbeach railway station as part of the proposals for the Waterbeach New Town. However, the relocation of the station itself does not form part of the study.
3. To ensure integrated walking and cycling routes are inherent in all proposals.
4. To generate options that support the reduction of traffic levels in Cambridge to 10%-15% below 2011 levels, which equates to a 24% reduction from 2018 traffic levels.
5. To generate sustainable options that address transport demand from the proposed Waterbeach New Town and enable development at NEC to proceed.
6. To address known transport problems in the corridor by generating options for ‘quick-wins’ that are deliverable over a period of one to two years.
7. To improve connectivity between existing settlements and to work with Cambridgeshire County Council (CCC), Cambridgeshire and Peterborough Combined Authority (CPCA) and other stakeholders to identify the best package of measures aimed at ensuring connectivity is in place at the opening of new developments, thereby reducing the propensity for trips to be made by private car.[6]

[6] Greater Cambridge Partnership (2019) New Town North of Waterbeach to Cambridge Public Transport Study Specification. [Pages 6 and 7]

2.2. Problem identified

The study area encompasses a transport corridor that already experiences congestion, as identified in previous studies[7]. This will worsen with significant housing (including the development of Waterbeach New Town) and employment developments (including NEC) at either end of the corridor without further transport capacity being provided. Significant transport intervention is required to facilitate growth in the corridor to ensure that transport connectivity does not become more constrained. The sections below outline the policies driving growth in the area and details of the existing transport networks, where current problems are forecast to become worse and new problems are forecast to appear as a result of the growth strategy for the corridor.

2.2.1. Policy background

A policy review has been conducted to understand the wider political context and support for interventions within the study area. This policy review is set out in Appendix A of the OAR and is summarised below. The following policy documents have been reviewed:

- the South Cambridgeshire Local Plan (2018);
- the Cambridge Local Plan (2018);
- the Cambridgeshire and Peterborough Local Transport Plan (LTP) (2021);
- the Cambridgeshire and Peterborough Interim Local Transport Plan (2017);
- the Cambridgeshire Local Transport Plan 2011-2031 (2015);
- the Cambridgeshire Local Transport Plan 2011-2031: Long Term Transport Strategy (2015);
- the Transport Strategy for Cambridge and South Cambridgeshire (2014);

the Waterbeach Supplementary Planning Document (2019); and the North East Cambridge Area Action Plan (2020). The policy review shows that the Waterbeach to Cambridge Public Transport Scheme strongly supports local policy, as it will help to facilitate economic growth, create safer and more attractive communities, provide real transport choice through which to reduce reliance on the car and the impact of travel on the environment.

New policies and strategies relevant to the study have been published following the publication of the OAR namely:

- **England's Economic Heartland – Transport Strategy (Summer 2020)[8]:** A new sub-regional strategy to improve connectivity to support the 'Green Recovery' from the Covid-19 pandemic and to support new zero carbon emission targets. Some key aspects of the strategy include:
    - harnessing the region's expertise in clean technologies to deliver a greener transport system;
    - investment in East West Rail and mass transit systems such as the Cambridgeshire Autonomous Metro (CAM) and Milton Keynes Mass Rapid Transit system as a catalyst for transforming public transport across the Heartland;
    - championing digital technologies to make transport smarter; and
    - improving local and rural connectivity.
- **Emerging New Joint Greater Cambridge Local Plan:** Following the adoption of both the Cambridge and South Cambridgeshire Local Plans, both authorities commenced a review and the production of a new joint Greater Cambridge Local Plan spanning both local authority areas, to plan and allocate sites more effectively over the region. The Plan is currently at the 'Call for Sites' stage and could take up to three years to adopt. The new Greater Cambridge Local Plan is for a period up to 2040, and possibly beyond[9].

The Waterbeach to Cambridge Public Transport Scheme will provide improved connectivity for communities in the study area for onward travel throughout England's Economic Heartland. The scheme would also support additional sustainable growth locations, beyond this Local Plan period.

---

[7] Mott MacDonald, on behalf of the Greater Cambridge Partnership (2018) Ely to Cambridge Transport Study: Preliminary Strategic Outline Business Case

[8] England's Economic Heartland (2020) *Regional Transport Strategy* https://eeh-prod-media.s3.amazonaws.com/documents/Connecting_People_Transforming_Journeys_av.pdf

[9] Greater Cambridge Shared Planning (2020) *The First Conversation* Page 4.

Policy growth areas

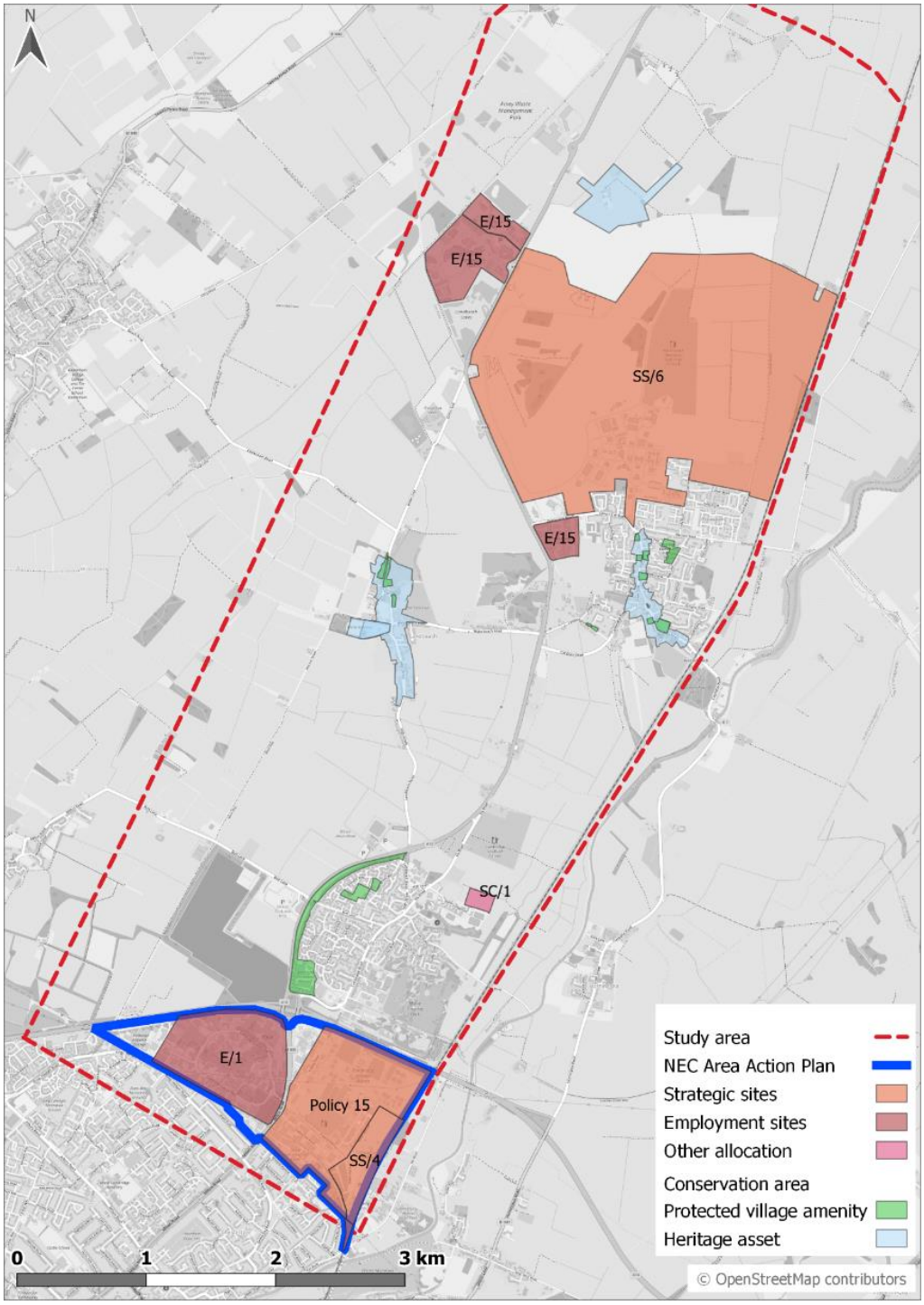
A recurring theme area of these documents is the extensive proposed growth in the study area. The Cambridge and South Cambridgeshire Local Plans identify a need for 33,000 homes and 44,000 jobs by 2031 and the study area has been identified as a key area in which to contribute towards this growth. Development sites include:

- Waterbeach New Town (up to 11,000 homes[10]), identified under Allocation SS/6; and
- NEC (up to 17,000 new homes and 14,000 new jobs), identified under Allocation SS/4 and Policy E/1, which includes:
  - redevelopment and intensification of existing employment centres in NEC (Cambridge Science Park, Cambridge Business Park, Trinity Hall Farm Industrial Estate, St John's Innovation Park); and
  - mixed-use development of the waste water treatment plant.

The locations of these sites and other relevant allocations and policies are shown in Figure 2-2. Further details on the major developments is in Section 2.3.

[10] Urban and Civic website: https://www.urbanandcivic.com/projects/strategic-sites/waterbeach-barracks/site-details and RLW estates website: http://www.waterbeach.co.uk/post.php?s=2018-06-05-planning-application-submitted-by-rlw-estates-for-up-to-4500-homes-at-waterbeach

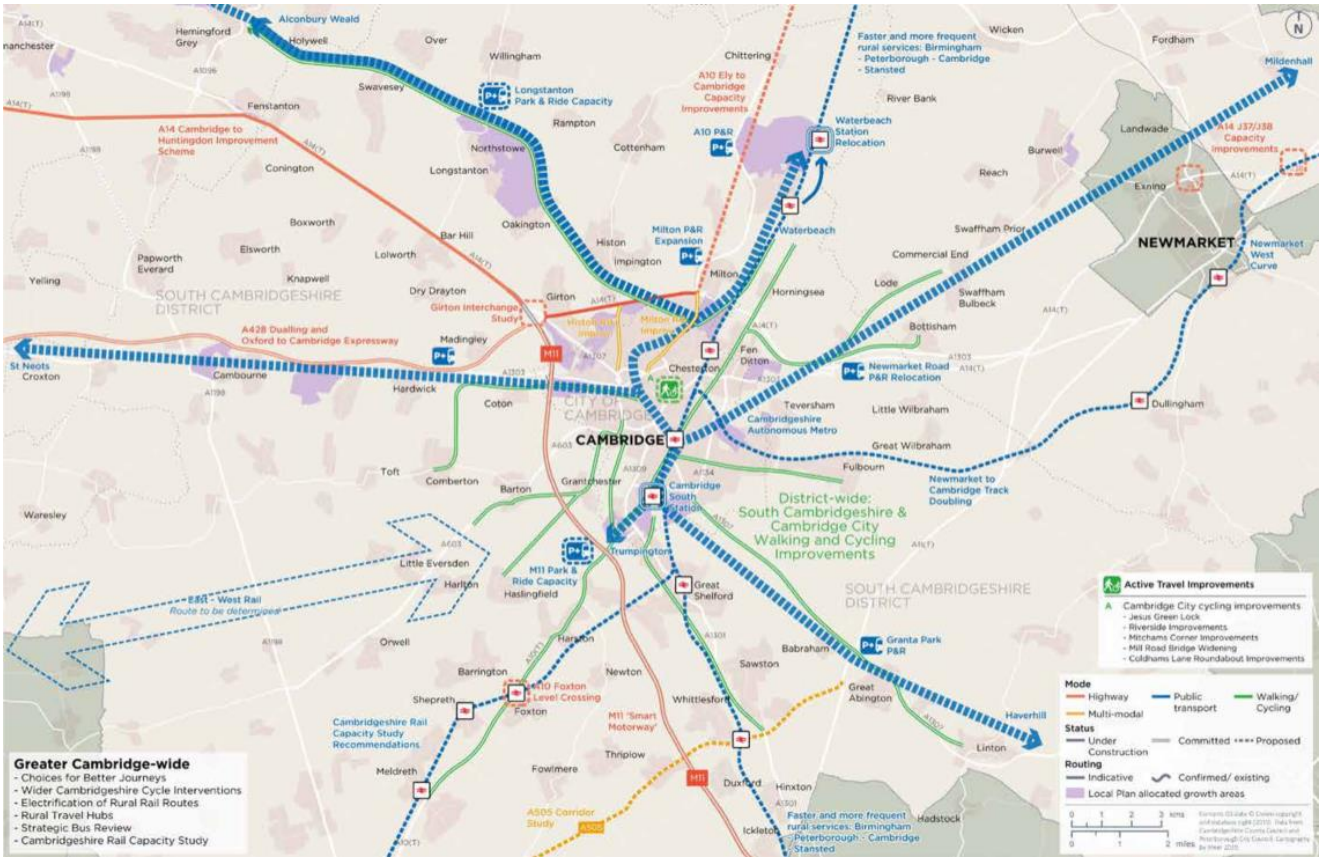
Figure 2-2 - Location of key allocation and policy sites



Another key policy area is the need for sustainable transport to solve existing congestion and connectivity issues in the study area, and to enable this growth to occur. The CPCA LTP identifies that public transport, walking and cycling need to be significantly upgraded to improve people's journeys into and around Greater Cambridge and reduce car dependency[11]. Figure 2-3 shows the key transport projects in Greater Cambridge from the CPCA LTP that aim to overcome the challenges faced by the Cambridge region.

[11] Cambridgeshire and Peterborough Combined Authority (2021) *The Cambridgeshire and Peterborough Local Transport Plan* [Page 96]

Figure 2-3 – Key projects in Greater Cambridge[12]



Public transport schemes are represented in blue in Figure 2-3, with the thick blue dashed line representing the GCP network. A new park and ride on the A10 is also identified in the LTP, as is an expansion at the existing Milton Park and Ride site.

2.2.2. Evidence base

Several previous studies have examined the constraints and potential transport options in this corridor. The previous studies that have been referred to are:

- Bus Strategy – Bus Route Option Study (2009);
- A10 Transport Corridor Constraints Study (2012);
- Waterbeach Busway Options Study (2014);
- A10(N) Corridor Constraints Study (2016);
- Ely to Cambridge Transport Study – Preliminary Strategic Outline Business Case (2018); and
- Ely to Cambridge Transport Study: Strand 2 New Town North of Waterbeach Transport Report (2018).

These studies are summarised in Appendix A, including the evidence base they provide and their findings.

2.3. Growth and development

2.3.1. Committed and planned developments

Waterbeach New Town and NEC are two major mixed-used development sites located within the study area which would increase transport demand once constructed.

[12] Cambridgeshire and Peterborough Combined Authority (2021) *The Cambridgeshire and Peterborough Local Transport Plan* [Page 97]

New Town North of Waterbeach

A proposed New Town north of Waterbeach, which could accommodate up to 11,000 homes, is being delivered by two developers: Urban and Civic and RLW Estates. Outline planning permission has been granted for the Urban and Civic site, comprising up to 6,500 dwellings in addition to business, retail, community, leisure and sports uses, a hotel, new primary and secondary schools, and green spaces including parks, ecological areas and woodlands[13]. On 11th March 2020 a planning application for Key Phase 1[14], for the first 1,600 homes on the Urban and Civic site, was submitted and is awaiting a decision. A Design Code has also been approved for the development, which specifies the design requirements and guidelines for Key Phase 1[15].

On the 29th January 2021, South Cambridgeshire District Council (SCDC) approved RLW Estates' planning application for a 4,500-dwelling development with business, retail, community, leisure and sports uses, new primary and secondary schools and sixth form centre, and public open spaces including parks and ecological areas[16].

The proposed Waterbeach New Town represents around a third of the proposed development set out in the Local Plans and therefore will significantly increase demand along the A10 corridor. Without additional transport infrastructure to provide additional travel capacity, this development may be constrained. As such, it is envisaged that Waterbeach New Town will be serviced by quicker, more frequent and more reliable transport links, which are the subject of this study.

The proposed high-quality public transport infrastructure would, as a minimum, extend as far as the proposed Waterbeach New Town centre. The current planning assumption is that it would continue eastwards to the relocated Waterbeach Station, if and when delivered. Transit services would be able to operate off the dedicated infrastructure, so would also be able to serve other areas of the New Town, and/or continue north towards Cambridge Research Park and beyond, as required to meet travel needs.

A high-level initial assessment has been undertaken of the most effective service routing at the northern end of the study area, including whether a service using the high-quality public transport route should serve the relocated Waterbeach Station and/or Cambridge Research Park.

The assessment shows that, to maximise achievement of the aims of the Study to provide a quicker, frequent and reliable services between Waterbeach and Cambridge, the preferred option for routing towards the north of the study area is to run a mix of direct services and services via the relocated station. This option would serve the main areas of demand with fast and direct services and provide connectivity to key transport hubs. A new public transport scheme would offer major benefits for commuters to and from Waterbeach New Town, therefore unlocking sustainable growth in this corridor.

It is proposed that two alternative services are provided; one that serves Cambridge Research Park directly and the other that terminates at the relocated Waterbeach station. Connectivity between Cambridge Research Park and the relocated Waterbeach Station is likely to be covered by a local stopping service and/or the Research Park shuttle.

Figure 2-4 shows the spatial framework for the New Town.

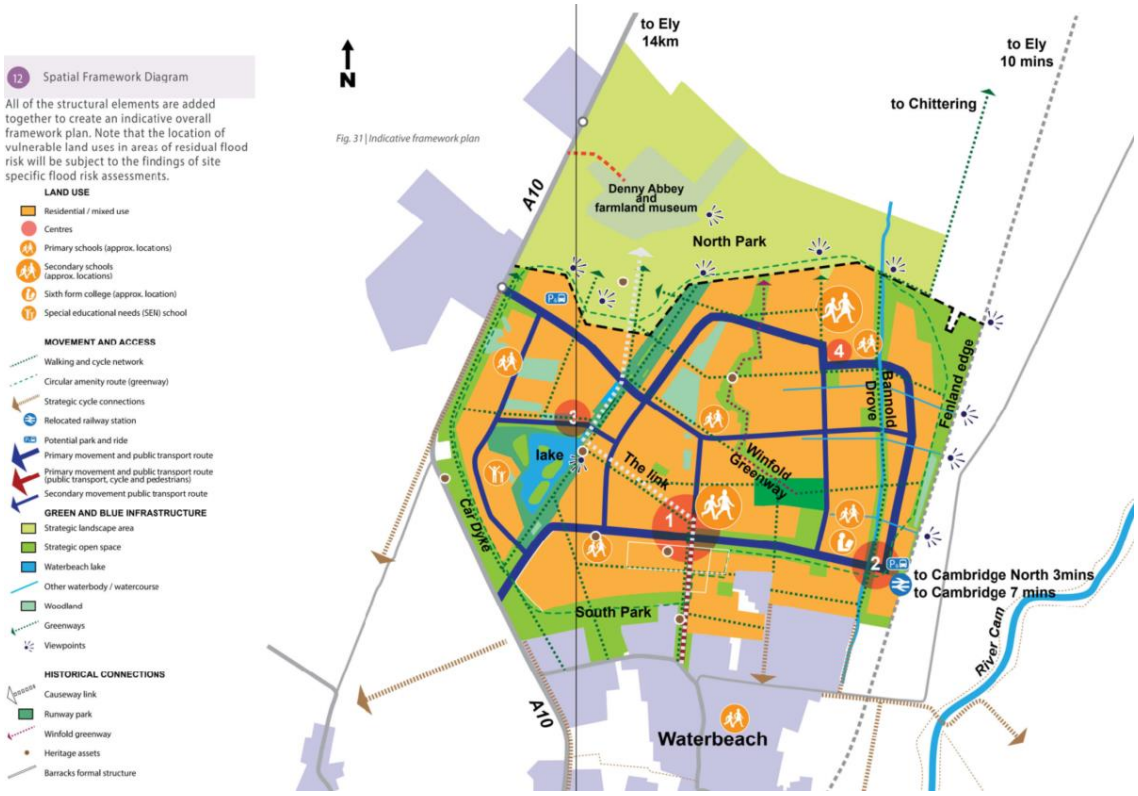
[13] Planning application: S/0559/17/OL.

[14] Planning application: 20/01649/REM

[15] Planning application: S/4383/19/DC

[16] Planning application: S/2075/18/OL

Figure 2-4 – Spatial framework layout for the proposed Waterbeach New Town[17]



North East Cambridge development

The NEC development comprises several sites, including (landowner or developer shown in brackets):

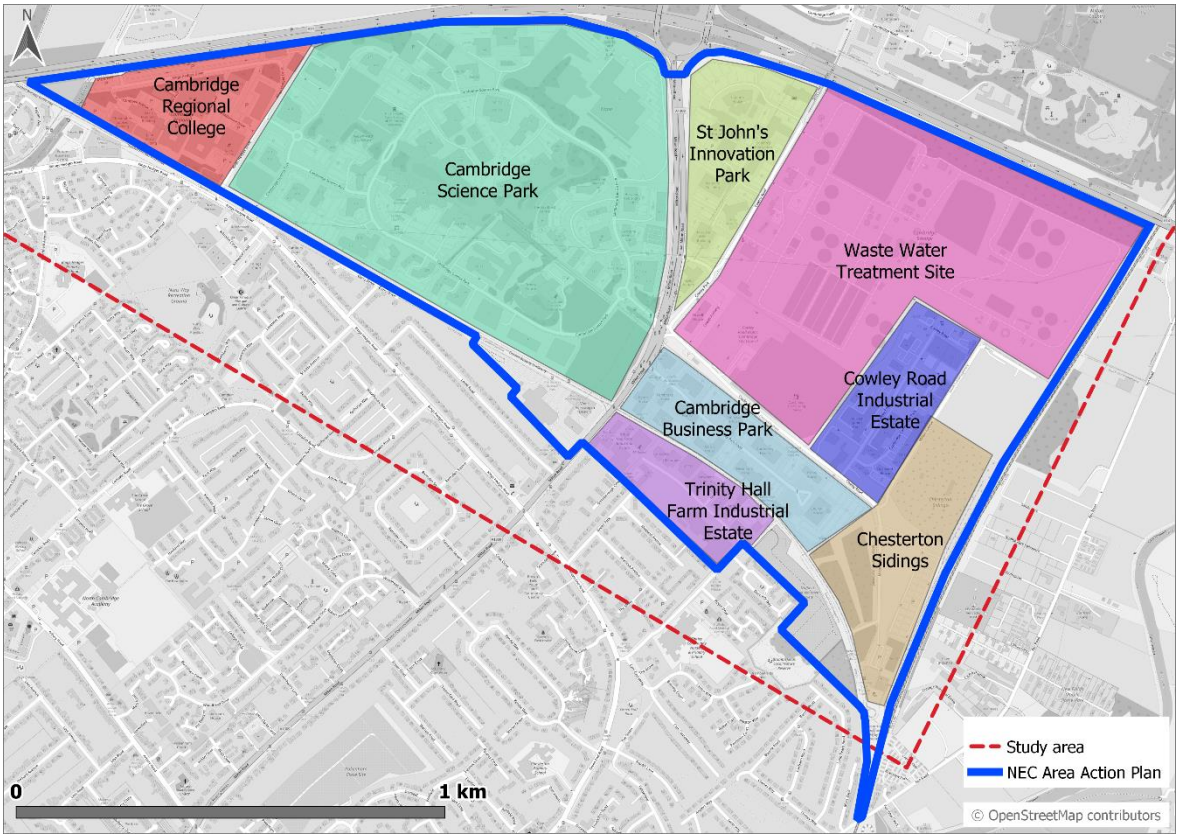
- Cambridge Science Park (Trinity College);
- Cambridge Business Park (The Crown Estate);
- Trinity Hall Farm Industrial Estate (Trinity Hall Farm / Dencora);
- St John's Innovation Park (St John's College);
- Chesterton Sidings (Network Rail / Brookgate / DB Schenker);
- Cambridge Regional College (Cambridge Regional College);
- The wastewater treatment plant (Anglian Water, plus some land owned by Cambridge City Council (CCiC); and
- Nuffield Road and Cowley Road Industrial Estates (various, including CCiC).

The Tarmac Aggregates facility lies within the NEC boundary but as yet does not have any plans for redevelopment.

The existing site layout is shown in Figure 2-5.

[17] South Cambridgeshire District Council (2019) Waterbeach New Town: A Spatial Framework and Infrastructure Delivery Plan. Supplementary Planning Document [Page 72-73].

Figure 2-5 - Existing sites in NEC proposals[18]



There are approximately 12,000 jobs across the existing sites. There are plans to intensify the area, providing an additional 18,200 to 27,000 jobs and 8,000 dwellings. As such, the NEC area could account for over half of job growth and a quarter of homes proposed in the Local Plan. Therefore, this area is susceptible to worsening congestion resulting in poorer air quality caused slow moving traffic.

The NEC development is currently served by local bus services, including the Milton Park and Ride service, and is proposed to be serviced by new transport links which have been considered within this study. Figure 2-6 shows the latest indicative concept plan within NEC, which will interact with the proposed schemes set out in this study, from the draft Area Action Plan published in June 2020[19].

The owners of the Cambridge Science Park development have aspirations for the site to be redeveloped and expand. The developers are seeking to re-design the frontage of the site to abut the existing Cambridge Guided Busway (CGB) alignment, with a view to increasing permeability to the site from the south. The vision is to make the NEC development a sustainable campus and therefore public transport is seen as a vital component.

All the options considered in this report, would support achievement of the strategic vision of the NEC development by enabling quicker, more frequent, and more reliable public transport journeys to and from surrounding villages and Waterbeach New Town. It is expected that the CGB and Waterbeach to Cambridge service patterns would be integrated to maximise service frequency. This would be agreed with service operators at a later stage when the operational aspects are considered in detail. Moreover, all options would support the delivery of economic growth in NEC within current traffic levels.

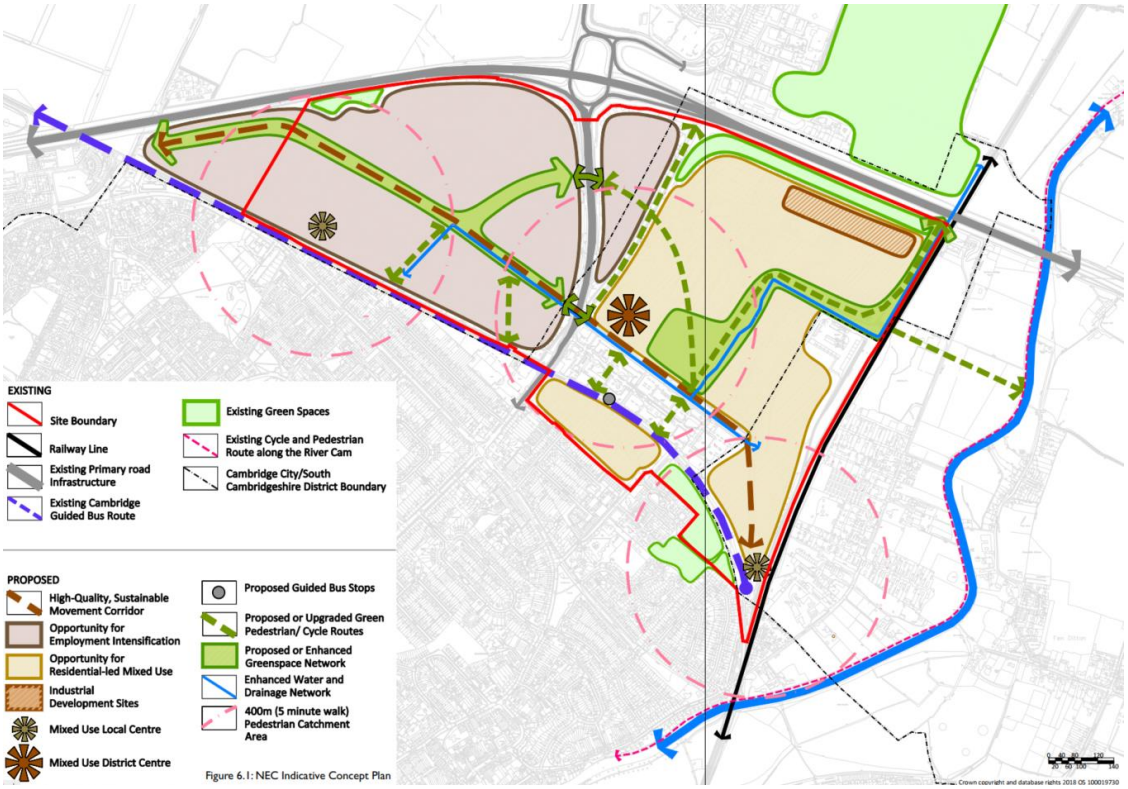
Providing sustainable infrastructure for NEC will provide access to jobs and education, whilst improving links to other local transport hubs such as Cambridge North Station and Milton Park and Ride for onward travel beyond the study area.

Moreover, additional transport links would support NEC growth aspirations by improving the transport capacity within the local area meaning more people can move between residential and employment areas.

[18] Information provided by the GCP.

[19] Greater Cambridge Shared Planning '*Draft Area Action Plan Evidence Base and Supporting Documents*' https://www.greatercambridgeplanning.org/emerging-plans-and-guidance/north-east-cambridge-area-action-plan/draft-area-action-plan-evidence-base-and-supporting-documents/ Accessed 29th June 2020

Figure 2-6 - NEC indicative concept plan[20]



2.3.2. Size of existing and future travel markets

Several key travel markets have been identified, comprising existing communities and future developments. The largest markets are expected to be journeys to or from the following locations within the study area:

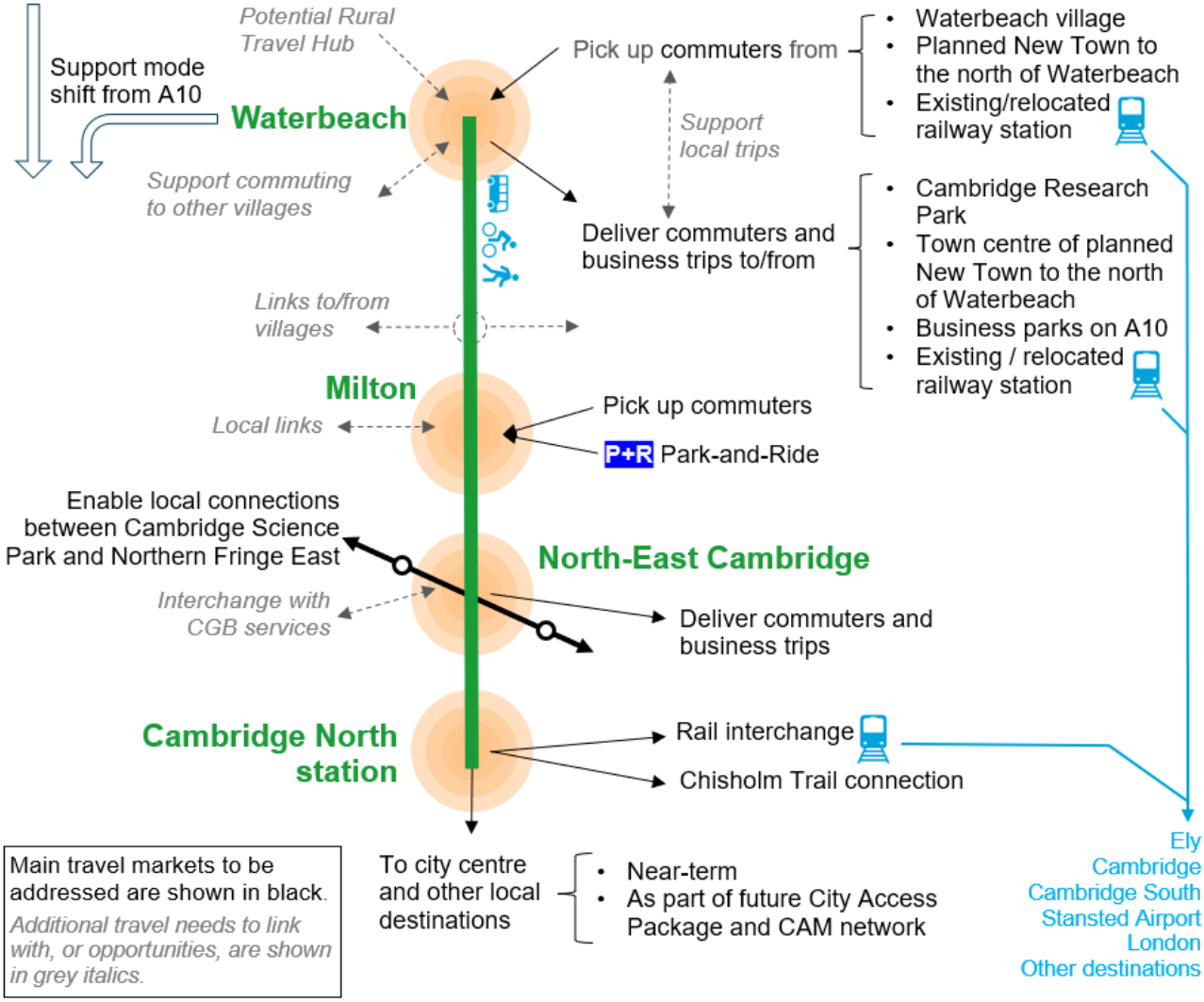
- Waterbeach (including the proposed Waterbeach New Town);
- Milton village;
- the NEC development, including Cambridge Science Park and other employment centres; and
- Cambridge North station.

Figure 2-7 highlights the travel markets that could be serviced by new transport links proposed in this study and summarises onward travel links. It should be noted that:

- The central green line shows the overall improved connections required from the project. The black lines and text show the main types of trip that these connections aim to serve;
- Figure 2-7 is not intended to imply that a single, linear intervention is preferred. The requirements could potentially be met through a combination of sustainable travel corridors and does not imply a single public transport route covers all markets;
- Orange circles represent key areas to be connected and not individual 'stops' or entry/exit points; and
- Dotted lines and grey italic text show potential additional synergies to be considered.

[20] Extract from North East Cambridge Area Action Plan – Issues and Options (2019) [Pages 84 and 85].

Figure 2-7 - Study area travel markets



As shown in Figure 2-7 the markets served by new transport links vary in size. The proposed Waterbeach New Town (11,000 dwellings and 40,000 sqm of employment use) and NEC area[21] (8,000 dwellings and approximately 330,000 sqm of employment use) represent the largest markets within the area.

Whilst the existing Waterbeach and Milton villages represent smaller markets, they account for approximately 3,700 dwellings in total and therefore proposed transport schemes should aim to service these villages where possible.

The scale of housing and employment for existing and future developments in the study area is shown in Table 2-1 and corresponds to the anticipated level of demand for transport services. As an indication of the relative scale of the commuter markets, Cambridge city centre has between 23,500[22] and 28,500[23] employees, which would equate to approximately 312,000 sqm of general office land use[24]. The figures provided have been obtained from a variety of sources including 2011 Census data and information provided by GCP.

[21] It should be noted that as NEC area covers a significant area (both east and west sides of Milton Road), a proposed scheme should seek to service multiple areas of the development.

22 CSRM2 2015 estimate for jobs in the area roughly corresponding to the Cambridge 007 MSOA

23 TEMPRO 2015 estimate for jobs in the Cambridge 007 MSOA

24 Homes and Communities Agency (2010) Employment Densities Guide https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/378203/employ-den.pdf Accessed 14th July 2020

Table 2-1 – Levels of housing and employment in existing and future developments

Development	Existing scale of development	Proposed scale of development
Waterbeach New Town[25]	Proposed development	11,000 dwellings; 25,500 sqm retail; 39,800 sqm employment use; 21,235 sqm leisure and community use
Waterbeach village[26]	2,070 dwellings	No significant growth planned
Milton village	1,765 dwellings (2011 census)	No significant growth planned
Cambridge Research Park[27]	41,660 sqm employment	315 sqm retail; 27,885 sqm employment
Waste water treatment plant	Approximately 44 ha	5,500 dwellings; 3,700 sqm retail; 23,500 sqm employment; 5,700 sqm community use
Cambridge Science Park	160,000 sqm employment[28]	1,000 sqm retail; 109,969 sqm employment; 100 sqm community use[29]
St John's Innovation Park	24,137 sqm employment[30]	100 sqm retail; 35,000 sqm employment
Cambridge Business Park	30,193 sqm employment[31]	500 dwellings; 1,500 sqm retail; 68,000sqm employment
Trinity Hall Farm Industrial Estate and Nuffield Road Industrial Estate	22,443 sqm employment	550 dwellings; 1,500 sqm employment
Chesterton Sidings	Proposed development	730 dwellings; 1,000 sqm retail; 55,000 sqm employment 100 sqm community use

The residential developments alone could lead to an increased demand of between 15,000 and 20,000 person trips[32] in the AM and PM peak hours across all modes of transport. Whilst not all these trips will be to or from Cambridge or will use the full length of the corridor, a significant proportion are likely to do so. If no interventions to increase capacity are made, this will increase the demand in the corridor and could saturate areas of the existing transport network, such as the currently congested Milton Interchange.

25 Planning applications S/0559/17/OL for Waterbeach New Town (west) and S/2075/18/OL for Waterbeach New Town (east)

26 Waterbeach Parish Council (2019) Waterbeach Neighbourhood Development Plan 2020 to 2031

27 Planning application S/4615/18/OL

28 Odyssey, on behalf of Trinity College Cambridge and Cambridge Science Park (2018) Cambridge Science Park Transport Strategy

29 Greater Cambridge Shared Planning (2020) North East Cambridge Draft Area Action Plan

30 St John's Innovation Park (2020) St John's Innovation Park: Buildings https://www.sjip.co.uk/buildings/ Site accessed 14th July 2020

31 Cambridge Business Park (2020) Cambridge Business Park https://www.cambridgebusinesspark.co.uk/ Site accessed 14th July 2020

32 Based on estimates of trip rates from TRICS database, version 7.6.4.

Demand for travel in the corridor

An assessment has been undertaken of the relative importance, in travel demand terms, of the key markets in the corridor. The analysis is summarised below and presented in full, including methodology and limitations in Appendix B.

The travel markets assessed as part of this exercise are the same as those outlined in Table 2-1 although the NEC development has been divided into eastern and western sections (split at Milton Road) to better understand the impact of corridor options that only serve one side of the NEC development.

Development trips have been calculated using three TRICS[33] land use categories for residential, business and educational developments for the morning peak period (07:00-10:00), evening peak period (16:00-19:00) and daily trips (07:00-19:00). The trip rates are presented in Appendix B.

The total number of trips generated by each travel market in the study area has been estimated by multiplying the level of existing and proposed development (shown in Table 2-1 and in Appendix B), by the trip rates. A summary of the forecast number of trips generated or the morning and evening peak periods and daily totals are shown in Table 2-2.

Table 2-2 - Total number of trips for existing and future travel market in the study area[34]

Travel Market	Morning peak period 07:00-10:00			Evening peak period 16:00-19:00			Daily 07:00-19:00		
	Arr.	Dep.	Total	Arr.	Dep.	Total	Arr.	Dep.	Total
Cambridge Research Park	2,500	400	**2,900**	300	2,200	**2,500**	4,000	4,000	**8,100**
Waterbeach New Town	14,600	19,500	**34,100**	15,600	10,800	**26,400**	52,400	54,900	**107,300**
Waterbeach village	1,200	3,100	**4,300**	2,800	1,400	**4,200**	7,400	7,900	**15,300**
Milton village	1,000	2,700	**3,700**	2,400	1,200	**3,600**	6,300	6,700	**13,100**
NEC (west)	9,800	1,400	**11,200**	1,200	8,500	**9,700**	15,700	15,600	**31,300**
NEC (east)	19,400	13,800	**33,200**	13,700	15,000	**28,700**	46,100	47,800	**93,900**
NEC (total)	29,200	15,200	**44,400**	14,900	23,400	**38,300**	61,800	63,400	**125,200**
Total	***48,500***	***40,900***	***89,400***	***36,000***	***39,100***	***75,100***	***131,900***	***136,900***	***269,000***

Table 2-2 shows that that Waterbeach New Town and the NEC development are likely to be the key drivers of demand in the corridor, with Waterbeach village, Milton village and Cambridge Research Park making smaller contributions to overall trips and trips in the corridor.

Estimates have been made on the geographical distribution of these forecast trips based on three categories:

- those internal to the larger developments such as Waterbeach New Town;
- those that use the corridor; and
- those that do not use the corridor (for example, where Waterbeach New Town residents travel northwards or eastwards out of the corridor).

The trip distribution for each travel market was derived using trip origins and destinations from the 2011 Census travel to work dataset at the Lower Level Super Output Area level. For new developments, such as Waterbeach New Town, data from the most local postcode area was such (for example, CB25 data was used to calculate the Waterbeach New Town trip distribution).

33 TRICS is an industry standard software used to predict trip rates for certain types of developments. The software uses empirical data from assessment for new developments. TRICS v7.7.2 was used for this assessment.

34 Appendix B breaks down the trips by TRICS category for each market by period.

The trip generation totals represent a future scenario in which all developments are built out. It does not reflect a specific time period.

The estimated trip distribution proportions for each travel market are summarised in Table 2-3. A detailed assessment of trip distributions is provided in Appendix B.

Table 2-3 - Trip distribution for travel markets[35]

Travel market	Internal (to development) trips		Trips using corridor (to/from the north)[36]		Trips using Corridor (to/from the south)[37]		Trips not using the corridor	
	Proportion of trips	Total daily Trips	Proportion of trips	Total daily trips	Proportion of trips	Total daily Trips	Proportion of trips	Total daily Trips
Cambridge Research Park	31%[38]	**2,500**	N/A	**-**	48%	3,900	20%	**1,600**
Waterbeach New Town	48%	**51,500**	N/A	**-**	31%	20,800	21%	**22,300**
Waterbeach village	27%	**4,100**	2%	**350**	43%	6,600	28%	**4,300**
Milton village	31%	**4,000**	12%	**1,600**	36%	4,700	21%	**2,700**
NEC (west)	15%	**4,800**	24%	**7,400**	N/A	-	61%	**19,100**
NEC (east)	29%	**26,800**	25%	**23,600**	N/A	-	46%	**43,600**

Table 2-3 shows that slightly more trips are likely to be generated from the south of the corridor travelling north than trips coming from the north. Some 68,900 daily trips are likely to use the corridor (either northbound or southbound) travelling between travel markets.

The impact of future demand for travel in the corridor

The existing transport network currently accommodates travel to and from approximately 3,800 homes and 300,000 m of employment space (see Appendix B for details); there are aspirations to increase this by up to 19,000 homes and 380,000 m^2 of employment space. As noted in Section 2.3.2, the majority of this development is centred around Waterbeach New Town and the NEC development. As a result, the local transport network will experience increased demand when these developments are occupied. Without investment, it is likely that the local transport network, including the A10 and Milton Interchange will experience significant congestion, causing journeys to become unreliable and slower. Furthermore, this will be put increased pressure on the local public transport network that is already reliant on an efficient transport network.

[35] Percentages may not add to 100% due to rounding.

[36] Trips that access Waterbeach New Town and Cambridge Research Park from the north will not use the corridor as the sites are located on the northern side of the corridor.

[37] Trips that access NEC from the south will not use the corridor as the sites are located on the southern side of the corridor.

[38] Internal to CB24 and CB25 postcode.

2.4. Existing and future transport

2.4.1. Existing transport networks

Local highway network

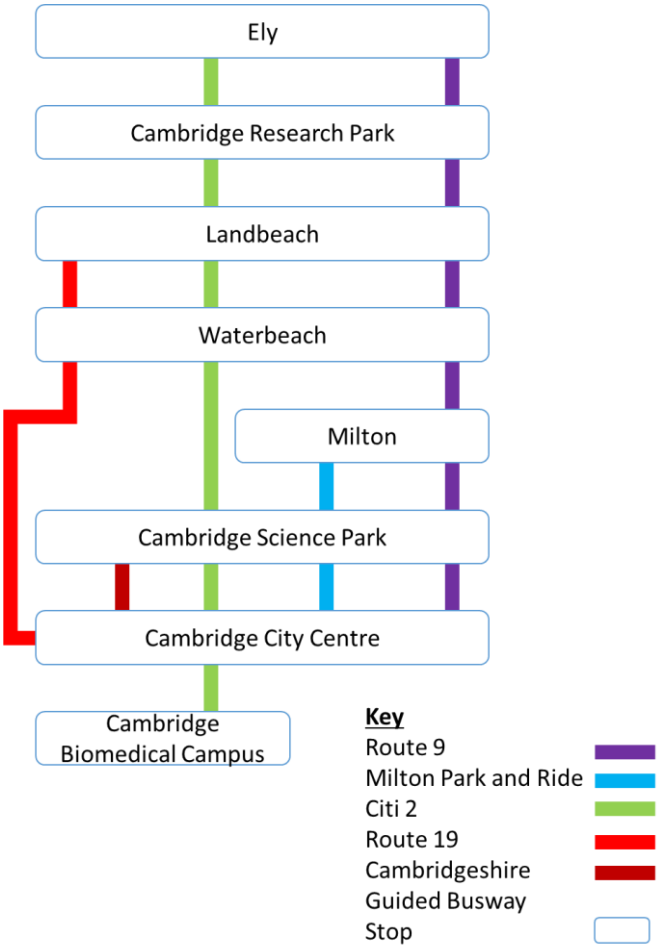
The local highway network includes the A10, which is the main highway connection between Waterbeach, the A14 and the NEC development. This route currently experiences considerable congestion during peak periods, particularly around Milton Interchange where the A10 and A14 converge. The new and improved section of the A14, as well as a new local access road (the A1307) opened for traffic on 5th May 2020[39].The 2019 CCC Traffic Monitoring Report[40] reports a two-way traffic flow of 26,327 vehicles on Milton Road to the south of the A14 across a 12-hour period.

Local bus network

The local bus network is currently operating at a reduced service due to the Covid-19 pandemic. Timetables are being reviewed regularly and changed to reflect new restrictions being implemented by the Government. The remainder of this section considers 'normal service patterns', i.e. pre-Covid-19 services, and whilst it is recognised that timetabling may change in the future, it is considered that this information is representative of a 'normal service pattern'.

There are four services that stop in this corridor, as shown in Figure 2-8.

Figure 2-8 - Local bus network



39 Highways England (No Date) What We've Delivered, https://highwaysengland.co.uk/our-work/a14-cambridge-to-huntingdon/what-we-ve-delivered/ [Accessed 27.07.2021]

40 Traffic Monitoring Report 2019, Cambridgeshire County Council, https://www.cambridgeshire.gov.uk/asset-library/Traffic-Monitoring-Report-2019.pdf [Accessed 14.07.2020]

There is currently no bus priority infrastructure on the A10 to the north of the A14, although there are existing bus lanes on Milton Road. There are proposals to improve the bus priority on Milton Road to the south of the study area as part of the GCP Milton Road project.

The CGB runs between St Ives and Cambridge North Station, and busway services A and D use this to serve Cambridge Science Park, Cambridge Business Park and Cambridge Regional College. The CGB also has a bridleway running adjacent to parts of the route which is widely used by non-motorised users. The Waterbeach to Cambridge Public Transport scheme could utilise this bridleway, creating a continuous active travel route for trips such as Histon to Waterbeach.

All options considered in this study would increase the public transport capacity within the corridor and beyond. The scheme will give flexibility to services which can use part, or all of the infrastructure provided. This means that the scheme would allow for future connections to other transport hubs, such as Cambridge North Station and Milton Park and Ride. Existing services, such as Route 9, could use the scheme, thus providing benefits to passengers to and from Chittering, Stretham and Ely.

Local rail network

Cambridge North and Waterbeach railway stations are located within the study area and provide connections to the wider UK rail network including London, Cambridge, Ely, Peterborough, Kings Lynn and Norwich. As part of the proposals for the Waterbeach New Town, the existing Waterbeach railway station is planned to be relocated further north to a site within the New Town. The full planning application for the new railway station was approved on 9th January 2020[41].

2.4.2. Transport improvements

There are several major transport schemes proposed for the local area to improve transport connectivity in the study area and beyond. These are summarised below.

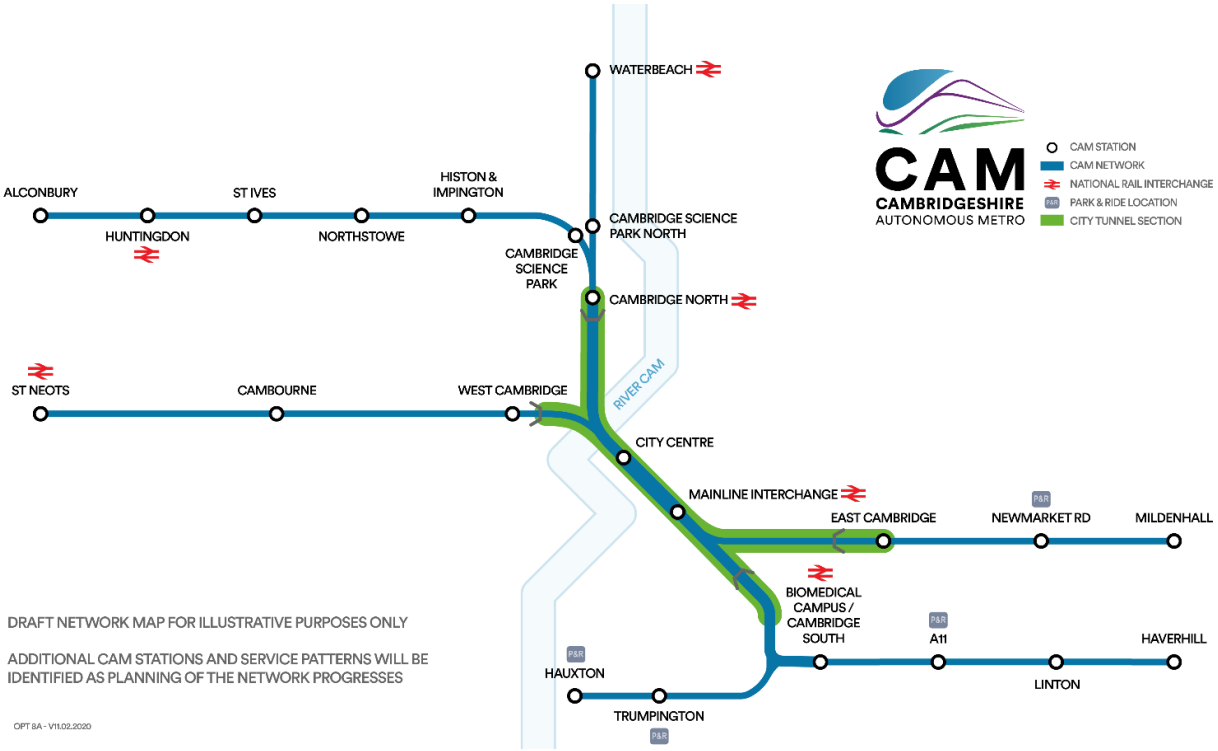
Cambridge Autonomous Metro (CAM)

The CAM will provide high-quality, high frequency services in the Cambridge region (including NEC) delivered by the GCP and CPCA. The GCP is leading on delivery of the shorter-term elements of the CAM network (including this scheme, the Eastern Access Study, Cambridge South East Transport Study and Cambourne to Cambridge). As a result, the four corridors can be delivered as standalone schemes. The central section of the CAM will be underground and is being led by CPCA.

This first phase of the CAM network will be served by electric vehicles, which will continue on-street into Cambridge city centre prior to the opening of the tunnels under the city centre. The proposed CAM network is shown in Figure 2-9. The CAM sub objectives from the CPCA LTP are set out in Table 2-4.

[41] Planning application: S/0791/18/FL

Figure 2-9 - Proposed CAM network[42]



[42] Cambridgeshire Autonomous Metro (No Date) *What is CAM?* https://cam-metro.co.uk/the-proposals/ *[Accessed 16.02.2021]*

Table 2-4 - CAM sub-objectives[43]

Goal	CAM sub-objective
Economy	CAM-E1: Promote agglomeration CAM-E2: Support new employment by enhancing access to and attractiveness of key designated areas CAM-E3: Increase labour market catchment CAM-E4: Serve and support new areas for sustainable housing development CAM-E5: Provide overall transport capacity to enable and accommodate future growth CAM-E6: Improve transport connectivity CAM-E7: Improve journey time reliability CAM-E8: Direct high-quality public transport access to key housing sites (existing designations) CAM-E9: Directly serve and link into transport hubs including existing and planned rail stations CAM-E10; At transport hubs, support easy and rapid mode changes and transfers CAM-E11: At transport hubs facilitate first and last mile connectivity to the local area CAM-E12: Support the development of demand responsive modes CAM-E13: Integration with other modes, including bus CAM-E14: Integrated with main arterial corridors, including the projected East West Rail route and the upgraded A428, and key LTP infrastructure projects CAM-E15: Dedicated segregated routes as default assumption. CAM-E16: CAM will use technology, infrastructure and concepts of operations that deliver safe, reliable, regular, resilient and inclusive transport CAM-E17: CAM must be deliverable within the current decade CAM-E18: CAM must be future proofed and flexible in terms of capacity and technology. CAM-E19: CAM will utilise sustainable, highly flexible, zero emission vehicles CAM-E20: CAM will be designed to maximise passenger trips in both directions and across the whole day.
Society	CAM-S1: Provision of safe and secure CAM network – safe by design, safe in construction and safe in operation – to meet all standards and global best practice CAM-S2: CAM will meet all planning and environmental requirements CAM-S3: Affordable and fair fare structure. CAM-S4: Compatible with county wide future integrated ticketing CAM-S5: Promotes seamless connectivity between regional settlements, major city fringe employment sites and key satellite growth areas across Cambridgeshire and Peterborough CAM-S6: Facilitates seamless cross country and city journeys to outlying regional settlements, urban fringe employment sites and key satellite growth areas CAM-S7: Improve opportunities for all residents and communities CAM-S8: Promotes high quality public realm at stations CAM-S9: Reduces adverse impacts of public transport provision on city, urban and village centre mobility for pedestrians and cyclists CAM-S10: Support and be complimentary to walking and cycling CAM-S11: Improve air quality CAM-S12: Promote low carbon economy

[43] Cambridgeshire and Peterborough Combined Authority (2019) Cambridgeshire Autonomous Metro Strategic Outline Business Case. [Page ix]

Goal	CAM sub-objective
Environment	CAM-EV1: Support environmental sustainability - Minimises adverse impacts on conservation areas, heritage and natural community assets, including protecting the character of villages and avoiding encouraging unsustainable village fringe development. - Meets net gain requirements and where possible offers additional visual and environmental enhancements. CAM-EV2: CAM infrastructure will utilise zero emission vehicles; other public transport zero emissions vehicles should be able to use sections of the CAM infrastructure if they are CAM compatible CAM-S11: Improve air quality CAM-S12: Promote low carbon economy

An assessment of the options taken forward from the optioneering process against the main objectives is included in Table 2-13.

Committed S106 schemes

Following the grant of outline planning permission for 6,500 dwellings as part Waterbeach New Town, the Local Planning Authority and Urban and Civic agreed a Section 106 agreement for a number of transport improvements including:

- **Milton:** Advisory cycle lanes, signage and hatch markings on Cambridge Road in Milton.
- **Mere Way cycleway designs:** A shared use path will be built along Mere Way and the Roman Road, passing through Landbeach and on to the A10, where a walking and cycling bridge will cross the A10 and connect with a shared use path into the New Town and to the Greenway through the existing village of Waterbeach.
- **Bus services:** extension of the Milton Park and Ride bus service or a new service to link Waterbeach New Town and Cambridge, and a new bus service between Cambridge Research Park, Waterbeach railway station and Waterbeach New Town.
- **A10 signalisation works (Landbeach Road/Humphries Way Junction):** Traffic signals will be installed at the junction of the A10 with Landbeach Road and Humphries Road to manage demand. The A10 at the junction will also be widened to accommodate turning lanes.
- **A10 improvements at Butt Lane and Milton Park and Ride enhancements:** Widening the southbound lane on the A10 south of Butt Lane.

Greenways and trails

There are two proposed Greenway and Trail schemes that are within or connect to the study area:

- **Waterbeach Greenway:** A paved shared use path with a grassed area to one side for horse riders, joggers or ramblers. The path will connect Waterbeach to the NEC development and run alongside the railway. A mass transit corridor option on the eastern side of the study area could tie in with the Waterbeach Greenway, with the greenway forming the parallel walking and cycling route.
- **Chisholm Trail:** A committed walking and cycling route between Cambridge station and Cambridge North station which would improve the link between the proposed NEC development and Cambridge Biomedical Campus. The southern end of a sustainable transport corridor from Waterbeach to the NEC development would connect to the Chisholm Trail, extending the reach possible for people walking or cycling along either route. Some parts of the Chisholm Trail are complete and open for use, including Chesterton Bridge.

Other Greenway projects are being proposed, including the Horningsea and Swaffham Greenways. The Horningsea Greenway will start within four kilometres of Waterbeach and would be an alternative route to the east of Cambridge via Fen Ditton.

Proposed A10 dualling

Several studies have considered dualling the A10 to the north of Cambridge to increase capacity and improve journey time reliability. The CPCA have commissioned a separate study on the A10, which is currently being undertaken in parallel to this study[44]. The seven options presented in the first round of public consultation for the A10 study are:

- predominantly online full length dualling, bypassing the key pinch points west of Milton and at Stretham (western bypass) and Little Thetford;
- predominantly online full length dualling, bypassing the key pinch points west of Milton and at Stretham (eastern bypass) and Little Thetford;
- offline dualling of the southern section to Cambridge Research Park in addition to the junction improvements;
- full length, offline dualling;
- maximise the extent of online dualling, whilst bypassing the key pinch points at Stretham (western bypass) and Little Thetford;
- online dualling of the southern section to Cambridge Research Park in addition to the junction improvements; and
- junctions only improvements.

None of the options considered in this public transport study are dependent on any of the A10 dualling proposals, although there may be interfaces if both a public transport scheme and an A10 scheme come forward.

There is potential to share part of the public transport corridor with the A10 dualling scheme. This could improve cost effectiveness and reduce any adverse impacts of the two schemes.

Milton Road Upgrade Scheme

Milton Road is a key arterial route into Cambridge city centre to the south of the study area. The road currently experiences congestion during peak periods, and this is expected to get worse in the future. The Milton Road project aims to improve public transport, cycle and walking infrastructure to make these sustainable travel options a more attractive alternative to the car, and to encourage the continued economic growth of Greater Cambridge, without harming existing communities, and the environment. The Milton Road scheme includes:

- Public Transport priority measures that include new sections of outbound bus lane and new floating bus stops;
- Improved cycle facilities with segregated cycle provision along both sides of Milton Road and priority over side roads. This requires the removal of the existing pavement parking on Milton Road;
- Improved pedestrian and cycle facilities, including Copenhagen style priority crossings at side roads, segregated features at all main junctions, and the relocation of some crossings;
- Landscaping to areas where more greenery can be included; and
- The development of a traffic regulation order to ban all parking on verges.

The Waterbeach to Cambridge Public Transport Scheme would build on this scheme creating a public transport priority corridor between Waterbeach and city centre.

Summary of transport improvements

The transport improvements outlined in this Section form the basis of the DM scenario, as summarised in Table 2-5.

[44] CPCA (2020) A10 https://cambridgeshirepeterborough-ca.gov.uk/about-us/programmes/transport/a10/ Site accessed 14th July 2020

Table 2-5 - Do Minimum scenario

Intervention or assumption	In Do Minimum?
Waterbeach Greenway	Yes – preferred route approved by GCP
Approved Waterbeach development and its S106 commitments	Yes
A10 junction enhancement schemes	Yes – the Waterbeach Phase 1 development schemes (used as a proxy for final situation)
A10 dualling	No – but taking account of it as part of context
RLW development and Waterbeach station relocation	Yes, plus a sensitivity scenario with neither of these
NEC Area Action Plan	Yes, for its urban realm assumptions
Cambridge South station	Yes
Chisholm Trail	Yes
Bottisham / Swaffhams / Horningsea Greenways	Yes
Local Plan growth sites	Yes
Higher Growth Scenario	Yes – for numeric purposes. This scenario is being used to test all GCP schemes and CAM
Choices for Better Journeys	No specific assumption at this stage If required, use existing CSRM proxy test as a sensitivity test Revised CSRM DM scenario, with other GCP schemes in place, complete summer 2020
Bus network changes and policies	No specific assumption at this stage

2.5. Summary of problems, challenges and need for intervention

This Chapter has identified the problems, challenges and need for intervention within the study area, which are outlined in the following Sections.

Existing problems

There are three key challenges in the study area:

- Proposed and allocated growth in the study area: Local policies (including Local Plans) have identified a need for an additional 33,000 homes and 44,000 jobs by 2031, which would exacerbate transport capacity issues that are currently experienced during peak periods. Whilst it is recognised that there is a need for growth, the existing transport network is unlikely to be able to accommodate this without new sustainable transport infrastructure. As a result, the local authorities will not be able to deliver planned growth in line with Local Plan objectives without further sustainable transport intervention.
- Congestion on A10 north of the A14 from Milton Interchange: Current congestion on the A10 around Milton village causes journey time and reliability issues. The evidence base suggests that this issue is likely to be exacerbated when additional development (such as Waterbeach New Town) is completed. Congestion in and around the A10 corridor will stifle sustainable growth in this area and reduce productivity due to delays caused by congestion.
- Constraints on the eastern side of the study area: Several previous studies (outlined in Section 2.2.2) noted that the eastern side of the study area adjacent to the railway line has a number of constraints. These include the location of existing dwellings and proposed developments, which could hinder future transport infrastructure provision.

Need for intervention

There is a strong need for intervention within the study area to:

- **Accommodate additional growth:** Additional growth proposed in the area is likely to result in major highway capacity issues in the future. Public transport services providing quicker, more frequent and more reliable public transport journeys along the A10 is a key measure to mitigate against this constraint. A new high-quality public transport scheme would not only accommodate additional growth, but would do so in a sustainable way and support current and emerging environmental policy.
- **Reduce dependency on private motor vehicles:** Due to a lack of quick, frequent and reliable public transport links between Waterbeach and Cambridge, there is a dependency on private motor vehicles to make the majority of these journeys. This causes large amounts of congestion and delays at pinch points (e.g. Milton Interchange). Potential interventions that increase north-south public transport links would significantly reduce the dependency on private car for these trips. Much-improved public transport services would increase the resilience of the transport network and reduce reliance on use of private motor vehicles in the A10 corridor.
- **Supporting local policy and strategies:** Local plans and policies identify a clear need to reduce congestion and enable additional sustainable growth to be accommodated within the study area. The policies demonstrate that the Waterbeach to Cambridge corridor is a key economic growth area and should be supported by the appropriate level of infrastructure to ensure that the transport network has enough capacity to support the movement of people between residential and employment areas sustainably. Moreover, local and regional policies have set goals to reduce car dependence. For example, the GCP has a target to reduce motor traffic levels in Cambridge by 10% compared to 2011 levels. To achieve this goal, investment is needed in sustainable transport modes to enable more people to travel by walking, cycling or public transport. A sustainable transport corridor between two major growth areas will reduce congestion and car dependence, connect more people to major employment areas, and enable the planned growth in housing to proceed.

Corridor opportunities

To overcome the existing issues within the study area, there are opportunities to:

- provide a more resilient public transport network that is not dependent on the A10;
- transform public transport to a high-quality, segregated attractive travel option along the corridor for a number of people (this would make public transport a more attractive alternative for existing car travellers and as a result could help manage the impacts of growth);
- provide sustainable infrastructure directly servicing new developments and key travel markets;
- encourage mode shift from private car to sustainable modes;
- improve journey times and reliability within the study area corridor by public transport; and
- accommodate growing transport demand in a sustainable way (via increased public transport, walking and cycling links).

2.6. Option development

2.6.1. Why is a high-quality public transport route the best option?

An assessment has been made of a range of options for delivering sustainable transport in this corridor both with and without a high-quality public transport route. The assessment makes a qualitative judgement on the impacts of each option in terms of:

- the transport outputs and outcomes from this study, and
- a sifting criteria that is consistent with that used by other GCP projects to assess their options which have been used for consistency throughout the GCP programme.

The following options were assessed:

- improvements to bus services;
- improvements to rail services;

- improvements to the walking, cycling and equestrian network;
- measures to manage the number of trips made and mode of travel (demand management);
- Park and Ride;
- a segregated high-quality public transport route; and
- a combination of rail, bus, walking and cycling routes.

Each option has been assessed on a five-point scale including **major positive (dark green)**, **minor positive (light green)**, **neutral (grey)**, **minor negative (orange)** and **major negative (red)**. The sifting criteria, outcome and accompanying notes are provided in Appendix C. The results of the assessment are presented in Table 2-6.

Table 2-6 shows that a segregated high-quality public transport route option, and improvements to walking, cycling and equestrian provision align best to the strategic objectives and offer the biggest benefits compared to other options. Given the high levels of potential modal shift and environment benefits arising from a reduction in car trips from these options, a combination of the two performs best in achieving the overarching objectives of Waterbeach New Town to the NEC development.

The demand management and Park and Ride options score less well.

The combined improvement approach scored well, but only scored ‘minor positive’ on the public transport objectives because bus and rail services already exist. A new segregated high-quality public transport route scored better in this regard as new infrastructure could serve different markets (such as Cambridge Science Park and Cambridge Research Park) and provided fast, frequent, and reliable connections.

As a result of the strategic option assessment, it is concluded that a segregated high-quality public transport route with accompanying walking, cycling and equestrian infrastructure would offer the best benefits compared to other options.

Table 2-6 - Strategic option assessment

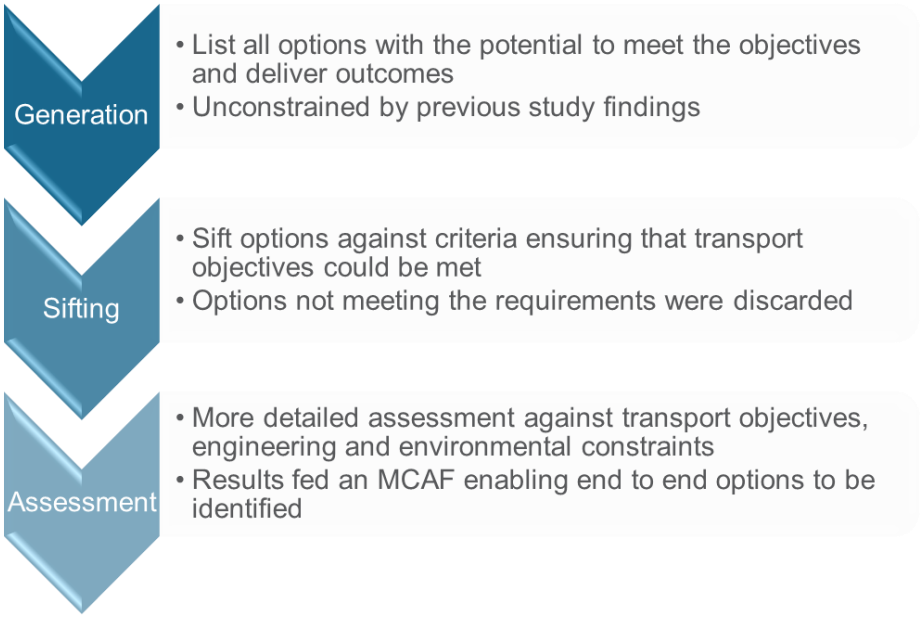
Strategic objective	Improvements to bus services	Improvements to rail services	Improvements to walking, cycling & equestrian facilities	Demand management	Park and Ride	Segregated High Quality Public Transport Route	Combined approach
Increase in public transport capacity							
Ability to contribute to 24% reduction in traffic levels							
Propensity to reduce congestion / delays							
Reduced journey times on public transport							
Increased reliability of public transport							
Ease of interchange							
Benefits to active travel							
Supports CAM							
Scale of catchment (jobs/housing)							
Ability to unlock growth							
Road safety							
Protection of green spaces							
Environment, air quality and carbon							
Quality of the public realm							
Severance							
Engineering constraints							
Environmental constraints							
Land ownership							
Planning							
Political / public acceptance							
Stakeholders acceptance							

2.6.2. Optioneering

This Section summarises the work reported in the OAR[45] and outlines the methodology employed and the findings of the option generation, sifting and assessment processes for the segregated high-quality public transport route plus walk / cycle / equestrian improvements option. The process had three stages:

1. The **option generation** stage identified possible options that had the potential to meet the objectives and deliver the outcomes of the study. Option generation was not constrained by the findings of previous studies.
2. Identified options were **sifted** by assessing them using a criteria selected to ensure that the transport objectives of the study could be met. Options that were unable to meet these high-level criteria were discarded at this stage.
3. In the final stage, a **more detailed assessment** of the options remaining was undertaken, assessing their fit against each transport objective and outcome, and engineering and environmental constraints. This assessment fed in to a Multi Criteria Assessment Framework (MCAF) to record the evidence and score each option against the criteria. From this, sets of options were considered in combination to provide corridor options for full connectivity to and from each end of the study area.

Figure 2-10 - Summary of optioneering approach



Option generation[46]

The initial option generation stage was informed by, but not constrained to, previous studies, proposed developments and driven by existing policy. All options with the potential to meet the transport objectives were considered.

Initial options were generated by the wider project team (including Atkins consultants and GCP officers), all of whom were familiar with the study area and the existing issues present within it. Different concepts for connections were considered, such as maximising the use of existing infrastructure, connecting all possible markets together via an indirect route, or providing the most direct end-to-end connectivity. Options that cross known constraints that would be too difficult to mitigate or avoid were not progressed, as they were not considered feasible.

[45] Atkins (2020) *Options Appraisal Report*
[46] Atkins (2020) *Options Appraisal Report* [Page 32]

Option sifting[47]

An options sifting process reviewed and sifted the identified options that had been generated in the previous stage. Each option was assessed against three overarching criteria of Effectiveness, Feasibility and Acceptability. The assessment used a Red, Amber, Green (RAG) approach as follows:

- green represented meeting each criterion individually;
- amber represented a challenge to meeting the criterion that could be mitigated or overcome; and
- red represented options that were unfeasible, unreliable, ineffective or unacceptable on a particular criterion.

Table 2-7 outlines the sifting assessment criteria and the key issues considered under each criterion that reflect the transport objectives and outcomes.

Table 2-7 - Sifting assessment criteria

Sifting criterion	Elements considered within each criterion
Effectiveness	Additional sustainable transport capacity
	More reliable public transport journey times
	More public transport journeys in the corridor
	More journeys by walking and cycling
Feasibility	Engineering constraints
	Environmental constraints
	Planning requirements
Acceptability	Stakeholder views
	Alignment with local and regional policies

GCP determined that a reliable system was key and that if options could not improve reliability, then they should be discounted at this stage. If links were online (with traffic) and there was not an option to provide public transport priority, these were discounted as they could not guarantee reliability. Exceptions are very short sections of highway with low traffic volumes that connect two other key pieces of proposed infrastructure.

If an option received one red rating or three amber ratings, it would normally be discounted. However, this was not rigidly applied, and certain options were retained following further assessment. For example, an online option using Milton Interchange was rated red for feasibility due to engineering constraints, however it was retained at this stage as it was considered too early to remove options that used the existing main north-south transport infrastructure. It was also found that some options became obsolete after other options were sifted out, so these were also removed at this stage.

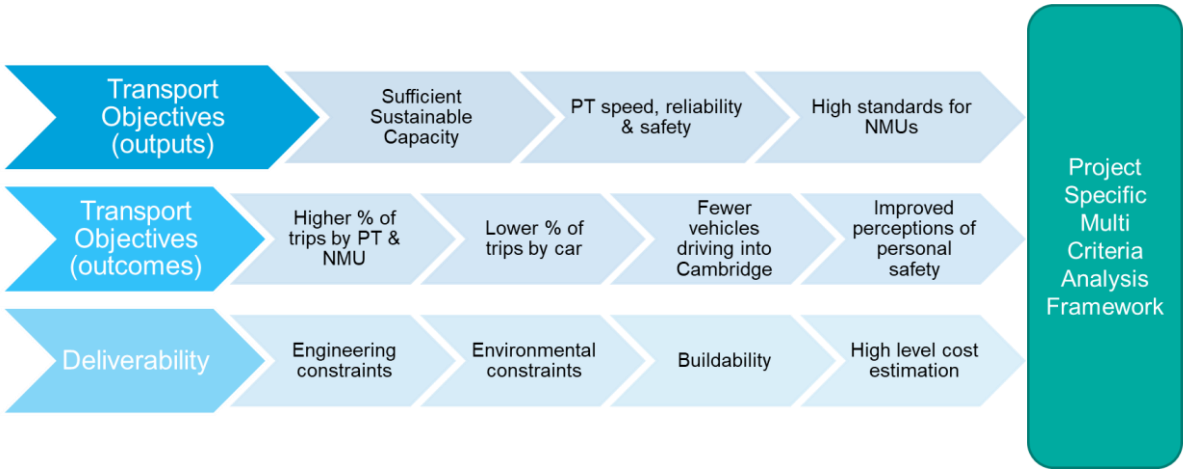
Options that crossed environmental or heritage constraints, such as the Mere Way Roman Road and the Waterbeach Abbey site to the south of Waterbeach, were discounted as the potential negative impact would not be acceptable on planning and environmental grounds. Options on the eastern side of Waterbeach parallel to the railway were discounted due to the land constraints and the complexities of interaction with Clayhithe Road and its level crossing.

More detailed assessment[48]

The More Detailed Assessment (MDA) considered the options that were carried forwards from the previous stage (option sifting). A summary of the assessment criteria used is provided in Figure 2-11.

[47] Atkins (2020) *Options Appraisal Report* [Page 34]
[48] Atkins (2020) *Options Appraisal Report* [Page 38]

Figure 2-11 - MDA criteria



In Figure 2-11, “Higher % of trips by Public Transport and Non-Motorised User” are shown together for convenience but were treated as separate criteria. This means there were a total of twelve criteria. Options were assessed using the criteria through desktop studies by specialists in each discipline who were as follows:

- Planning Lead: buildability;
- Environment Lead: environmental constraints;
- Highway Design Lead: engineering constraints, buildability and high-level cost estimation; and
- Transport Planning Lead: transport objectives (both outputs and outcomes).

To summarise the assessments, and to allow intuitive comparison of relative performance, each option was scored against the 12 criteria. using a four-point scale (0 to 3). Scores from each criterion were combined to provide overall informative scores for:

- transport planning (the eight criteria covering transport objectives);
- deliverability (the four criteria in this area); and
- all criteria.

A workshop followed where the assessment was presented to GCP officers who provided feedback and approval on the process and outcomes.

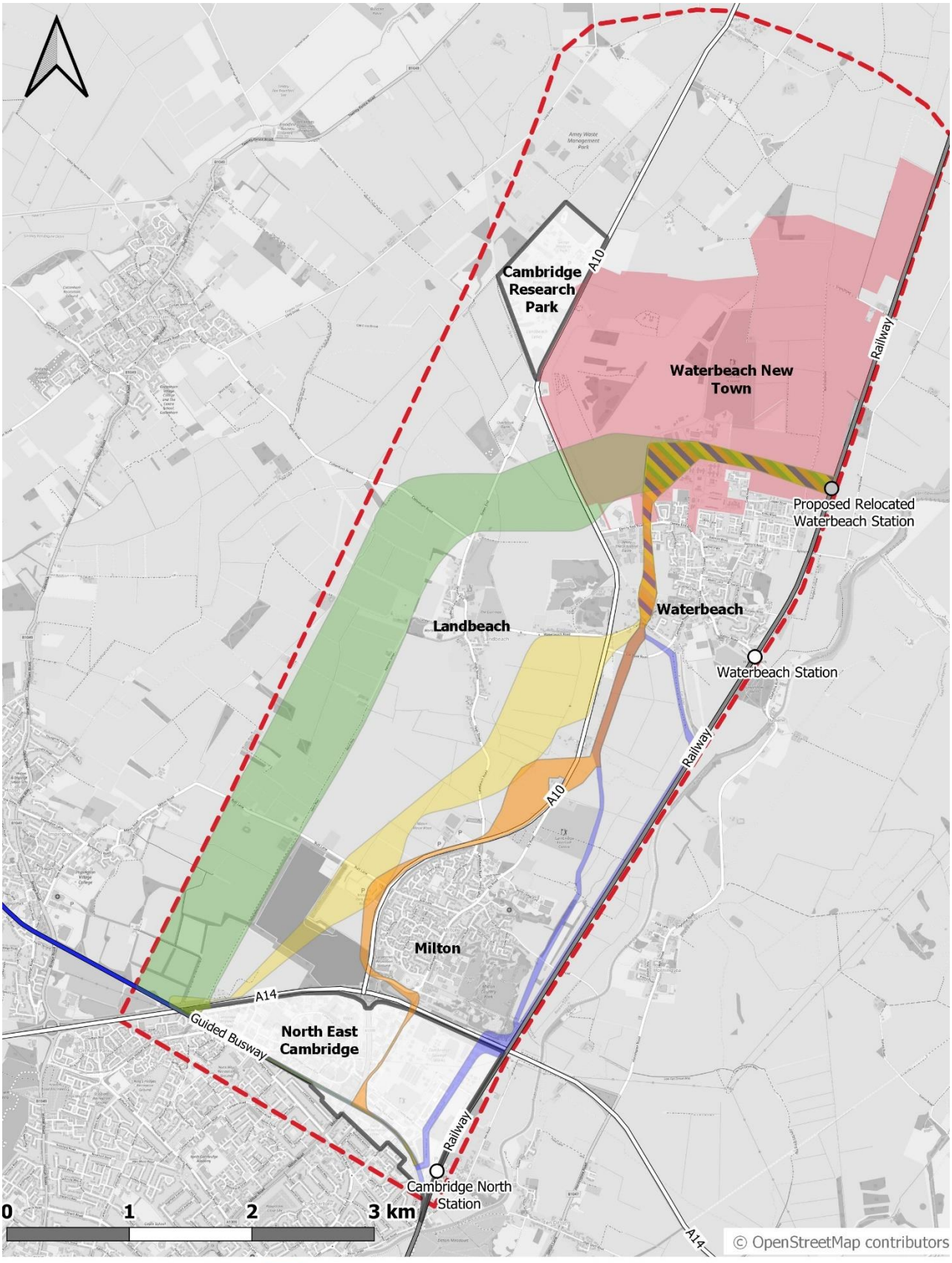
Following the MDA, corridors were identified holistically, drawing together appropriate combinations of better-performing options and nodes in order to create coherent and mutually distinct corridors. These better-performing options were agreed with GCP and are described in Table 2-8 and shown in Figure 2-12. These options were presented at public engagement in July 2020, the results of which are summarised in the following Section.

Table 2-8 - Corridor options presented at public engagement

Option name	Description	Key option-specific issues to be considered further at SOBC stage
Western route option (green)	The Western route option originates near Cambridge North Station and follows the CGB under the A14, then turns northeast and continues to the west of Mere Way. The route then bears east north of Landbeach and crosses the A10 at the proposed access roundabout to Waterbeach New Town.	• Interaction with Mere Way Roman road • Interaction with A10 at the access roundabout

Option name	Description	Key option-specific issues to be considered further at SOBC stage
Central route option (yellow)	**Short Term** The short-term option could be provided prior to the redevelopment of the NEC development and would service the periphery of the Cambridge Science Park. This option originates near Cambridge North station and follows the CGB under the A14, where it then turns east and traverses the agricultural land between Landbeach and Milton. The route crosses the A10 southwest of Waterbeach at Cambridge Road, then bears north, crossing Denny End Road to Waterbeach New Town. **Long Term** The long-term option could be provided following the redevelopment of the NEC, subject to agreement with the landowners. Instead of using the CGB, this route would use an offline route through the NEC, and would cross the A14 at a new crossing north of Cambridge Science Park. This would improve the route's ability to serve employees on site.	• Interaction with allotments at Cambridge Road, Waterbeach • Interaction with properties adjacent to allotments • Interaction with the landfill west of Milton • Interaction with A10 at staggered crossroads (A10, Car Dyke Road, Waterbeach Road), south west of Waterbeach • Whether duplicating CGB infrastructure on a new parallel route through the Cambridge Science Park is necessary
A10 route option (orange)	The A10 route option originates near Cambridge North station and travels along Cowley Road to Milton Road. From here, the route bears north and crosses the A14 at a new crossing near Jane Coston Bridge, then bears west to the south of Milton Tesco supermarket. The route crosses the northern arm of the Milton Interchange before bearing north to the west of the A10. The route crosses the A10 southwest of Waterbeach on Cambridge Road then bears north through to Denny End Road, and continues north to Waterbeach New Town. There is potential for a more direct routing using a segregated alignment along Milton Road and through Milton Interchange. However, this is assumed to only be practicable if there were separate proposals for highway changes in this part of the A10 corridor that could enable such a routing. This possibility will be reviewed as the current A10 study progresses.	• Interaction with allotments at Cambridge Road, Waterbeach • Interaction with A10 at staggered crossroads (A10, Car Dyke Road, Waterbeach Road), south west of Waterbeach • Design of route where it crosses the A14 from the eastern side of the NEC development and A10 at Milton interchange
Eastern route option (blue)	The Eastern route option originates near Cambridge North Station and bears north through the eastern side of NEC, crossing the A14 south of Milton Country Park. The route traverses the borders of the Country Park on the eastern side, before heading north to the west of the proposed sports lake development and east of the existing Footgolf area. The route reaches Waterbeach at Car Dyke Road, then continues through to Denny End Road, and continues north to Waterbeach New Town.	• Interaction with the NEC development • Interaction with the proposed Waterbeach Greenway, including the Greenway underpass of the A14 • Interaction with the sports lake complex • Interaction with residential properties and allotments on Cambridge Road in Waterbeach

Figure 2-12 - Plan of options taken forward to SOBC



2.7. Impact of not changing

The Cambridge region is growing rapidly, and Local Plans identify the need for more housing over the next decade to support this growth. If the housing planned for the Cambridge region cannot be delivered, people will continue to be priced out of the Cambridge housing market and will have to live further away from the city, placing increased pressure on the transport network as commutes get longer. The labour market catchment for companies in Cambridge will be reduced if housing supply is limited and transport connectivity is constrained. As a result, Cambridge would see a very congested transport network which would significantly reduce productivity whilst increasing carbon emissions. Sustainable growth could be stifled and would not be sustainable due to the reliance on private cars.

As the city and region already experience congestion, local and regional policies have set goals to reduce car dependence, for example the GCP has a target to reduce motor traffic levels in Cambridge by 10% compared to 2011 levels. To achieve this goal, investment is needed in sustainable transport modes to enable more people to travel by walking, cycling or public transport. A sustainable transport corridor between two major growth areas will help to reduce congestion and car dependence, connect more people to major employment areas, and enable the planned growth in housing to proceed.

2.8. Measures of success

For the purposes of quantifying the benefits and therefore the success of this study, the overarching objectives have been developed in more detail into a set of outputs and a set of outcomes. The agreed transport outputs were set out in the Appraisal Methodology Report (AMR) and represent the desired infrastructure capabilities. The transport outputs are:

- sufficient sustainable transport capacity with appropriate frequencies to meet the additional demand for travel due to jobs and housing growth;
- high standards of public transport speed, reliability and safety between Waterbeach New Town and NEC (and beyond); and
- high standards of infrastructure for walking, cycling and other non-motorised modes of travel between Waterbeach New Town and north east Cambridge, including making routes as direct as possible.

The transport outcomes are those which any investment recommended by the study should seek to achieve. The outcomes agreed for this study, which reflect the ‘study objectives’ set in the brief, are:

- a higher share of journeys along the corridor being made by public transport;
- a higher share of short journeys being made by walking and cycling;
- a smaller share of journeys in the corridor being made by private car;
- fewer vehicles driving into Cambridge (compared to 2011 levels); and
- improved perceptions of safety.

2.9. Scope of the scheme

Having set out that there is a strong case for change, the scope of this study is to develop scheme options and prepare an SOBC for a public transport corridor connecting north east Cambridge and Waterbeach. The interventions considered must ensure that employment and housing growth can be accommodated without increasing levels of motor vehicle traffic within Cambridge, accounting for the existing and future needs of large businesses, employment parks and housing developments in the corridor. The scheme can be delivered in isolation to other transport improvements in the Greater Cambridge area but, in the future, it could be part of Phase 1 of CAM as a regional extension towards Waterbeach and Ely. The scheme will also significantly enhance walking, cycling and other non-motorised transport infrastructure between the proposed Waterbeach New Town, NEC and points in between.

2.10. Constraints identified

When considering potential transport options, the following constraints need to be investigated:

- Engineering constraints, including:

  - any type of crossing over the A14, e.g. north of Cambridge Science Park or Cambridge Northern Fringe East;
  - potential to fit through pinch points such as the allotments north of Cambridge Road, Waterbeach;
  - potential to accommodate a transit route to the east of Waterbeach alongside the railway without encroaching directly on local properties; and
  - any type of interaction with Milton Interchange is a constraint, given the existing capacity issues experienced at the junction during peak periods.
- Environmental constraints, including:
  - the buildability of a transit route over the landfill site west of Milton; and
  - the study area south of Waterbeach is designated Greenbelt.
- A masterplan for the NEC development is in the process of being developed and therefore any option traversing the area will be required to be coordinated with potential development proposals and existing buildings and transport infrastructure.

2.11. Interdependencies

A full list of interdependencies is provided in the Management Case, Section 6.3. Major dependencies that could impact the Strategic Case are summarised in Table 2-9.

Table 2-9 - Interdependencies of this study at the strategic level

Project	Dependency
Waterbeach New Town	Waterbeach New Town is dependent on a sustainable transport corridor. In turn, the sustainable transport corridor depends on the layout of the development to accommodate the route.
NEC development	Development in this area is dependent on a sustainable transport corridor to meet the trip budget[49]. In turn, under certain corridor options the sustainable transport corridor depends on the layout of the development to accommodate the route, and the ability to do so will influence corridor selection.
Sports Lake development	This development will affect the alignment of the sustainable transport corridor if a route on the eastern side of the study area is selected.
A10 dualling	A new A10 route may require new crossings for the sustainable transport corridor. If an online dualling option is selected, this may impact the ability to deliver a sustainable transport corridor alongside the existing A10.

2.12. Stakeholders

Table 2-10 summarises the key stakeholders as identified by GCP and any areas where they have a particular role within this study. These stakeholders, and the public, have had a direct influence on option development.

[49] A trip budget is a planning policy that restricts the amount of highway trips that a development is allowed to generate. If an assessment shows that highway trips may exceed the budget, then the development will not be accepted.

Table 2-10 - Summary of key stakeholders (listed alphabetically)

Stakeholder	Role within study
Bus Operators	Existing and potential providers of services within study area. Agreement to be sought regarding operations of potential scheme.
Business Organisations	Stakeholder
Cambridge Ahead	
Cambridge North East Land Owner Forum	
Cambridge Northern Fringe East	Potential for transit route to traverse Cambridge Northern Fringe East. Agreement to be sought regarding operations of potential scheme through land.
Cambridge Past Present and Future	Stakeholder
Cambridge Research Park	Potential service could originate/terminate in Cambridge Research Park. Agreement to be sought regarding operations of potential scheme through land
Cambridge Science Park	Potential for transit route to traverse Cambridge Science Park land. Agreement to be sought regarding operations of potential scheme through land
Cambridge University	Stakeholder
CCC (Local Highway Authority)	Statutory consultee with any proposed planning permission within the study area
Camsight and groups which represent people with limited mobility or a sensory impairment and wheelchair users	Stakeholder
Commuters	
Councillors (Local)	Councillors to provide approval for scheme.
Councillors (Wider)	Statutory consultee with any proposed planning permission within the study area
Cambridgeshire and Peterborough Combined Authority (Local Transport Authority)	Scheme will aim to satisfy key stakeholder policies Consultee with any proposed planning permission within the study area
Emergency Services	Statutory consultee with any proposed planning permission within the study area
Environmental Groups	Stakeholder
GCP Executive Board	Study to be approved by GCP Executive Board
GCP Officers for other GCP Schemes	Provision of wider GCP project information and tie in with parallel projects
Greater Cambridge Planning Service	Consultee with any proposed planning permission within the study area
Highways England	Statutory consultee with any proposed planning permission within the study area
GCP Joint Assembly	Consultee with any proposed planning permission within the study area

Stakeholder	Role within study
Landowners	Stakeholder Negotiations may be required for potential land take (subject to proposed routes)
Local Businesses	Stakeholder
Local Campaign Groups	
Local Developers	
Local Residents	
Media	
Members of Parliament	
Network Rail	Statutory consultee with any proposed planning permission within the study area Potential interaction if any schemes involve or are close to the railway
Parish Councils	Statutory consultee with any proposed planning permission within the study area
Park and Ride	Stakeholder
Residents' Associations	
Schools	
Smart Cambridge	
Technical Consultants	
Transport User Groups	
Utilities Companies	
Youth Groups	

Details of the stakeholder management plan can be found in Section 6.7.

2.13. Consultation outcomes

2.13.1. Methodology

A public consultation on the four corridor options was held virtually between Monday 19th October 2020 and Monday 14th December 2020. All events were online/virtual due to Covid-19 restrictions on face-to-face contact. The consultation adopted a multi-channel approach to promote and seek feedback, including the wide-spread distribution of around 6,000 consultation booklets and online media.

Eight online briefings were held, one one-to-one session, four parish council meetings, three resident meetings and the pre-launch briefing with local district and county councillors. In addition, a social media campaign was undertaken including a Facebook live session with over 50 questions submitted. There were over 3,000 visitors to the dedicated website and over 1,000 documents (maps, information, and copies of the booklet) were downloaded. All parish councils and schools in the study area were contacted. Adverts were also placed in local newspapers, at local railways stations and at the Milton Park and Ride site.

Quantitative data was recorded through a formal consultation questionnaire (online and hard copy) with 570 complete responses in total recorded. A large amount of qualitative feedback was also gathered via the questionnaire, email and social media. The GCP also received 72 additional written responses.

The consultation strategy has allowed a wide variety of people to engage within this public consultation, therefore mitigating the lack of face-to-face events as a result of the coronavirus restrictions.

2.13.2. Consultation findings

This section summarises the findings in the public consultation report. The full public consultation report can be found on the GCP website[50].

Public opinion and support

Over half (52%) of respondents supported the high-quality public transport route proposals and 36% opposed. The most supportive groups were those who usually travel in the area by cycle (63% support, 29% oppose), along with those whose usual destination is North Cambridge (64% support, 29% oppose) or South Cambridge (62% support, 31% oppose). Figure 2-13 shows level of support for each of the four corridor options.

Figure 2-13 - Support for proposals amongst respondents[51]

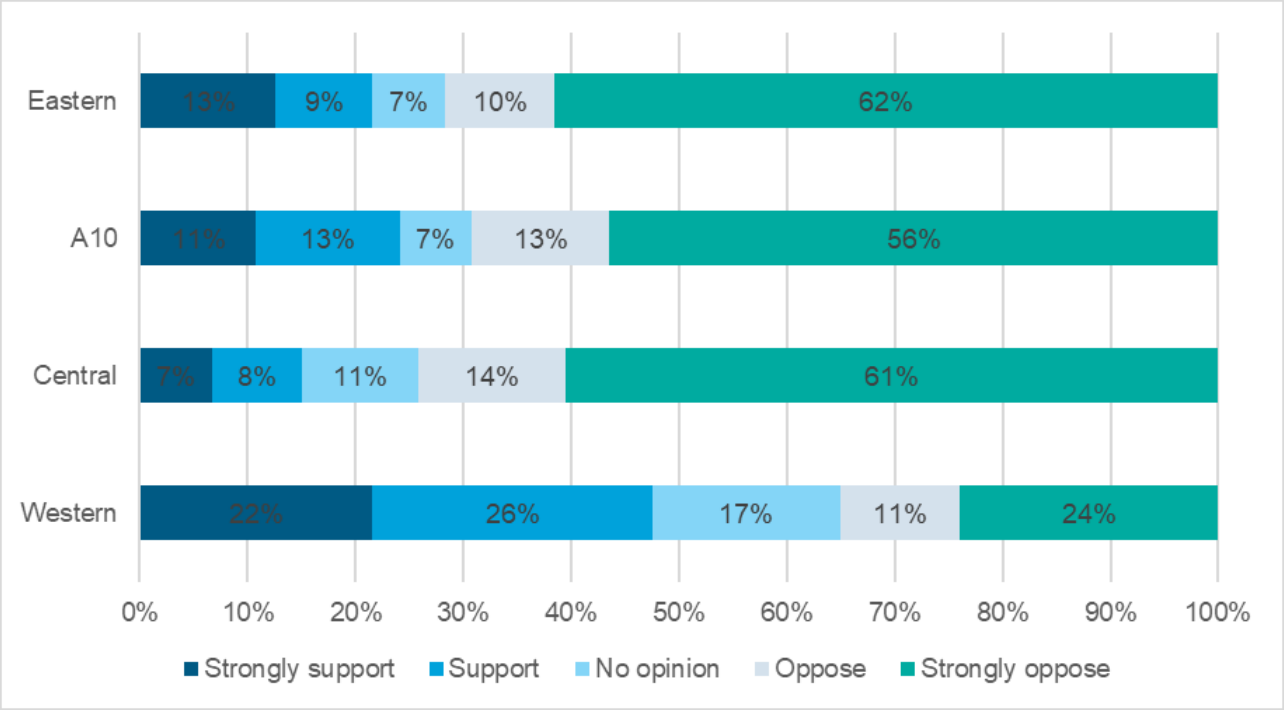


Figure 2-13 shows that the **Western route option had the most positive response** (48% supported proposals), however there was strong opposition to the Central, A10 and Eastern route options (75%, 69% and 72% strongly oppose or oppose the options respectively).

When asked which markets should be served, half the respondents in indicated that Waterbeach village (50%), Waterbeach new town (50%) and the relocated Waterbeach railway station (49%) should be given 'somewhat high' or 'very high' priority on the route which supports the end-to-end objectives of the schemes. Moreover, respondents considered that the provision of connectivity to key markets was more favourable than achieving faster journeys. With this in mind the emerging service patterns should seek to mix a fast service for end-to-end journeys whilst other services should seek to serve local centres to maximise demand and therefore patronage. Service patterns are not restricted to the infrastructure that could be provided as part of the scheme and it is possible for alternate services to run to reach different users. This will be investigated further during the next stage of scheme development.

The GCP received a number of detailed comments, from which the most common areas of discussion were:

- concerns about the loss of housing / personal property;
- concerns about negatively impacting the local environment;
- further improvements to active travel in the area;
- use of existing infrastructure, and the linkages with the potential duelling of the A10 route; and

[50] https://www.greatercambridge.org.uk/public-transport-schemes/waterbeach-to-cambridge

51 Cambridgeshire County Council (2021) Waterbeach to Cambridge: Summary Report of Consultation Findings Figure 10 Page 21

- concerns about connections to and from Waterbeach, and loss of existing bus services.

Some responses raised opposition to proposals that could potentially result in the loss of housing / personal property, which contributes to the overall levels of support of the Central, A10 and Eastern route options.

Respondent profile

The respondent profile has been summarised below:

- Just over half (51%) of respondents stated that they were a resident of Waterbeach, whereas 28% regularly travel in the area;
- Cambridge, Milton and Landbeach residents made up 24% of respondents;
- Up to 79% of respondents usually travel by car, whilst 52% travel by bicycle and 44% walk[52];
- Nearly one in five (18%) of respondents stated that they would use a scheme like the one being proposed on a daily basis; and
- 21% of respondents stated they would not use the proposed infrastructure.

2.14. Route amendments

Following the consultation exercise and initial technical work, a review was undertaken of the four corridor options to determine which should be taken forward to economic assessment.

As a result of the review, amendments were made to three of the four corridor options, as described below.

Western route option (not revised)

Initial technical work did not indicate any concerns with the performance of this option. The Western route option is also the most publicly supported option. As a result, no alterations have been made to this option.

Revised Central route option

Initial technical work indicated that the Central route option alignment could cause severe traffic congestion issues at the Car Dyke Road, Waterbeach Road A10 junction, as the scheme would require an additional set of signals. Moreover, there was strong public opposition to where the potential route traversed Cambridge Road and ran north through the Waterbeach allotments. Finally, the tight alignment around the allotments could cause some possible engineering constraints.

A Revised Central route option has been developed to mitigate these issues. The key features of this option are as follows:

- the same alignment as the original Central route option between Cambridge North Station to Landbeach Road to the north of Milton Park and Ride;
- then following a new alignment due north running roughly mid-way between Landbeach village and the A10 avoiding private and commercial properties;
- running north-east then to a proposed roundabout at Waterbeach New Town on the A10; and
- then following the same alignment as the Western route option through Waterbeach New Town to the proposed relocated Waterbeach Station and Cambridge Research Park.

A plan comparing the original route and the revised route is shown in Appendix D.

Revised A10 route option

This option in its original form ran around the allotments via Cambridge Road; however there are operational concerns around the tight geometry of this part of the route. Furthermore, the responses to the public consultation do not support this alignment.

The route of this corridor option has been amended so that it joins Car Dyke Road from the south and runs via Car Dyke Road and High Street through Waterbeach village centre and onward to Waterbeach New Town.

[52] Percentages do not total 100% as some respondents travel by more than one mode.

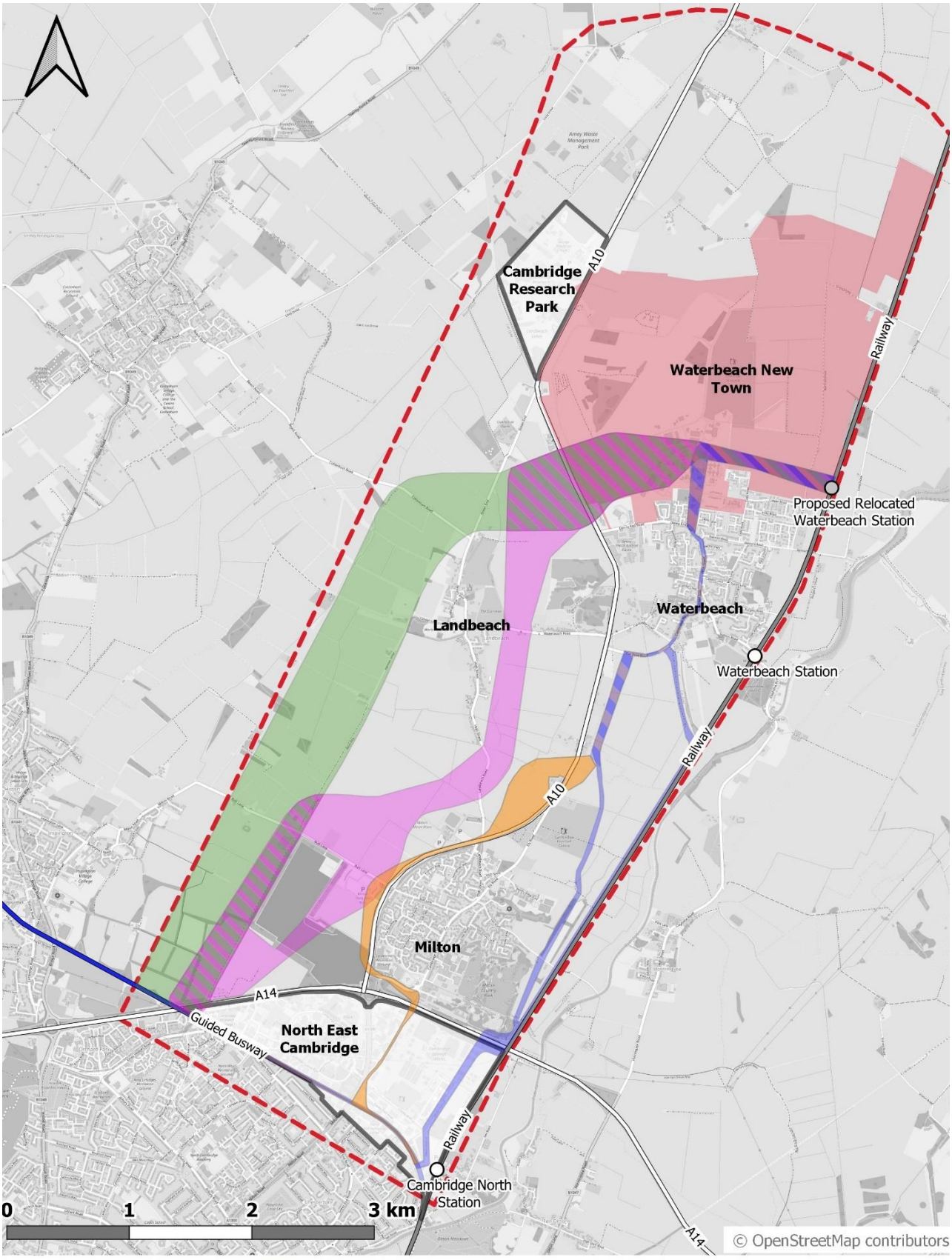
This new alignment would not achieve the high-speed and reliable service that a wholly offline service would provide. However it would mitigate the concerns raised during public consultation. A plan comparing the original route and the revised route is shown in Appendix D.

Revised Eastern route option

As with the Revised A10 corridor option, the alignment around the Waterbeach allotments is not supported by the public and there are operational concerns associated with the geometry of that part of the route. As such, the option has been amended to join Car Dyke Road and run on-road to Waterbeach New Town as the Revised A10 corridor option. A plan comparing the original route and the revised route is shown in Appendix D.

The new proposed alignments are shown in Figure 2-14.

Figure 2-14 – Revised corridor option alignments

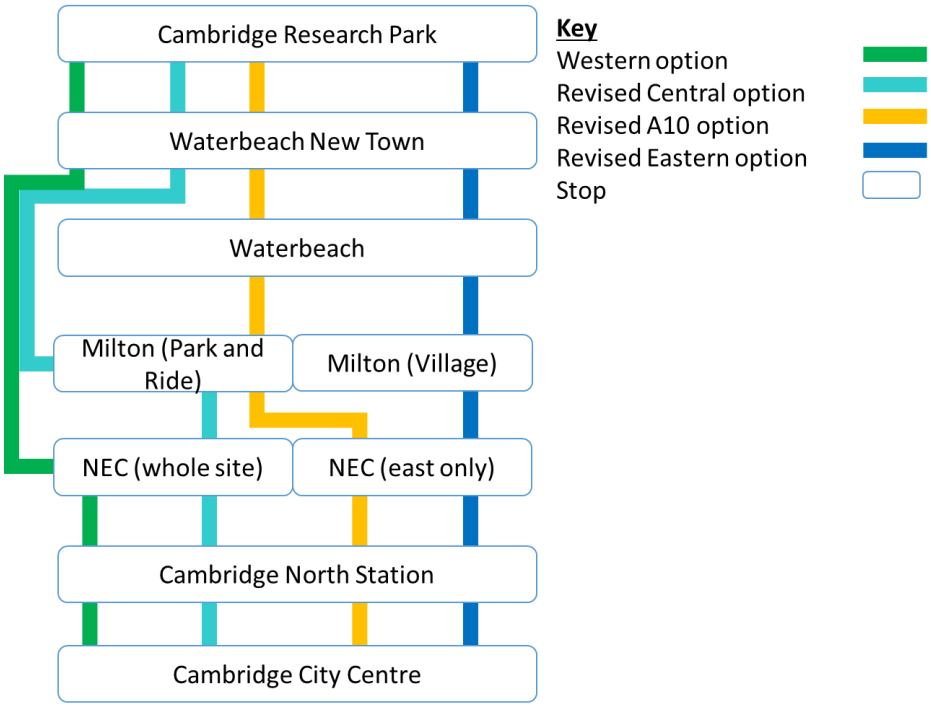


The impacts of the revised options were forecast using CSRM2. The assessment showed that the shift away from car use is forecast to be higher in the Revised Central route option than the Western route option, but less than in the Revised A10 route option. This is reflected in the patronage of park and ride sites: as Milton Park and Ride site is served by high-quality public transport services, the number of users of this site is seen to increase, on top of the trips using Waterbeach New Town Park and Ride site. Guided bus and the proposed Waterbeach to Cambridge Public Transport Scheme patronage is comparable for the Western route option and the Revised Central route option.

Travel markets served

Figure 2-15 shows the residential and employment areas that would be served by each option. Both the Western and Revised Central route options would not directly serve Waterbeach, but would accessible via Waterbeach New Town. These two options would serve the whole of Cambridge Science Park. The Revised A10 and Revised Eastern route options would serve both Waterbeach New Town and the existing Waterbeach village but would only serve the eastern side of NEC.

Figure 2-15 - Areas served by high-quality public transport route



Journey times

A high-level assessment has been made of likely public transport journey times. Methodologies used in previous GCP projects (including Cambourne to Cambridge Better Bus Journeys Scheme, Cambridge South East Transport Study and the Western Orbital) have been considered. Following a review of methodologies, the recommended methodology for estimating journey times for Waterbeach New Town to North East Cambridge Public Transport Scheme is as follows:

- for rural areas, the timetable for services along the CGB between St Ives Park and Ride and Histon and Impington will be used to calculate the average speed of the proposed service;
- for urban areas, the timetable for the CGB through built-up areas will be used, for example along the section from the Cambridge Science Park to Cambridge North Station; and
- one of the above average speeds to be applied to each section of the proposed route options based on whether it is passing through primarily urban or non-urban areas.

Using this method, average speeds were derived and are shown in Table 2-11.

Table 2-11 - Summary of average speeds for different route types

Section type	Average speed
Non-urban separated route	54 km/h
Urban separated route	27 km/h

Using the plan of corridor options (Figure 2-12), sections of the route were defined as either "rural, segregated" or "urban, segregated". To reflect the fact that the exact length of each section is currently unknown, a 'sample maximum' and 'sample minimum' route length within each option was assumed. These are hypothetical lengths for the purposes of bracketing journey times and do not represent actual design options.

Based on this approach, minimum and maximum journey time estimates for each option from Cambridge Research Park to Cambridge City Centre are shown in Table 2-12.

Table 2-12 – Estimated times for each corridor option

Option	Estimated journey time range
Western route option	27 to 32 mins
Revised Central route option	27 to 32 mins
Revised A10 route option	26 to 31 mins
Revised Eastern route option	27 to 32 mins

The c. 30-minute journey time between Waterbeach and Cambridge city centre in the weekday morning peak compares with a pre-Covid bus journey time of around 45 minutes[53] for the same journey. **This represents a significant journey time saving (of around 15 minutes (33%)** between Cambridge Research Park and Cambridge City Centre which further highlights the benefits of this scheme.

Moreover, the Waterbeach to Cambridge Public Transport Scheme would significantly increase journey time reliability as it is proposed that the majority of the route will be segregated from the rest of the A10 traffic. This, combined with the Milton Road improvement scheme, would mean that the vast majority of the route would not be subject to delays caused by general traffic. Currently, services such as the Citi 2 and route 9 can experiences delays between Ely and Cambridge as they are reliant on the existing non-prioritised highway network. Journey time reliability is further explored in Section 3.4.11.

2.14.1. Alignment with policy and objectives

Better-performing corridor options were those which aligned best with local, regional and national objectives[54] as well as the CAM objectives (set out in Table 2-4) and the overall scheme objectives (set out in Section 2.1.2). Consideration was given to whether each option aligns to policy and objectives and it presented in Appendix D and is summarised in Table 2-13.

Table 2-13 - Option alignment to policy and objectives

Policy / Objective	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Local, regional and national policy				
South Cambridgeshire Local Plan – 2018	✓	✓	✓	✓
Cambridge Local Plan – 2018	✓	✓	✓	✓
Cambridgeshire Local Transport Plan 2011-2031 – 2015	✓	✓	✓	✓

[53] Information from timetables February 2020 for Citi 2, Route 9 and Route X9 services.

[54] Relevant policies are set out in Appendix A of the OAR.

Policy / Objective	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Cambridgeshire Local Transport Plan 2011-2031: Long Term Transport Strategy – 2015	✓	✓	✓	✓
Cambridgeshire and Peterborough Local Transport Plan – 2021	✓	✓	✓	✓
Transport Strategy for Cambridge and South Cambridgeshire –2014	✓	✓	✓	✓
Waterbeach Supplementary Planning Document – 2019	✓	✓	✓	✓
CAM Objectives				
Promote economic growth and opportunity	✓	✓	✓	✓
Support the acceleration of housing delivery	✓	✓	✓	✓
Promote Equity	✓	✓	✓	✓
Promote sustainable growth and development	✓	✓	✓	✓
Scheme Objectives				
Deliverable option which will improve the reliability, safety, capacity and speed of sustainable transport connections	✓	✓	✓	✓
To identify measures that allow for the relocation of Waterbeach railway station	✓	✓	✓	✓
To ensure integrated walking and cycling routes are inherent in all proposals	All proposals will ensure walking and cycling routes are provided alongside the proposed high-quality public transport route			
To generate options that support the reduction of traffic levels in Cambridge to 10%-15% below 2011 levels	✓	✓	✓	✓
To generate sustainable options that address transport demand from Waterbeach New Town	✓	✓	✓	✓
To generate options for ‘quick-wins’	Quick wins have been provided in the OAR (See Chapter 7).			
To improve connectivity between existing settlements and to work stakeholders to identify the best package of measures.	✓	✓	✓	✓

Table 2-13 shows that all options align with the identified policies, CAM and scheme objectives, at least to some extent. There are some nuances where some options align better than others. For example, the Revised A10 and Revised Eastern route option align better to the South Cambridgeshire Local Plan policy SS/4 (Cambridge Northern Fringe East and Cambridge North railway station) as both routes traverse through the eastern side of NEC, thus serving it better.

2.15. Strategic Case summary

The Waterbeach to Cambridge corridor experiences significant congestion, particularly during peak hours, and the A14 Milton Interchange acts as a significant pinch point to motor traffic travelling between Cambridge and the north of the region. Significant housing and employment growth is planned at either end of the corridor, concentrated at Waterbeach New Town and north east Cambridge. There is a clear need for significant change which has been outlined in this Strategic Case and summarised in Table 2-14.

Table 2-14 - Need for change

Area	Need for change
In its own right	Enables quicker, more frequent, and more reliable public transport journeys for: • Waterbeach residents to and from Cambridge Science Park, Cambridge Research Park, Cambridge Regional College and the city centre; • Waterbeach residents to and from Cambridge North station, West Cambridge, Addenbrooke's and other destinations (depending on service patterns, may be direct or via interchange); and • Similar benefits for Milton residents (subject to route decision).
	More resilient public transport, which is less reliant on the A10
	Faster journey times – saving up to around 15 mins between Waterbeach and city centre
	Unlocks transformation of public transport into a high-quality, attractive travel option along the route for a wide range of people
	Supports access to education and jobs
	Supports access to existing and proposed leisure attractions
	Some options support Milton Park and Ride users
	Unlocks potential for a future park and ride that can directly serve Waterbeach New Town residents
	Supports air quality goals
	Supports the delivery of economic growth in NEC within current road traffic levels
	Supports economic recovery from Covid-19
	Supports the Local Plan commitment to delivering necessary growth in a sustainable way, including Waterbeach New Town
	Potential to support additional sustainable growth locations, beyond the current local plan
Synergy with other schemes	Scheme builds upon the Milton Road Public Transport scheme, to create public transport priority corridor between Waterbeach and the city centre
	Options utilise the existing CGB and opens up options for cross-corridor services. For example Waterbeach to and from West Cambridge
	Supports delivery of the Greater Cambridge public transport network vision
	Generates further opportunities for park and ride and local active mode connections along the corridor
Synergy for public transport users	Unlocks transformation of public transport into a high-quality, attractive travel option along the route
	Provides additional flexibility of core corridor routes and local village i.e. local buses have greater choice of routing
	Potential for being a local link to Cambridge North station, as required over time and subject to service planning decisions
	Supports current Milton Park and Ride users, and potential future park and ride users
	Passengers from the wider area (such as Chittering, Stretham and Ely) would benefit from addition public transport connections

Area	Need for change
Synergy for walking, cycling and other active travel	Dedicated active travel link between Waterbeach and Cambridge (extent of new or existing/planned infrastructure depends on route selection)
	Complements existing and planned greenway projects. There is a choice of route depending on origin and destination
	Particular benefits include for commuting between Waterbeach (also Milton on Revised Central and Revised A10 route options) and Cambridge Regional College or Cambridge Science Park, and for workers in Waterbeach
	Links with existing CGB bridleway, creating a continuous active travel route for trips such as Histon to Waterbeach
	Unlocks opportunities for additional active travel links between the corridor and the wider Greater Cambridge area

Planned transport improvements in the Greater Cambridge area aim to unlock sustainable growth. A number of GCP projects, including this scheme, Eastern Access Study and Cambridge South East Transport Study will provide high-quality, high frequency services in the Cambridge area (including north east Cambridge).

An option identification, sifting and assessment process has been undertaken as part of this Strategic Case resulting in four route options that were taken to public consultation in late 2020. As a result of the further assessment work and the public consultation outcomes various options were amended to mitigate public concern, particularly related to those options that routed through Waterbeach allotments. The four corridor options, with amendments, have been taken forward for further assessment as part of this SOBC:

- Western route option;
- Revised A10 route option
- Revised Central route option; and
- Revised Eastern route option.

In addition, the Strategic Case demonstrates a strong need for segregated infrastructure within the Waterbeach to Cambridge corridor, but it is recognised that service patterns can be flexible and respond to changing demand from travel markets. It is possible for a service to use some of the segregated infrastructure for parts of the route and use the highway for other parts. Therefore, further investigation is required to determine likely service patterns and consider the impacts of proposed routing, which will be undertaken during the next phase of business case development.

The four corridor options identified and consulted on were taken forward for further economic analysis, as reported on in the remainder of this SOBC.

3. Economic case

3.1. Introduction

The Economic Case sets out the extent to which each package provides good value for money, and the assessments underlying this. The structure is as follows:

- an overview of the options appraised (Section 3.2);
- an overview of the of the assumptions supporting the analysis (Section 3.3);
- the results of the quantified and qualitative appraisals that have been carried out to date (Section 3.4);
- the summary reporting of the results, including benefit-cost ratios (Section 3.5); and
- a concluding statement of the likely value for money of each option (Section 3.6).

A proportionate approach to economic assessment based on the stage of scheme development (SOBC) has been followed and analysis and evidence continue to be developed as greater depth of information becomes available.

3.2. Options appraised

The economic appraisal involves assessing the monetised costs and benefits of each option (DS scenarios), compared to the situation without any of the packages (DM) scenario). The scenarios appraised are the four corridor options outlined at the end of the Strategic Case, namely:

- the Western route option;
- the Revised Central route option;
- the Revised A10 route option; and
- the Revised Eastern route option.

These are described in detail in the Strategic Case (Section 2.6).

3.3. Assumptions

3.3.1. TAG and Green Book principles

The appraisal follows the principles set out in the Department for Transport (DfT) guidance TAG, which itself is based on principles set out by the Treasury in its Green Book.

All monetised costs and benefits are expressed as present values (PV) in 2010 prices, discounted to 2010. This is in line with DfT and Treasury guidance.

3.3.2. Overview of economic appraisal approach

Costs

The costs of each option are based on:

- the investment (capital costs), as estimated by the design teams for each element;
- estimated operation, maintenance and renewal costs over the 60-year appraisal period; and
- any relevant grants, subsidies, developer contributions or equivalent, and revenues that accrue to the public sector.

These costs are outlined in Section 3.3.4

Benefits

The benefits are estimated from several sources:

- user benefits (including travel time savings for public transport users) and revenue impacts on private sector providers (essentially public transport operators), assessed using TUBA based on the modelling of the options in CSRM2;
- user impacts during construction and maintenance;
- impacts from changes to the number of accidents;
- greenhouse gas impacts assessed using TUBA;
- local air quality and noise impacts;
- physical activity impacts;
- journey quality impacts;
- journey time reliability;
- wider economic impacts;
- social impacts; and
- distributional impacts.

For User Benefits, a trip-weighted average approach to combining all public transport modes has been adopted to minimise the impact of a new transport mode within the corridor. For park and ride, where new connectivity has been made, a pseudo DM journey time has been used equal to the option's journey time for the movements. Whilst this would result in zero journey time benefit for new users, this would be a conservative representation. More detailed assessment would be carried out proportionately in the OBC phase of the study to fully quantify the scale of benefits on offer. More detail is provided in Section 3.3.5.

Results

The results from different elements of the appraisal are set out in four summary tables for each scenario:

- the Transport Economic Efficiency (TEE) Table (Section 3.5.1);
- the Public Accounts (PA) Table (Section 3.5.2);
- the Analysis of Monetised Costs and Benefits (AMCB) Table (Section H.6); and
- the Appraisal Summary Table (AST) (Section 3.5.6 / Appendix G).

For each corridor option, a benefit-cost ratio (BCR) has calculated (Section 3.5.4). In line with DfT guidance, this BCR excludes the monetised journey time reliability impacts. Certain other impacts, such as non-monetised impacts and are then also taken into account (Section 3.5.5), leading to a final value for money assessment (Section 3.6).

3.3.3. Modelling approach

The central modelling tool used in this appraisal is CSRM2. This is a TAG-consistent multi-modal transport model that can be used to test the impacts and benefits of land use and transport interventions. The model has uses 2015 as the base year.

Modelling assumptions

Public transport journey times have been estimated based on forecast travel times along the new proposed high-quality public transport route and existing road network (where applicable), considering the potential stop frequencies, the nature of the surrounding environment (rural or urban) and quantum of bus priority on each section of the route.

Headways of six minutes have been assumed for services between Cambridge North railway station and Waterbeach New Town, with headways of 12 minutes for services beyond Waterbeach New Town towards Ely (on the existing highway network). This is a service frequency comparable with the proposed changes to the timetables of Stagecoach routes on the existing Cambridge Guided Busway, which would have taken effect from 29th March 2020.

In order to capture the benefits offered by a high-quality public transport service in CSRM2, the additional services along the proposed high-quality public transport route were coded as guided bus routes as these are more attractive to users in the model than regular bus services. The Model Development and Validation Report[55] for the D-series of CSRM2, which still applies to the current E-series, states that: *"the Guided Bus time weighting of 0.9 reflects the high quality and comfort (e.g. leather seats and wireless internet access), and the fact that the ride quality on [segregated high-quality public transport route] sections is superior to normal bus services."* This compares to a time weighting of 1 for bus and 0.8 for rail. Such changes to the time weighting are in keeping with TAG Unit M3.2 which confirms that: *"in some instances, factors may be applied to the in-vehicle times that reflect people's preferences for the various modes. This is most likely to be relevant where the influence of fare on the choice of routes and services is likely to be quite weak and, as a result, the fare term may be excluded from the generalised cost formulation used at the assignment stage. These in-vehicle time factors may be interpreted as mode-specific values of in-vehicle time. Thus, instead of an in-vehicle value of time of unity being used, as might be used in models for multimode transport studies, non-unity values of in-vehicle time are used to represent the inherent, relative attractiveness of the various modes"*.

The CSRM2 modelling uses a modified Core Minus development scenario. In the area of interest, around the A10 corridor, this means that Waterbeach New Town is built out at a consistent and reasonable rate, beyond the initial 1,600 dwellings, associated employment and other facilities covered by the first round of planning applications; whilst the NEC development is not included. As NEC is not included, further benefits are likely to be obtained that are not captured in the current modelling if it were constructed.

3.3.4. Estimation of capital costs

Capital costs

These are the costs of physical interventions that would be implemented as a result of the scheme. Section 4.2 describes these costs and their calculations. The high-level estimates of capital cost are based on the following assumptions:

- 10 services per hour in each direction between Cambridge North railway station and Waterbeach New Town;
- no change to the existing bus network (this includes the retention of the existing No. 9 bus route (and its variants) along with the existing No. 19 bus route);
- infrastructure (both physical and vehicle-type) is based on electric single decker bus operation;
- an allowance for those items which have not or cannot be quantified at this stage of the design (10%);
- an allowance for optimism bias (44% for costs associated with the road sections of the scheme and 66% for costs associated any structures of the scheme) as recommended in TAG Unit A1.2 – Scheme costs;
- an allowance for risk (10%) of the infrastructure costs;
- an allowance for preliminaries associated with construction (20%);
- a flat rate of £2,000,000 has been added for utilities division in accordance with the nature of interventions; and
- a percentage allowance for traffic management in accordance with the nature of the interventions (25%).

Conversion to Present Value Costs

The following calculations were used to convert the costs to Present Value Costs (PVC):

- conversion to 2010 prices using the Treasury GCP deflator;
- discounting to 2010 values using the annual rate as specified in the TAG Data Book, Table A1.1.1; and
- conversion to market prices (using a factor for the average rate of indirect taxation in the economy of 1.19).

[55] Cambridge Sub-Regional Model 2: D-Series Transport Demand and Public Transport Model Development and Validation Report. Cambridgeshire County Council, October 2018

Table 3-1 - Present Value capital costs (£m)

Option	Infrastructure capital cost	Initial bus capital cost
Western route option	£41.5	£2.0
Revised Central route option	£42.5	£2.0
Revised A10 route option	£160.7	£1.8
Revised Eastern route option	£36.9	£1.5

2010 values and prices.

Table 3-1 shows that infrastructure capital costs for the Revised A10 route option are up to four times the amount of the other routes. This is largely caused by the cost of the proposed structure over the A14 and Milton Interchange.

Operation, Maintenance and Renewal (OMR) costs

For appraisal purposes, OMR costs for the length of the appraisal period have been estimated. Table 3-2 shows these costs and their basis compilation.

Table 3-2 – Present Value operation, maintenance and renewals of each corridor option (£m)

Option	Vehicle operating costs	Vehicle renewal costs	Infrastructure operating costs
Western route option	£13.4	£3.0	£5.0
Revised Central route option	£13.4	£3.0	£6.9
Revised A10 route option	£11.3	£2.7	£6.9
Revised Eastern route option	£9.8	£2.3	£5.0

2010 values and prices.

Table 3-2 was calculated using the following assumptions:

- operational expenditure of vehicles has been calculated for 12-hour weekday, in line with the service provision for which the benefits have been captured;
- operational expenditure of infrastructure costs has been estimated based on a collation of information from previous studies and examples of currently operating infrastructure; and
- capital expenditure of vehicles includes the renewal costs of the vehicles which occurs 15 years after the initial purchase (the renewal cost is with the same base cost as the original purchase in addition to the cost of inflation, which is assumed to be 2.2%).

Grants, subsidies, developer contributions and revenue

Grants and subsidies: No grants or subsidies are envisaged.

Third-party funding: No developer contributions are envisaged.

Revenue: There will be an impact on the bus operators' revenue. The extent to which there is an increase in revenue will depend on the uptake of the scheme. The higher the uptake, the higher the increase in revenue for scheme operators.

3.3.5. Estimation of programme benefits

User Benefits and Revenue to Private Sector Providers

These benefits cover impacts on:

- travel time;
- vehicle operating costs; and
- user charges (any impacts on parking, tolls, fares, etc.).

These benefits have been captured in accordance with TAG unit A1.3 (May 2019) and using TUBA version 1.19.14[56]. For each scenario, outputs from CSRM2 were used as the inputs to TUBA.

The CSRM2 demand model outputs (used for all modes except highway) represent three-hour morning and evening peak periods and a six-hour inter-peak period. The SATURN highway assignment model reports single hours. Conversion factors to covert to modelled periods are included within the model and these factors have been adopted in the TUBA assessment to scale the single hour highway assignment model outputs to peak periods. These factors are shown in Table 3-3.

Table 3-3 - CSRM2 Hour to time period conversion factors

Time period	Factor
Morning peak period	2.50000
Inter-peak period	5.98802
Evening peak period	2.70270

Annual impacts were calculated for each modelled year, using an annualisation factor of 253 to convert the average weekday modelled values to a representation of the number of average weekdays within a calendar year. Benefits for non-modelled years were calculated by linear interpolation between the modelled years of 2026 and 2036, and flat-line extrapolation beyond the final modelled year. However, the impact of the discounting on estimated benefits means that the benefit 'curve' declines towards the end of the appraisal period. The 'rule of a half' was applied as appropriate.

Due to the introduction of a new service for one transport mode in the model, the potential for large cost changes associated with the new mode may be presented within the economic outputs, if each mode was considered in isolation. To account for this, trip weighted average across all public transport modes (excluding bus park and ride which is a sub mode of the main "car" choice, but including rail trips with car access to stations) have been used for the assessments to enable TUBA to assess the benefits of the scheme across public transport for this corridor. Appropriate factors have been employed to covert from model units to those expected by TUBA.

Private sector provider impacts

The revenue to private sector providers represents public transport operator's income. It was captured in TUBA alongside other user benefits. It has also been assumed for this stage of the study that all changes in parking revenue accrue to the private sector.

Their incremental investment and operating costs over the 60-year appraisal period also count as private sector impacts.

Indirect tax impacts

Indirect tax impacts represent the change in fuel tax income to the Treasury as a result of drivers using differing amounts of fuel due to changes in the amount of congestion they encounter, or the overall distance driven. It also represents the effect on the wider economy through changes in spend on transport versus incidental spend. It was captured using TUBA alongside the user benefits.

Impacts during construction and maintenance

Transport users incur additional costs when construction and/or maintenance works affect the transport network. For the Waterbeach to Cambridge Public Transport Scheme DS options, the main impact in this area will be during the construction of junctions where the high-quality public transport route intersects the existing network. At present, traffic management plans for these schemes have not yet been prepared and it is therefore not possible to assess the impacts during construction. A qualitative assessment of the impacts is provided in Section 3.4.6.

[56] Using economics parameters Economics_TAG_db1_13_1.txt.

Impacts from changes to the number of accidents

The impact of the corridor options on the number of accidents has been assessed qualitatively. The options will result in a change to the forecast traffic flows and movements in the area which may in turn impact on the number of accidents recorded. The use of Marginal External Costs in line with TAG A5.4 has enabled quantification of the marginal changes in accidents across the modelled area in lieu of a full assessment which is not proportionate for this stage of business case development.

Greenhouse gas impacts

Greenhouse gas impacts were estimated using TUBA, as described in Section 3.4.7.

Local air quality and noise impacts

Local air quality and noise impacts resulting from changes to traffic volumes and travel patterns on the road network have been assessed qualitatively for each of the options. This follows latest version of TAG guidance (TAG Unit A3 Environmental Impact Appraisal, May 2019) which includes the latest updates to the scoping of noise assessment (Section 2.2.2 of unit A3). As noise impacts are deemed to be minimal TAG states "*a comment should be included on the 'key impacts' column of the AST*". The use of Marginal External Costs in line with TAG A5.4 has enabled quantification of the marginal changes in local air quality and noise across the modelled area in lieu of full noise and air quality modelling which is not proportionate for this stage of business case development.

Physical activity impacts

Changing levels of walking and cycling represent, in addition to economic efficiency impacts, changing levels of physical activity. These in turn generate health impacts, expressed as impacts on risk of premature death and on absenteeism.

The DfT Active Mode Appraisal Toolkit (AMAT) has been used to provide an indication of the physical activity benefits accrued by the increase in walking and cycling as a result of the scheme options. From the model outputs, only changes in active trips to or from Waterbeach village or Waterbeach New Town are considered in this analysis, excluding trips within or between these settlements. The average length of cycle trips has also been derived using these data to reflect local trip lengths in the corridor, but all other values have been left as the AMAT defaults.

Journey quality impacts

The provision of additional walking and cycling routes will provide an enhanced public realm and an improved ambience for pedestrians and cyclists. These are represented as journey quality impacts.

At this stage, and particularly as the scheme designs themselves are under development, the journey quality impacts have been assessed at the overall package level using assumptions based on the enhancement afforded to each of the new and existing users of the new infrastructure, monetised using the DfT AMAT. The Revised A10, Western and Revised Central route options assume no cycle route provision exists in the DM, whereas the Revised Eastern route option assumes provision of a segregated cycleway in the DM as this option directly parallels the existing Waterbeach Greenway.

Journey quality associated with the vehicles on the high-quality public transport route is incorporated within the perception factor within the model, so has not been considered separately to avoid potential double counting.

Journey time reliability

Journey time reliability refers to variation in journey times that individuals are unable to predict. This could come from recurring congestion at the same period each day (day-to-day variability) or from non-recurring events such as incidents. It excludes predictable variation relating to varying levels of demand by time of day, day of week or season. (the above is a paraphrase of Unit A1.3 para 6.1.1) In accordance with DfT TAG, journey time reliability impacts are reported only in the adjusted BCR and the AST.

A qualitative statement has been made on the potential changes to journey time reliability that may accrue because of the scheme.

Wider economic impacts

Wider economic impacts have been assessed qualitatively at this stage and considered as non-monetised impacts (Section 3.4.12). A proportionate monetised appraisal will be carried out ahead of the final submission of this business case.

Social impacts

Social impacts (SIs) cover the human experience on the transport system and its impact on social factors, where not considered as part of economic or environmental impacts. SIs include the impacts on accidents, physical activity, security, severance, journey quality, option and non-use values, accessibility, and personal affordability.

Distributional impacts

Distributional impacts (DIs) represent the variance of impacts across different social groups. DI analysis identifies those who would gain or lose from the interventions, with particular emphasis on equality through identifying the impacts on those who are disadvantaged compared to the majority of people. This means dis-aggregating the impacts on different socio-economic groups affected by the scheme. A high-level qualitative assessment of DIs has been undertaken at this stage, and the results are entered into the AST.

3.4. Results

The following sections outline the results of the economic appraisal.

3.4.1. Scale of transport demand

Building on the market analysis presented in Section 2.3.2, an exercise was undertaken to estimate the scale of demand that the transport services; to understand the relative performance of options. As part of this assessment, CSRM2 has been used to test how the different route options might influence travel patterns over the Cambridgeshire Sub-region.

Five scenarios were run to understand the impact of the scheme in the future. These scenarios include assessment years of 2026 and 2036 for each of the four options, plus a DM scenario (i.e. what would happen if the scheme was not developed – see Table 2-5 for what is included in the DM scenario). The results are presented in the following sections for the 2036 scenario.

Change in level of demand

Table 3-4 shows the forecast change in level of demand compared to the DM Scenario for the scheme in 2036 for each of the four options across a 12-hour period. The change in trip numbers in the Do Something (DS) options relative to the DM scenario are shown.

Table 3-4 - Change in daily person trips by mode (12-hour period)

	Route options			
Mode	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Highway	-800	-1,900	-2,300	-950
Public Transport	500	900	550	350
Park and Ride	800	2,450	2,700	1,100
Active Travel	-100	-100	100	-150

Table 2-1 shows that, in 2036, the Revised Central route option and Revised A10 route option are expected to lead to the largest mode shift from highway (car/van) to park and ride. This is as a result of both options making park and ride more attractive by:

- serving Milton Park and Ride site directly; and
- using the new public transport connection over the A14, bypassing Milton Interchange, significantly reducing congestion for public transport vehicles at this pinch point.

It is likely that those trips forecast to switch to park and ride with the High-Quality Public transport Route would drive to the park and ride site. Therefore, the highway network to the north of the park and ride site could experience an increase in traffic flow due to a greater demand for park and ride.

Forecast demand for public transport demand is similar across the options, with the exception of the Revised Central route option which would encourage more public transport use as it directly avoids congestion. Forecast ridership is highest for options that directly serve both sides of Milton Road within North East Cambridge, demonstrating the importance of providing this connectivity with any new infrastructure, as would be delivered by either the Western or Revised Central route options.

Levels of walking and cycling are forecast to only change slightly as a result of the scheme. The Revised Eastern route option leads to a larger reduction in walking and cycling as a result of the lack of additional active travel infrastructure proposed as part of this option due to the proximity of the proposed Waterbeach Greenway. Other decreases in trips are likely to be as a result of slight mode shift from active travel modes to public transport or park and ride.

Impact on highway congestion

The Revised A10 route option is expected to experience the largest increases in delays to traffic due to the signalisation of the A10 to the north of Milton village which results in traffic re-routing through Landbeach, via Waterbeach Road and Landbeach Road. The northbound A10 is predicted to experience an increase in delay of over six minutes in the 2036 evening peak at the Car Dyke Road junction, with most diversionary routes through Horningsea, Histon, Impington, Cottenham and Landbeach experiencing large increases in delay. The Revised Central, West and Revised Eastern route options could cause some delay at junctions with the proposed High Quality Public Transport Route.

Summary

As shown in Table 3-4, the Revised Central route option clearly outperforms the Revised Eastern and Western route options in terms of mode shift away from car and towards public transport and park and ride. The Revised Central, Revised Eastern and Western route options do not interact with major roads as much as the Revised A10 route option, so the former tend to result in lower increases in congestion. Whilst the Revised A10 route option does have some positive attributes, these come at a significant increase in cost which more than offsets the positive elements of the option.

3.4.2. User benefits

The following sections summarise the outcomes from the economic appraisal. Additional information is provided in Appendix H.

Overall

Table 3-5 summarises the forecast user benefits for each corridor option. The user benefits consist of journey time savings, plus changes in vehicle operating costs due to changes in levels of congestion, and hence fuel consumption, and user charges related to changes in paying tolls and fares.

Table 3-5 - Summary of user benefits (£m)

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Journey time savings	£27.9	£29.8	£62.1	£22.7
Vehicle operating costs	£2.2	£3.5	£6.0	£2.0
User charges	-£1.6	-£0.9	£1.5	-£0.5
Total user benefit	***£28.5***	***£32.4***	***£69.5***	***£24.3***

2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

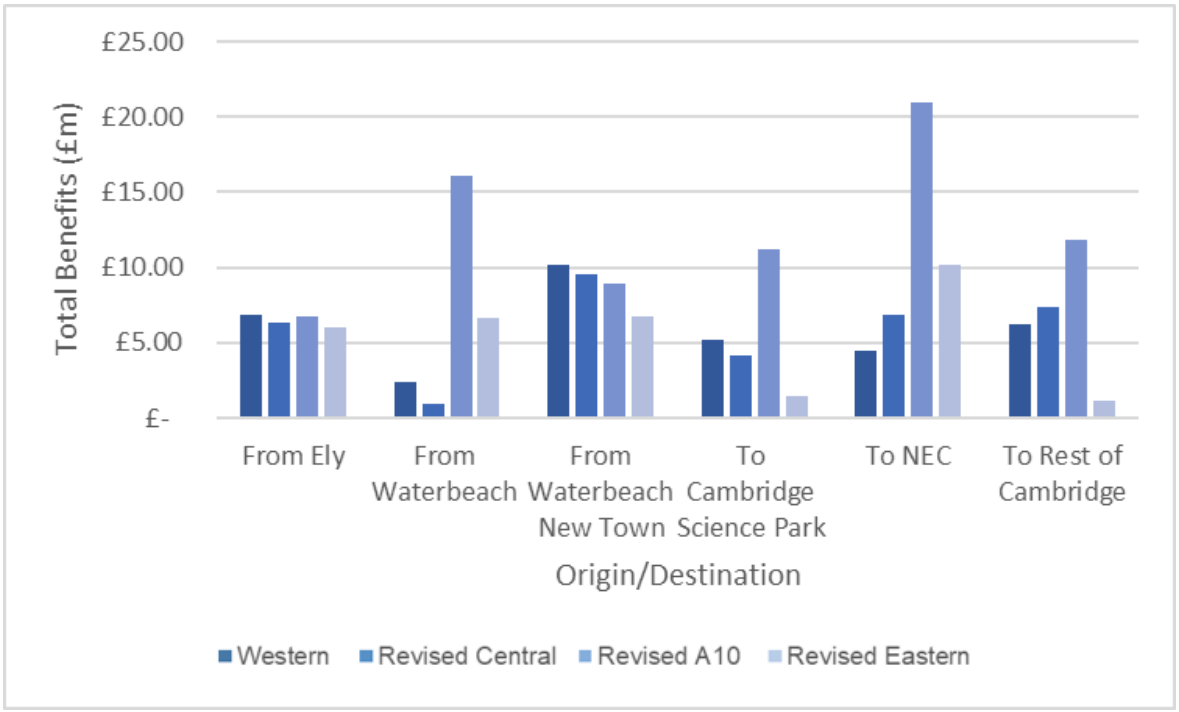
User benefits, shown in Table 3-5, are predominantly journey time savings, with some improvements to vehicle operating costs associated with reduced car use in the corridor and congestion reduction. There are minor changes to user charge benefits across all options, reflective of the balance of change between more users switching to public transport and therefore paying additional fares compared to the DM.

Several detailed analyses were undertaken on the TUBA user benefit outputs, to ensure that the results are logical and in line with expectations. These analyses are reported below.

Spatial distribution of user benefits

To understand the spatial distribution of benefits, sector analysis was carried out. As well as showing which movements benefit most/least, the analysis shows the extent to which model 'noise' is potentially having an impact on the results produced by TUBA (usually identified by counter-intuitive impacts for movements that are not expected to be affected by the interventions). Figure 3-1 summarises the spatial distribution of user benefits for key origins and destinations within the Study Area.

Figure 3-1 - Summary of spatial distribution of user benefits



Analysis of the spatial distribution of benefits for the Western route option shows that the greatest benefits are generated On journeys between Waterbeach New Town and Cambridge Science Park. This reflects the western alignment of the scheme serving Cambridge Science Park directly. Significant benefits are also seen between Waterbeach New Town and Northstowe likely to be as a result of the connection to the existing CGB, and from Ely and surrounding villages.

The Revised Eastern route option provides greater benefits for trips to Waterbeach village than Waterbeach New Town, and less benefits to Waterbeach New Town than the Western route option. This reflects the route alignment to the east of the study area and suggests that this route is not as effective as the Western route option in achieving the overall aim of the study. As a result of the Revised Eastern alignment, the greatest benefits are experienced on trips to NEC, rather than Cambridge Science Park.

The Revised Central route option generates most benefits for journeys to and from the Northstowe corridor, aligned with the CGB. Most of these benefits are attributed to trips to and from Waterbeach, Waterbeach New Town, Ely and surrounding villages. Significant benefits area so seen between Waterbeach New Town and NEC in both directions, with less benefits for those travelling to the Science Park.

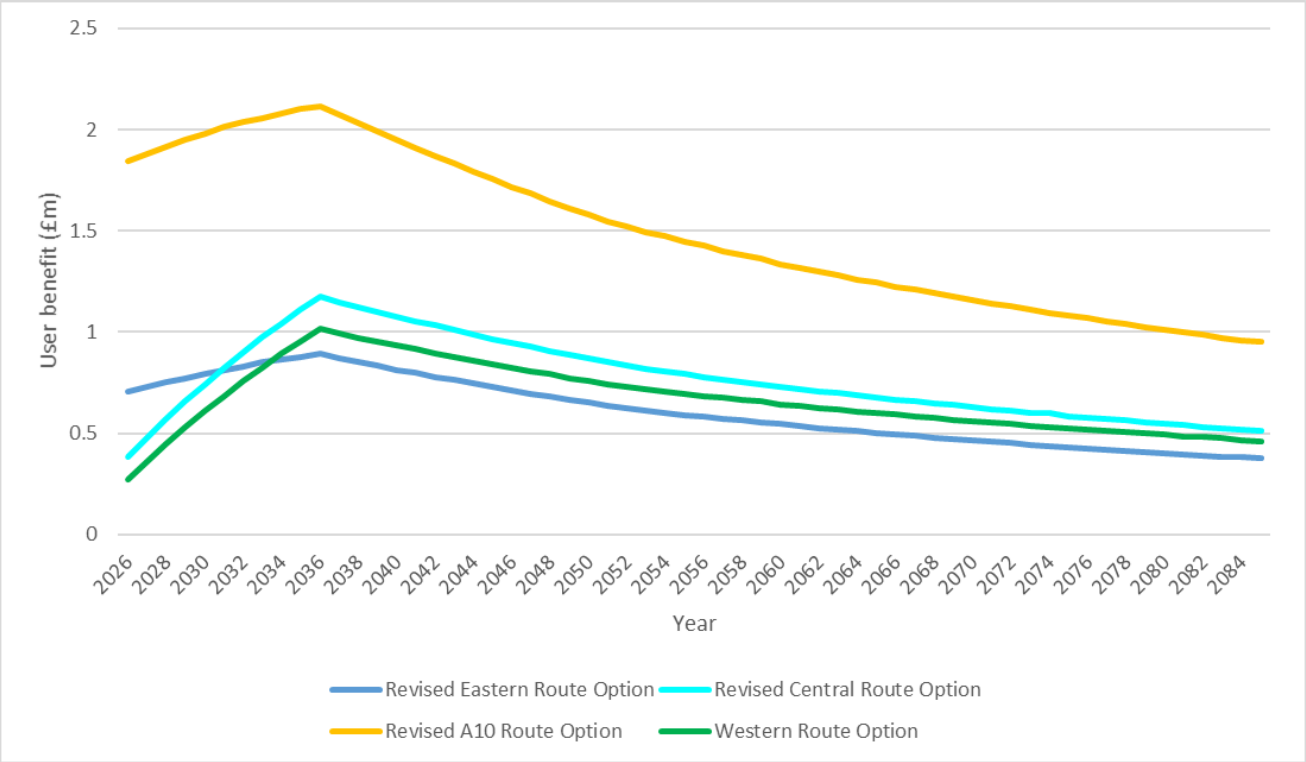
The Revised A10 route option provides most benefits to trips to and from NEC, mostly from Waterbeach, Waterbeach New Town, Ely and surrounding villages. Benefits are also generated for trips to Cambridge Science Park and Northstowe, particularly from the north of the Study area. It is possible to conclude that the Revised A10 route option provides greater and more evenly spread benefits to NEC and Cambridge Science Park. This is likely due to the alignment of the scheme in the centre of the study area and the benefits offered to existing users of Milton Park and Ride. However, in a similar pattern to the Revised Eastern route option, significantly greater benefits are predicted to be experienced on trips to and from the existing Waterbeach village than those to and from Waterbeach New Town.

Overall disbenefits across all options are expected on trips to Ely and the surrounding villages, likely to be as a result of increasing congestion on the A10 northbound towards Ely.

User benefits profile over 60-year appraisal period

Figure 3-2 shows the forecast profile of the user benefits across the 60-year appraisal period for each corridor option.

Figure 3-2 - Profile of user benefits over appraisal period



£m, 2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

The profile of benefits can be split in to two different trends. The Revised Eastern and Revised A10 route options have a slower growth from the initial modelled year of 2026 to the second modelled year of 2036, in line with growth in the area and increased scheme performance. In contrast, the Revised Central and Western route options have a much sharper increase in benefits from 2026 to 2036. This is aligned to these options having greater benefit to Waterbeach New Town in line with the scheme objectives, with the profile representative of the growth of the development to 2036. This also indicates that should a further forecast year be available, the benefits stream for these options is likely to grow further in-line with the continued build out of the site.

All options demonstrate a decline in benefits from 2036 onwards, where benefits are held constant in real terms, but decline in-line with discounting through the remainder of the appraisal period.

User benefits by mode of travel

Table 3-6 shows the user benefits disaggregated by mode of travel, for each corridor option over the appraisal period.

Table 3-6 - User benefits by mode of travel (£m)

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Road	£12.2	£14.3	£15.1	£5.1
Public transport	£4.3	£5.1	£11.2	£4.7
Park and Ride	£6.1	£10.6	£34.5	£13.8
Active travel	£5.9	£2.3	£8.7	£0.7
Total user benefit	***£28.5***	***£32.4***	***£69.5***	***£24.3***

2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

The results show a varying mix of benefits across the different modes of travel for each corridor option. The park and ride element of the Revised Central and Revised A10 route options is responsible for the largest share of benefits. There is also mode transfer from highway trips to park and ride and public transport across all options, resulting in benefits to road users as a result of a reduction in congestion, assuming no latent or suppressed demand.

Active travel benefits are higher in the Western and Revised A10 route options when compared to the Revised Eastern route option. This is a result of the Western and Revised A10 route options providing additional active travel facilities whereas the Revised Eastern route option would use the planned greenway.

User benefits by journey purpose

Table 3-7 summarises the user benefits disaggregated by journey purpose, for each scenario, over the appraisal period.

Table 3-7 - User benefits by journey purpose (£m)

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Non-business commuting	£10.1	£13.8	£39.3	£13.2
Non-business other	£13.2	£12.0	£21.6	£6.5
Business	£5.3	£6.6	£8.6	£4.6
Total user benefit	***£28.5***	***£32.4***	***£69.5***	***£24.3***

2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

The table indicates that there is not an even spread of the benefits between business and non-business users: for all options business benefits are significantly lower than for non-business benefits. With the Revised Central, Revised Eastern and Revised A10 route options, the majority of benefits are experienced by commuters. However, with the Western route option the largest proportion of benefits is derived from non-business other. This is a result of more direct connectivity to Cambridge Regional College, affording greater benefits for education trips than is seen across the other options as a proportion of the overall user benefits.

User benefits by size of time savings

The analysis for user benefits by time savings is summarised below and more detail is provided in Section H.2.

The patterns of benefit scale are very similar across all options. Road user benefits and disbenefits are most significant in the two-minute change band, with slightly greater benefits accruing through up to two-minute journey time reductions compared to journey time increases.

Public transport benefits are expected to be significant in journey time improvements above five minutes, in line with the expected impact of the scheme. There are disbenefits from other journey time changes, expected to be from where existing services are impacted by any point increased congestion. The OBC should focus on identifying these locations and understanding if mitigation can be put in place to minimise these impacts and improve the overall performance of the scheme. The positive benefits for travel by park and ride are demonstrated through journey time savings predominantly over above minutes. Active travel benefits are also for significant time savings, in line with opening up of new active mode corridors for three of the options.

User benefits by distance travelled

The analysis for user benefits by distance travelled is summarised below and more detail is provided in Section H.3.The vast majority of public transport and park and ride benefits are experienced by journeys between five and 50 kilometres in length. This is the case for all corridor options.

As expected, the main active travel benefits arise from short length trips of between one and five kilometres in length. This is the case for all options however, due to the Waterbeach greenway, the active travel benefits between this range are reduced when compared to other options.

3.4.3. Private sector provider impacts

Table 3-8 summarises the forecast revenue to private sector providers for each scenario. This essentially represents changes in public transport fare revenue.

Table 3-8 - Summary of revenue to private sector providers (£m)

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Private Sector Revenue	£15.9	£19.4	£29.8	£16.7

2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

The increased public transport patronage results in an increase in public transport revenue raised, which is reflected in the increase shown in Table 3-9. This revenue increase is considerable contribution to the overall proposition benefits stream, being approximately the same as the user time benefits afforded by the rapid transit proposition.

The incremental investment and operating costs, over and above the DM level, also count as private sector provider impacts.

3.4.4. Indirect tax impacts

Table 3-9 summarises the forecast indirect tax impacts, which reflect the forecast change in fuel duty and tax on public transport tickets.

Table 3-9 - Summary of indirect tax impacts (£m)

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Road	£1.8	£2.8	£5.0	£1.9
Public transport	£1.4	£1.5	£1.3	£0.8
Park and Ride	£1.2	£1.5	£3.2	£1.8
Active travel	£0.0	£0.0	£0.0	£0.0
Total indirect tax impacts	***£4.4***	***£5.8***	***£9.5***	***£4.4***

£m, 2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

There is a forecast increase in indirect taxation to road users in all corridor options, despite the reduction in congestion leading to fuel savings. The attraction of the high-quality public transport route scheme results in a greater number of people driving to access public transport and park and ride facilities than without the scheme, offsetting the reduction in indirect tax caused by reduced congestion. Therefore, the overall level of indirect tax rises. Public transport users also see a rise in taxation revenues, since the additional (non-taxable) spend on public transport fares results in a more incidental spend elsewhere in the economy on taxable goods.

3.4.5. Impacts during construction and maintenance

As much of the high-quality public transport route is, by definition, offline from the existing highway network, much of the construction will have a minimal impact upon existing delays and congestion. An exception to this is where the high-quality public transport route crosses or joins the existing highway network, including the CGB. Typically, this is achieved with new signalised crossings. It may be possible to avoid protracted road closures here as the level of intervention is small and could be achieved in off-peak periods, such as at weekends or during the night. Options that cross the A10 in this manner are expected to incur the greatest disbenefit from this, as it is the most major road encountered. The exception to this being when the junction would be a part of a highway entrance to Waterbeach New Town which would need installing regardless, as a part of the development.

The options that are likely to cause the greatest amount of disruption to the highway network during construction are the Revised A10 and Revised Eastern route options. The Revised A10 route option would require the creation of a new signalised level crossing of the A10, and also a substantial flyover across Milton Interchange, which would likely necessitate the temporary closure of both the A10 and A14 as it was installed. Likewise, the Revised Eastern route option would require tunnelling under the A14, which would, at a minimum, disrupt that road.

During maintenance of the high-quality public transport route, it is assumed that the high-quality public transport route vehicles will be able to divert onto the existing highway network between junctions to avoid the section being maintained, as is the case on the existing CGB. It is also assumed that, except in emergencies, any maintenance would be undertaken outside of peak hours, for instance overnight or during weekends and school holidays, to minimise the amount of congestion and delay the high-quality public transport services would encounter on the diversion, and the number of passengers affected. This is also based on the operations of the existing CGB.

3.4.6. Impacts from changes to the number of accidents

The modal shift from highway to public transport, combined with safety improvements incorporated within the scheme designs are likely to have a cumulative effect of reducing the number of accidents on the network. All options are likely to contribute to benefits through moderate mode shift and localised network improvements associated with the core high-quality public transport route schemes. This modal shift away from car is expected to be the principal source of the reduction of accidents regardless of the option adopted.

The provision of walking and cycling routes alongside the high-quality public transport route is also likely to reduce the number of accidents to these users as it will provide an alternative route to the A10 itself. The Revised Eastern route option is the least likely to provide benefits here as it runs parallel to the proposed route of the Waterbeach Greenway. Similarly, the Western route option parallels Mere Way for most of the way between Cambridge and Waterbeach New Town, however it may offer some safety benefits in keeping walkers and cyclists off the highway network between Landbeach and Waterbeach New Town, providing a suitable crossing of the A10 is provided. In this regard the Revised Eastern route option may prove to be the safest as it has no crossing of the A10 and minimal at grade crossings of other roads. The safety benefit to pedestrians and cyclists resulting from the adoption of each of the options is captured as a part of the journey quality impacts in Section 3.4.10.

Minimising the number of at-grade road crossings of the high-quality public transport route also reduces the risk of collisions between regular vehicles on the highway and services on the high-quality public transport route. Likewise, by minimising at grade crossings there would be a reduced risk of unauthorised vehicles entering the high-quality public transport route posing a collision hazard or damaging the high-quality public transport route itself.

The qualitative assessment has been supplemented by the use of Marginal External Cost calculations based on changes to total travel within the transport model. The marginal changes associated have been monetised below.

Table 3-10 - Summary of accident impacts (MEC) (£m)

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Accidents	£0.42	£0.39	£0.25	£0.06

2010 values and prices.

Source: Marginal External Cost Assessments for T1001A, T1002, T1004, T1005 compared to T1000D

Table 3-10 shows that all four corridor options would result in accident benefits. The Western and Revised Central route options are forecast to achieve slightly higher benefits than the Revised A10 and Revised Eastern route options. These results would be developed through accident impact assessments during the OBC.

3.4.7. Greenhouse gas impacts

Table 3-11 summarises the estimated greenhouse gas impacts for each scenario.

Table 3-11 - Summary of greenhouse gas impacts (£m)

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Greenhouse gases	£0.9	£1.4	£2.3	£0.9

2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

Greenhouse gas emissions are forecast to fall with all four corridor options due to reductions in highway congestion and levels of traffic.

3.4.8. Local air quality and noise impacts

A qualitative Air Quality Assessment (AQA) has been conducted. The higher the mode shift from car to public transport or walking/cycling, the greater the reduction in emissions as there are fewer vehicles on the highway. As a result, there is a greater benefit in the AQA because the air is cleaner due to the reduction in air pollutants given off by vehicle exhausts. This approach is in accordance with TAG unit A3, Section 3.3.3 – AQ Impacts Scoping, that states "*The air quality appraisal should be proportional to the scheme and its proposed impact. Analysis should be no more detailed than is required to support robust decision making.*", therefore as there are not any significant changes anticipated, a quantitative approach will not be undertaken.

As a result of the increased provision of public transport in all options, small reductions in traffic flow and delay are predicted across the built-up area around the A10 corridor north of Cambridge. These are likely to lead to small local air and noise quality benefits. An increase in flow and delay is predicted on the approach to the new park and ride site at Waterbeach New Town and, if it is served by the high-quality public transport route, the existing park and ride site at Milton. Waterbeach New Town Park and Ride site is assumed to be adjacent to the A10 on the north western side of the Waterbeach New Town site, thus any increased queuing or delay approaching the site from the north would not significantly impact air quality or noise pollution in any built up area, although flows exiting the site could cause increases in these issues within Waterbeach New Town itself. This is offset to some degree by trips from Waterbeach New Town using the public transport service offered by the high-quality public transport route instead of trying to leave the development by car, and thus reducing queuing and delays on the main highway exits from the development.

Public transport routes on the high-quality public transport route that serve Milton Park and Ride site (namely the Revised Central and Revised A10 route options) lead to some rerouting to through Impington and Histon without any mitigation, due to car flows attempting to leave the park and ride site and access the A14, as here the most direct route requires crossing the northbound A10 flow. This is likely to lead to localised disbenefits in terms of air quality and noise.

The qualitative assessment has been supplemented by the use of Marginal External Cost calculations based on changes to total travel within the transport model. The marginal changes associated have been monetised below.

Table 3-12 - Summary of local air quality and noise impacts (MEC) (£m)

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Local air quality	£0.08	£0.07	£0.04	£0.01
Noise	£0.04	£0.06	£0.02	£0.02

2010 values and prices.

Source: Marginal External Cost Assessments for T1001A, T1002, T1004, T1005 compared to T1000D

This monetisation supports the qualitative statements that some very small improvements would be brought about by each of the four options, with Western and Revised Central route options demonstrating slightly higher benefits than the Revised A10 and Revised Eastern route options. These results would be developed through full noise and air quality assessments during the OBC.

3.4.9. Physical activity impacts

Table 3-13 summarises the forecast physical activity benefits of each corridor option. A benefit is accrued as a result of increased numbers of users travelling by active modes, with the associated health benefits (reduced mortality and absenteeism) captured below.

The greatest benefit from changes to the levels of physical activity of users is expected from the Revised A10 route option as it provides the most direct link between Waterbeach (village and New Town), Landbeach, Milton and the Science Park and therefore attracts the greatest number of active mode users. The Western and Revised Central route options are not as direct, so attracts fewer new active mode users from the Waterbeach area to the Science Park.

The Revised Eastern route option performs poorly here as there are no additional walking and cycling links provided as it would duplicate the Waterbeach Greenway. Consequently, the provision of improved public transport links along the high-quality public transport route results in a reduction in the number of people walking and cycling. Therefore, the Revised Eastern route option experiences a slight reduction in physical activity benefits.

Table 3-13 - Summary of physical activity benefits (£m)

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Physical activity benefits	£4.1	£1.5	£8.0	-£0.3

2010 values and prices.

Source: AMAT Assessments for T1001A, T1002, T1004, T1005 compared to T1000D

3.4.10. Journey quality impacts

The Revised A10, Western and Revised Central route options assume no cycle route provision exists in the DM, whereas the Revised Eastern route option assumes provision of a segregated cycleway in the DM as it directly parallels the Waterbeach Greenway. Therefore, the Revised Eastern route option would be expected to perform poorly in comparison to the others here. Note that the walking provision is assumed to remain unchanged between the DM and four corridor options due to the length of the routes meaning they are not principally designed for pedestrians. Table 3-14 summarises the benefits for each scenario.

Table 3-14 - Summary of journey quality impacts (£m)

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Journey quality benefits	£25.5	£25.1	£19.0	£0.0

2010 values and prices.

Source: AMAT Assessments for T1001A, T1002, T1004, T1005 compared to T1000D

As there is no proposed improvement to the quality of the cycleway in the Revised Eastern route option, there is no journey quality improvement. By comparison, the Revised A10 route option is expected to generate more physical activity benefits than the Western route option, due to there being more additional cycling trips in the former. The Western and Revised Central route options have the greater journey quality benefits. This occurs despite both options seeing the same level of improvement (no provision for cyclists to off-road segregated cycleway) because the average cycling trip on the Western and Revised Central route options uses the cycleway for a greater proportion of the entire trip, therefore yielding greater ambience benefits.

3.4.11. Journey time reliability impacts

Journey time reliability has been assessed qualitatively. The provision of a segregated high-quality public transport route between Waterbeach New Town and Cambridge North railway station, independent of route, will improve journey time reliability. This is because public transport services on the high-quality public transport route will be off-line and therefore are not subject to existing congestion. As a result, all options are expected to deliver journey time reliability benefits.

Further journey time reliability benefits are expected due to the shift of journeys towards park and ride and public transport trips. This is observed in each of the options indicating there is greater use of the high-quality public transport route resulting in reduced congestion along A10 between Milton Park and Ride and Waterbeach New Town, meaning benefits are delivered to the remaining highway users. For example, highway journey times are expected to become more reliable. The Revised A10 route option appears to deliver the most benefits due to the reduction in congestion along the stretch of the A10 previously mentioned.

The proposed high-quality public transport route will provide a higher level of journey time reliability than the existing bus services on the corridor because all options would bypass Milton Interchange, which is historically the most congested part of the A10 corridor. Journey time reliability may not be improved if portions of the services run on the normal highway network, meaning services may be subject to congestion due to the absence of public transport priority.

3.4.12. Wider economic impacts

Wider economic impacts have been assessed qualitatively. The provision of a segregated high-quality public transport route between Waterbeach New Town and Cambridge North railway station will have large positive wider economic impacts. The scheme would provide the infrastructure to support and accelerate the creation in the Greater Cambridge area of 44,000 new jobs (notably, around the North East Cambridge development), 33,500 new homes (including Waterbeach New Town) and 420 additional apprenticeships[57]. In addition, this scheme unlocks employment opportunities from onward travel to Ely and from the Cambridge North railway station will lead to improved employment opportunities through better accessibility to jobs for residents of Waterbeach New Town. As a result, a new segregated high-quality public transport route would vastly improve the connectivity between villages and towns to the north of Cambridge with the wider GCP network, thus avoiding bottlenecks on the transport network (at Milton Interchange, for example).

3.4.13. Social impacts

Social impacts have been assessed qualitatively. The provision of a segregated high-quality public transport route between Waterbeach New Town and Cambridge North railway station will generate positive impacts in terms of severance and health.

Currently, based on public consultation feedback, Waterbeach suffers from moderate severance issues in terms of the public transport services and active travel routes to/from Cambridge. Leading to residents feeling isolated, particularly if they do not have access to private vehicle travel. The severance is deemed moderate in accordance with TAG Unit 4-1 where more than 200 people per day are affected by the severance issues but less than 1,000. Therefore, any of the four options would deliver moderately positive social impacts in terms of severance.

The scheme would also provide additional links to education, including but not limited to Cambridge Regional College from Ely, Waterbeach village and Waterbeach New Town. All options would have a positive impact on access to education.

[57] Greater Cambridge Partnership (2021) *Our Vision* https://www.greatercambridge.org.uk/ [Accessed 03.03.2021]

As discussed in Section 3.4.8, there will be small air quality benefits due to the reduction of congestion along the A10. This means that local air will be cleaner. As a result, users and non-users alike, of the high-quality public transport route will experience improvements in health attributed to cleaner air.

3.4.14. Distributional impacts

Distributional impacts have been assessed qualitatively. The provision of a segregated high-quality public transport route between Waterbeach New Town and Cambridge North railway station will generate positive impacts in terms security.

The security benefits will mainly be driven by the improvements in public transport waiting facilities and interchange infrastructure. Security benefits will also be received from formal surveillance such as CCTV at the public transport waiting facilities as well as the provision of lighting and visibility along the corridor. In accordance to TAG Unit 4-2, the security benefits will largely be felt by the following groups:

- women;
- younger people;
- older people;
- people with disabilities; and
- Black and Minority Ethnic (BME) communities.

These user groups suffer from greater anxiety when using public transport leading to the potential suspension of travel. Therefore, the interventions discussed will not only improve security they will also increase the number of users, using the high-quality public transport route as well as the accompanying active travel provision.

3.5. Reporting of results

3.5.1. Transport Economic Efficiency (TEE) table

The TEE table brings together the impacts on transport users and providers (Section 3.4.2) and the impacts during construction and maintenance where appraised (Section 3.4.5). The TEE tables are provided in Section H.4 and summarised in Table 3-15.

Table 3-15 – Summary of TEE table results

Trip type	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Non-business: commuting	£10,058	£13,772	£39,266	£13,174
Non-business: other	£13,174	£11,975	£21,647	£6,535
Business: User Benefits	*£5,287*	*£6,636*	*£8,576*	*£4,571*
Business: Private sector provider impacts	*£-2,499*	*£1,026*	*£14,167*	*£3,175*
Business Impacts	£2,788	£7,662	£22,743	£7,746
TOTAL[58]	**£26,020**	**£33,409**	**£83,656**	**£27,455**

millions, 2010 values and prices.

Source: TUBA Runs for T1001A, T1005, T1004, T1002 compared to T1000D

Table 3-15 shows that the Revised A10 route option has the most benefits for transport users due to large journey time decreases compared to the other three. The Western and Revised Eastern route options offer comparable benefits, whilst the Revised Central route options offer slightly better benefits because of positive business impacts, including large revenues to private sector providers.

[58] The total is calculated by adding Non-business: commuting, Net non-business benefits: other and Net Business Impacts.

3.5.2. Public Accounts (PA) table

The PA table brings together the costs of the option and the revenue and tax changes which would result for the public sector. The costs are as set out in Section 3.3.5. The revenue and tax impacts which follow from changes in traffic routing and speeds are derived from the TUBA output. The PA tables are provided in Section H.5 and in Table 3-16.

Table 3-16 - Summary of PA table results

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Broad Transport Budget	£46,468	£49,373	£167,571	£41,929
Wider Public Finances (Indirect tax)	£4,376	£5,841	£9,560	£4,448

Table 3-16 shows that the Revised A10 route option would require significantly more funding from local government, approximately three times as much as the next closest options (Revised Central route option). The other three options require a comparable amount of funding from local government funding and wider public finances.

3.5.3. Analysis of Monetised Cost and Benefits (AMCB) table

The AMCB table brings together monetised scheme costs and benefits, to help determine value for money of each option. The table is based on those elements of the economic appraisal which are considered to produce robust monetised estimates of the impacts and therefore contribute to the Initial BCR. It includes, where available:

- user benefits, including changes in user charges (Section 3.4.2);
- revenue to private sector providers (Section 3.4.3);
- impacts during construction and maintenance (Section 3.4.5);
- indirect taxation impacts (Section 3.4.4);
- accident impacts (Section 3.4.6);
- environmental impacts (Sections 3.4.7 and 3.4.8);
- journey quality impacts (Section 3.4.10); and
- physical activity impacts (Section 3.4.9)

The AMCB table presents four key overall measures:

- Present value of benefits (PVB): The sum of the discounted benefits over the appraisal period, reduced by the discounted value of any developer contributions or equivalent (in this case, the operators' share of the investment costs).
- Present value of costs (PVC): The sum of the discounted costs over the appraisal period, reduced by the discounted value of any developer contributions or equivalent (in this case, the operators' share of the investment costs). In effect this represents the cost to government.
- Net present value (NPV): The PVB minus the PVC. This indicates whether the net benefits are positive or negative, and their scale.
- Benefit-cost ratio (BCR): The ratio of the PVB and the PVC. A BCR above 1.0 indicates that the benefits exceed the costs (i.e. the net benefits are positive).

Table 3-17 shows the Analysis of Monetised Costs and Benefits for the four options.

Table 3-17 - Analysis of Monetised Costs and Benefits

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Noise	£3	£59	£19	£16
Local Air Quality	£75	£71	£43	£10
Greenhouse Gases	£887	£1,356	£2,326	£887
Journey Quality	£25,538	£25,090	£18,951	£0
Physical Activity	£4,148	£1,478	£7,983	-£288
Accidents	£424	£378	££250	£64
Economic Efficiency: Consumer Users (Commuting)	£10,058	£13,772	£39,266	£13,174
Economic Efficiency: Consumer Users (Other)	£13,174	£11,975	£21,647	£6,535
Economic Efficiency: Consumer Users (Commuting)	£2,788	£7,662	£22,743	£7,746
Wider Public Finances (Indirect Taxation Revenues)	-£4,376	-£5,841	-£9,560	-£4,448
Present Value of Benefits (PVB) – Total of above factors)	**£52,753**	**£55,999**	**£103,669**	**£23,697**
Broad Transport Budget	£46,468	£49,373	£167,571	£41,929
Present Value of Costs (PVC) (see Table 3-16)	**£46,468**	**£49,373**	**£167,571**	**£41,929**
Net Present Value (NPV) (PVB – PVC)	£6,285	£6,626	-£63,902	-£18,231
Benefit to Cost Ratio (BCR)	**1.135**	**1.134**	**0.619**	**0.565**

millions, 2010 values and prices.

Source: TUBA Runs for T1001A, T1005, T1004, T1002 compared to T1000D

3.5.4. Benefit-Cost Ratio (BCR)

Table 3-18 summarises the PVB, PVC, NPV and Initial BCR for each of the four corridor options.

Table 3-18 - Summary of Benefits, Costs and BCRs

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Present Value of Benefits (PVB) (£m)	£52.8	£56.0	£103.7	£23.7
Present Value of Costs (PVC) (£m)	£46.5	£49.4	£167.6	£41.9
Net Present Value (Initial) (NPV) (£m)	£6.3	£6.6	-£63.9	-£18.2
Benefit: Cost Ratio (Initial) (BCR)	**1.135**	**1.134**	**0.619**	**0.565**

2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

The options fall within two categories of performance. The Western and Revised Central route options both have BCRs that are greater than 1.00, with a positive NPV. These options have the best balance between benefits accrued to users and the cost to implement the scheme.

In contrast, the Revised A10 and Revised Eastern route options exhibit BCRs of less than 1.00, with negative NPV. The Revised A10 route option does yield the greatest benefit stream, but also has the highest costs to deliver the scheme and unlock these benefits. This results in a lower value for money than scheme with lower overall benefit levels, but lower costs of implementation.

The Revised Eastern route option performs more poorly, despite having similar cost levels to the Western and Revised Central route options. This is as a result of lower benefit streams due to the narrower market for public transport and park and ride use and minimal improvements to active travel.

3.5.5. Non-monetised impacts

The following non-monetised impacts have been assessed and are summarised in the Appraisal Summary Table (AST) where appropriate:

- Security;
- Severance;
- Accessibility;
- Townscape;
- Historic environment;
- Landscape;
- Biodiversity;
- Water environment;
- Affordability;
- Access to services; and
- Option and non-use values.

3.5.6. Appraisal Summary Table (AST)

The AST summarises all the aspects of the appraisal, whether qualitative, quantified or monetised. The ASTs for the scenarios can be found in Appendix G.

3.5.7. Sensitivity tests

A number of sensitivity tests of the appraisal have been made, the results of which are described in the following sections.

Excluding the impact of Marginal External Cost calculations

Marginal External Costs present a mechanism to give an early indication as to benefits accrued through changes to Noise, Local Air Quality and Accidents, in lieu of formal and detailed assessments. The table below presents the BCRs for each option without the MEC analysis included.

Table 3-19 - Summary of Benefits, Costs and BCRs - Excluding Marginal External Costs

	Western route option	Revised Central route option	Revised A10	Revised Eastern route option
Present Value of Benefits (PVB) (£m)	£52.2	£55.5	£103.4	£23.6
Present Value of Costs (PVC) (£m)	£46.5	£49.4	£167.6	£41.9
Net Present Value (Initial) (NPV) (£m)	£5.7	£6.1	-£64.2	-£18.3
Sensitivity Benefit: Cost Ratio (Initial) (BCR)	**1.124**	**1.124**	**0.617**	**0.563**
Original Benefit: Cost Ratio (Initial) (BCR)	**1.135**	**1.134**	**0.619**	**0.565**

2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

This demonstrates that the impact of this assessment is marginal in terms of the overall scale of benefit and does not impact upon the value for money category that each option would sit within.

Excluding estimates for Bus purchase, operation, and maintenance

At the current stage of scheme development, the exact nature of vehicle type or service patterns that will be run on the infrastructure is not yet known. Assumptions have been made for the purpose of transport modelling to inform the economic appraisal and enable an estimation of the initial capital, renewal and operation costs of representative services, assuming single deck electric bus operation. Given the longer-term aspirations for this route to form part of the wider CAM network, these assumptions may not prove to be representative of the longer-term picture. Given this uncertainty, this sensitivity presents the economic appraisal results excluding the current estimates of the capital, renewal and operational expenditure for the Private sector services.

Table 3-20 - Summary of Benefits, Costs and BCRs - Excluding Bus CAPEX and OPEX

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Present Value of Benefits (PVB) (£m)	£71.1	£74.4	£119.3	£37.2
Present Value of Costs (PVC) (£m)	£46.5	£49.4	£167.6	£41.9
Net Present Value (Initial) (NPV) (£m)	£26.7	£25.0	-£48.2	-£4.7
Sensitivity Benefit: Cost Ratio (Initial) (BCR)	**1.531**	**1.507**	**0.712**	**0.888**
Original Benefit: Cost Ratio (Initial) (BCR)	**1.135**	**1.134**	**0.619**	**0.565**

2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

These results show that the impact of removing the OMR costs for the bus services **is significant** and would move both the Western route option and Revised Central route option BCRs from the 'low' to 'medium' category. The Revised A10 and Revised Eastern route options would remain rated as 'poor' value for money.

This indicates that when quantifying the value for money during the OBC, it will be important to resolve the type and pattern of service that will utilise the high-quality public transport route and accurately account for the incremental costs that are required as a result of this scheme. Should, for example, the vehicles required not be purchased specifically for this scheme, but part of a wider fleet purchase, then the cost implications associated with this scheme directly could have an impact on the value for money categorisation.

Reduced OB to OBC levels

As the scheme design progresses, the level of Optimism Bias associated reduces as early uncertainties are quantified. To demonstrate the potential impact of reduced Optimism Bias at OBC (15% for all elements except structures at 23%), assuming no other change to project costs, the following summary has been produced.

Table 3-21 - Summary of Benefits, Costs and BCRs – OBC-level Optimism Bias

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Present Value of Benefits (PVB) (£m)	£52.8	£56.0	£103.7	£23.7
Present Value of Costs (PVC) (£m)	£38.1	£40.8	£130.8	£34.4
Net Present Value (Initial) (NPV) (£m)	£14.6	£15.2	-£27.1	-£10.7
Sensitivity Benefit: Cost Ratio (Initial) (BCR)	**1.384**	**1.372**	**0.793**	**0.690**
Original Benefit: Cost Ratio (Initial) (BCR)	**1.135**	**1.134**	**0.619**	**0.565**

2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

These results show that the change in Optimism Bias will not change the value for money category for any option but will result in an increase in the BCR. Assigning the appropriate level of Optimism Bias and undertaking quantification of the risk allowance will therefore be important aspects for considering at OBC.

High Value for Money threshold

The following tipping point analysis identifies the level of change to the Present Value Benefit stream required for each option to reach the 'high' value for money category.

Table 3-22 – Present Value Benefits tipping point analysis

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Present Value of Benefits (PVB) (£m)	£52.8	£56.0	£103.7	£23.7
Present Value of Benefits Required for BCR 2.0 (PVB) (£m)	£93.0	£98.8	£335.2	£83.8
Increase in Benefits Required (PVB) (£m)	£40.2	£42.8	£231.5	£60.1
Percentage Increase in Benefits Required (%)	76%	76%	223%	254%

£m, 2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

This shows that the Western and Revised Central route options would require a 76% uplift in their Present Value Benefit stream to move to the 'high' value for money category should no changes to the scheme costs take place. A much larger uplift would be required for the Revised A10 and Revised Eastern route options, with 223% and 254% increases in Present Value Benefits required respectively.

Present Value Cost reductions could also yield a change in value for money categorisation. The sensitivity test below shows the cost reductions that would be required for each option to meet a 'high' value for money category.

Table 3-23 – Present Value Costs tipping point analysis

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Present Value of Costs (PVC) (£m)	£46.5	£49.4	£167.6	£41.9
Present Value of Costs Required for BCR 2.0 (PVC) (£m)	£26.4	£28.0	£51.9	£11.9
Decrease in Costs Required (PVC) (£m)	-£20.1	-£21.4	-£115.75	-£30.05
Percentage Decrease in Costs Required (%)	-43%	-43%	-69%	-72%

£m, 2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

This demonstrates that as with the benefits uplift, the Western and Revised Central route options require less change to move to the 'high' value for money category, with a 43% cost reduction required. The Revised A10 and Revised Eastern route options again require higher shifts, with reductions of 69% and 72% respectively.

A combination of Present Value Benefit increases and Present Value Cost reductions could also yield the same shift, with the above outlining the extremes of each.

Sensitivity test economics file

DfT have released a secondary economics file for use in TUBA runs, with revised forecasts for Value of Time changes aligned to the forecast direction that TAG is likely to take in its next update. TUBA has therefore been re-run utilising the sensitivity economics file (version 1_14_0) with the results compared to the initial results below.

Table 3-24 - Summary of Benefits, Costs and BCRs – Sensitivity Test Economics

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Present Value of Benefits (PVB) (£m)	£48.1	£51.0	£94.1	£20.1
Present Value of Costs (PVC) (£m)	£46.5	£49.4	£167.6	£41.9
Net Present Value (Initial) (NPV) (£m)	£1.6	£1.6	-£73.5	-£21.8
Sensitivity Benefit: Cost Ratio (Initial) (BCR)	**1.034**	**1.033**	**0.562**	**0.481**
Original Benefit: Cost Ratio (Initial) (BCR)	**1.135**	**1.134**	**0.619**	**0.565**

2010 values and prices.

Source: TUBA Runs for T1001A, T1002, T1004, T1005 compared to T1000D

These results show that the revised Value of Time forecasts would slightly reduce the benefits accrued by the scheme. The impacts are similar across each of the options, demonstrating that while the overall value for money of each option would be influenced, the relative performance would not be affected. It is anticipated that revised TAG guidance and forecasts will be in place to be used during the OBC phase of the study.

3.6. Value for money statement

Tests for four different corridor options have been undertaken to demonstrate the current forecast of the economic value for money of the scheme. The initial BCRs of 1.134 and 1.135 for the Revised Central and Western route options respectively represent 'low' value for money, as defined in WebTAG. The value for money of these options has the potential to be enhanced, depending on the future level of growth that comes forward in the corridor and longer modelling forecasts to capture the full build out potential of Waterbeach New Town. For example, the recent call for sites for the Greater Cambridgeshire Local Plan identify a number of potential development sites in this area and should these developments come forward, significant sustainable transport measures will be required to ensure that it does not have a significant impact on the already congested highway network. Sensitivity testing for higher growth scenarios is to take place at OBC stage of the business case process. The benefits of these options are driven by improved journey times for public transport and park and ride users, alongside journey quality benefits for active travel users. More detailed transport modelling at OBC phase would provide greater depth of representation and analysis of the results.

The initial BCRs of 0.619 and 0.565 for the Revised A10 and Revised Eastern route options respectively represent 'poor' value for money, as defined in WebTAG. Whilst there is also a case for these options to result in increased benefit streams as uncertainties are resolved, it is unlikely that these options will represent the same value for money return as demonstrated by the Western and Revised Central route options.

With the above in mind, the proposed scheme provides significant wider economic benefits (see Section 3.4.12), as it enables economic growth and boosts connectivity, particularly to/from:

- settlements to the north of Cambridge, such as Waterbeach New Town and Ely; and
- employment areas, such as NEC and onward travel to Cambridge city centre and beyond.

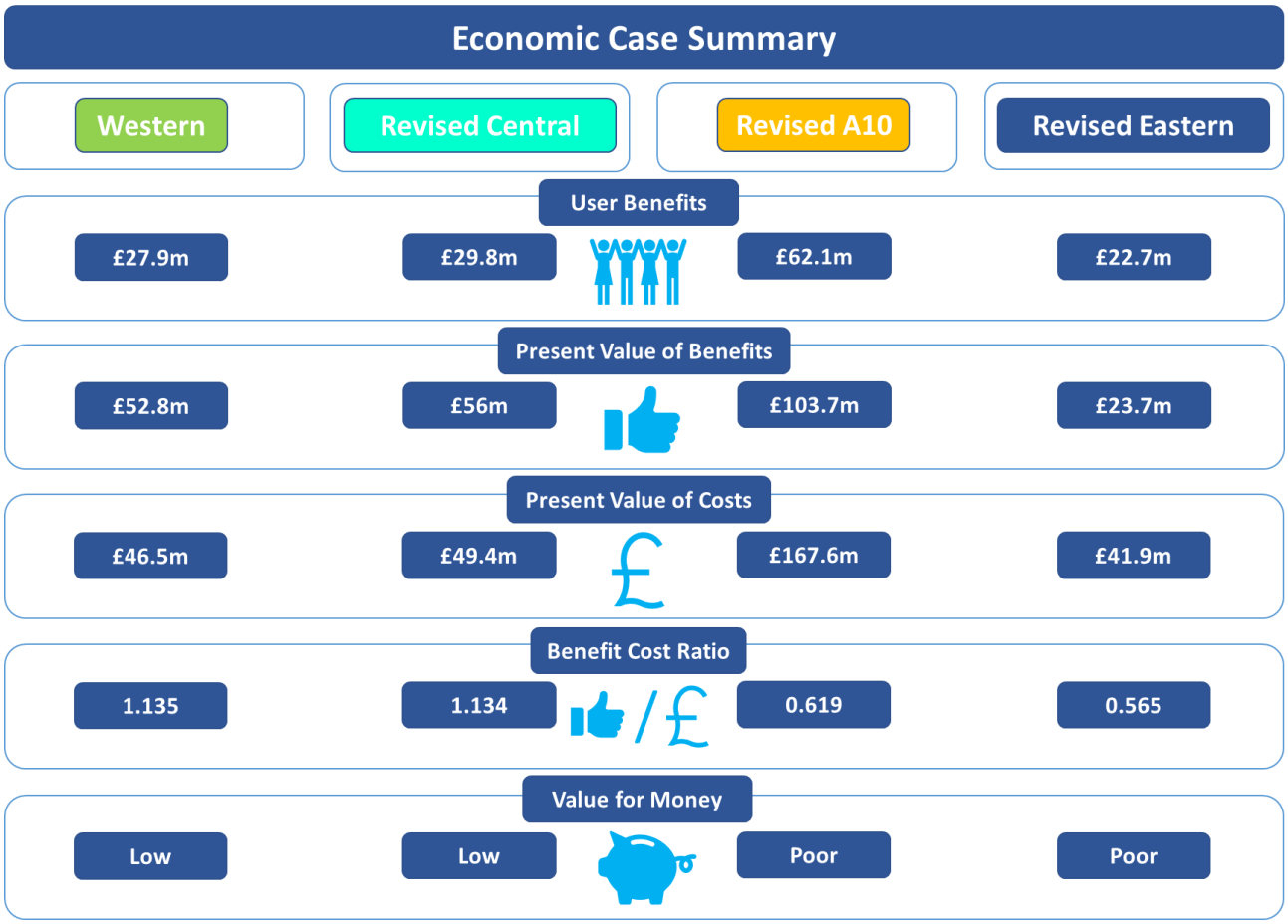
The scheme significantly supports the development of homes and jobs within the Greater Cambridge area and enables sustainable travel between travel markets in the study area too.

Key uncertainties remain in terms of the interaction with other schemes in the area, including the proposed A10 upgrade. The option to be taken forward for the A10 highway improvement would have an impact on the economic performance and strategic fit of the options considered here and should be taken into account once further details are known. Possible enhancements to the transport model have also been identified through this and other studies as part of a process for continual improvements. These enhancements will enable a more detailed representation of the corridor and the schemes, which alongside clarification over a number of uncertainties in the area will enable a more accurate qualification of the scheme value for money as the study progresses to OBC.

3.7. Appraisal results

Figure 3-3 summarises the key quantified benefits and costs from the economic appraisal which is set out in the Economic Case.

Figure 3-3 - Summary of appraisal outcomes



4. Financial Case

4.1. Introduction

This chapter sets out the Financial Case for the Waterbeach to Cambridge Public Transport Scheme. The objective of the Financial Case is to provide evidence as to the affordability of the proposal including funding arrangements and technical accounting issues. At SOBC stage the DfT document '*The Transport Business Cases*'[59], requires that the Financial Case contains the following:

- an introduction outlining the approach taken to assess affordability (Outline); and
- analysis of budgets / funding cover for the project (Outline).

The following aspects of the Financial Case are not required at SOBC stage and will therefore be considered at Outline Business Case (OBC) and beyond:

- costs (not required at SOBC, but high-level capital cost estimates are nevertheless included in this Chapter); and
- accounting implications.

4.2. Capital costs

Initial capital estimates have been made based on the Waterbeach to Cambridge network structure presented in Strategic Case (see Figure 2-1). Estimates of cost are based on current cost rates, based on unit prices for infrastructure and the associated works.

The costs produced are based on the following assumptions:

- the prices are as at Q1 2021 and exclusive of VAT;
- ground conditions are generally good with no soft spots (except for Milton Landfill, where a separate allowance has been identified for ground stabilisation);
- "shallow foundations" for the entire length of the guideway i.e. no piling;
- stabilisation of soils not required over and above risk allowance;
- services are generally not diverted but protected;
- no major ecological impacts i.e. badgers, owls, newts, etc. over and above risk allowance;
- a cost for a park and ride has been included at £10,586,000;
- an allowance for 20% preliminaries, 25% traffic management and 30% contingency.

There are also a number of exclusions from the costs as follows:

- works arising from asbestos surveys or analyses;
- works arising from the identification of hazardous materials;
- treatment of contaminated ground over and above allowance;
- abnormal ground conditions over and above risk allowance;
- client direct order works;
- requirements imposed by Planning Authority or Fire Officer;
- landfill tax higher level for active waste;
- agency costs, legal fees and finance charges;
- development taxes, levies or other "planning gain" items;
- Section 106 costs/278 agreements;
- VAT;

59 The Transport Business Cases, Department for Transport, Table 5.1 – Contents of the Commercial Case. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/85930/dft-transport-business-case.pdf

- statutory fees;
- land acquisition and associated costs (CPO), provided separately; and
- piled foundations other than at Waterbeach Landfill (Revised Central route option).

Table 4-1 shows the initial capital costs per option.

Table 4-1 - Capital costs (£m)

	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Capital cost estimate	£54.2	£55.4	£196.4	£47.8

Table 4-1 shows that the Revised A10 route option has the largest capital costs which is as a result of a new structure across the A14 and a 'flyover' over the A10 to the north of Milton Interchange is required. The Revised Central route option and the Western route option capital costs are similar (around £55m). The Revised Central route option is anticipated to cost slightly more than the Western route option as it may be required to traverse Milton Landfill.

4.3. Funding

Funding for the north east Cambridge to Waterbeach Public Transport Scheme is expected to be sourced through the Greater Cambridge City Deal. City Deals provide a funding framework for central Government and local partners to agree investment programmes, centred on the promotion of local economic growth and development. The Greater Cambridge City Deal is worth up to £500 million over 15 years for transport infrastructure and other investments to boost economic growth. It is considered that another £500m could be provided in match funding.

The Greater Cambridge City Deal, which was agreed between Government and local authorities allows GCP to maintain and grow its status as a prosperous economic area. The deal:

- creates an infrastructure investment fund with an innovative Gain Share mechanism;
- accelerates delivery of 33,480 planned homes;
- enables delivery of 1,000 extra new homes on rural exception sites;
- delivers over 400 new Apprenticeships for young people;
- provides £1 billion of local and national public sector investment, enabling an estimated £4bn of private sector investment in the Greater Cambridge area;
- will create 45,000 new jobs; and
- creates a governance arrangement for joint decision making between the local councils.

The Waterbeach to Cambridge Public Transport Scheme, will accelerate the delivery of Waterbeach New Town by providing future users with sustainable transport options to key employment areas and travel hubs. This will also support the creation of new jobs in the area and support sustainable growth. Therefore, this scheme supports the City Deal aims and objectives.

£100 million of government funding was made available for the period to 2020. Following the recent successful 'Gateway review' of GCP by the Government, a further fund of £400 million is available up to 2030. The latter will be the Waterbeach to Cambridge Public Transport Scheme's main funding source.

To meet funding requirements, CCC will be seeking to recover a proportion of the cost from local developer contributions, secured through the planning process. The local developer contributions are dependent upon on-going negotiations and may vary between options.

5. Commercial Case

5.1. Introduction

This chapter sets out the Commercial Case for the Waterbeach to Cambridge Public Transport Scheme. The objective of the Commercial Case is to provide evidence as to the commercial viability of the proposed scheme and outline the procurement strategy that will be used to engage the market. At SOBC stage the DfT document *'The Transport Business Cases'*[60], requires that the Commercial Case contains:

- an introduction outlining the approach taken to assess commercial viability (Complete);
- an output-based specification which summarises the requirement in terms of outcomes and outputs, supplemented by a full specification as annex (In outline); and
- a procurement strategy detailing procurement / purchasing options including how they will secure the economic, social and environmental factors outlined in the Economic Case (In outline).

The following aspects of the Commercial Case are not required at SOBC stage and will therefore be considered further at OBC and beyond:

- sourcing options;
- payment mechanisms;
- pricing framework and charging mechanisms;
- risk allocation and transfer;
- contract length;
- human resource issues; and
- contract management.

5.1.1. Outline approach to assessing commercial viability

The Commercial Case sets out options for the potential procurement strategies available to engage the market, setting out the financial implications of each strategy and the commercial strategy that drives best value for money.

At this stage of SOBC development, the Commercial Case has been prepared at a high level, to provide a strategic outline or overview. The Commercial Case would be developed in future stages following the steps in the approach outlined below:

- set the procurement objectives, define desired outcomes and identify potential constraints;
- identify potential procurement / purchasing options;
- assess the procurement options in terms of pros and cons, to develop a rationale for selecting the preferred sourcing option;
- confirm the preferred payment mechanism and pricing framework; and
- assess how different types of risk might be apportioned / shared, with risks allocated to the party best placed to manage them.

GCP should work to secure infrastructure associated with this scheme whilst securing operators to run services on the infrastructure in parallel to ensure a holistic approach to procurement. In terms of infrastructure, the scheme itself is considered major however it would be generally relatively conventional highway-type construction. In terms of operations, the Commercial Case must reflect both the legal context for local transport services and the emerging policy landscape including the CPCA Bus Review and CAM proposals. At this early stage the Commercial Case sets out a range of potential procurement routes for infrastructure and operations that will require further consideration.

60 The Transport Business Cases, Department for Transport, Table 5.1 – Contents of the Commercial Case. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/85930/dft-transport-business-case.pdf

5.1.2. Summary of options

Four corridor options for the north east Cambridge to Waterbeach Public Transport Scheme (as described in the Strategic Case) have been considered within this Commercial Case. In identifying an appropriate procurement strategy for the infrastructure (capital) outputs for these options, it is important to understand both the engineering and logistical complexity of each option. In terms of infrastructure, the key characteristics of the four options are as follows:

- segregated high-quality public transport route;
- crossing of the A14;
- utility works;
- crossing of the landfill site (Revised Central route option); and
- bus priority traffic signals.

Different elements of the packages are likely to be implemented using different routes depending on the nature of the infrastructure delivered. Some measures may also be implemented by third parties such as developers, via S106 or S278 agreements, or Network Rail. As the scheme is developed, further work is required to determine the exact procurement routes taken, which could include:

- for large scale schemes (up to £20m), the Eastern Highways Alliance Framework;
- for smaller scale schemes, the CCC Highway's services contract;
- potential open invitation to tender (OJEU procurement) to select a contractor for the works from the open market;
- Network Rail procurement mechanism for rail-related works; and
- developer-led works on the public highway and on-site via S278 Highways Act Agreements or S106 agreements via a planning condition.

5.2. Output-based specification

Section 2.8 of the Strategic Case sets out the strategic objectives and intended outcomes for the scheme. The scheme objectives as defined by GCP are as follows:

1. Provide additional sustainable transport capacity to provide for the transport demands of economic and housing growth.
2. More reliable journey times by public transport.
3. More journeys along the corridor being undertaken by public transport.
4. More short journeys along the corridor being undertaken by non-motorised modes (because people feel safer and have direct routes between origins and destinations).

The objectives have been developed into a set of outcomes and outputs as follows:

- Scheme Outputs:
  - sufficient sustainable transport capacity with appropriate frequencies to meet the additional demand for travel due to jobs and housing growth;
  - high standards of public transport speed, reliability and safety Waterbeach New Town and NEC (and beyond); and
  - high standards of infrastructure for walking, cycling and other non-motorised modes of travel between Waterbeach New Town and NEC, including providing as direct routes as possible.
- Scheme Outcomes:
  - a higher share of journeys along the corridor being made by public transport;
  - a higher share of journeys being made by walking and cycling;
  - a smaller share of journeys in the corridor being made by private car;
  - fewer vehicles driving into Cambridge (compared to 2011 levels); and
  - improved perceptions of safety.

For the purposes of highlighting the ability of different procurement methodologies to deliver these outputs, it is helpful to simplify the list into key concepts for contracts: Cost, Quality and Time. In this case Quality is understood more widely as covering not just the immediate passenger experience of ride quality but also the ease and speed of undertaking a journey. Time is important in the delivery of both Quality and Cost; delivering a transport system quickly increases utility of the new transport scheme due to earlier use and increases value for money derived from earlier income streams for the service provision. Time and Cost are key differentiating factors between possible procurement methodologies.

Developing a set of requirements for the outputs will be key to a successful procurement process whether that process is Traditional, Design and Build (D&B), Develop and Construct (D&C) or Develop and Operate (D&O). As the Commercial Case develops, a specification will be developed to achieve the outcomes set out above.

5.3. Tendering procedure

The Public Contracts Directive 2014 issued by the European Union was implemented in the UK through the Public Contracts Regulations 2015. CCC as the public authority responsible for procuring the Waterbeach to Cambridge Public Transport Scheme on behalf of the GCP, are required to comply with these regulations. The regulations describe several options for procurement processes for contracts and the criteria that determine which of these options can be applied. The options given are outlined in the following sections.

5.3.1. Open procedure

Bids for the contract are received from any applicant who fulfils certain minimum criteria. This procedure requires a fully developed scheme design and proposal and may result in the receipt of numerous bids. This procedure allows an unlimited number of interested parties to tender against defined parameters.

There are no restrictions (e.g. pre-qualification) on the parties who are permitted to tender, meaning that some parties may not be suitable to carry out the work. This procedure is straightforward and transparent but can attract numerous potential bidders (which will require a greater degree of assessment and resource requirements).

It also takes considerable time and resource, as well as limiting time for Early Contractor Involvement (ECI), and buildability input from the contractor.

5.3.2. Restricted procedure

Applicants are required to submit a pre-qualification application from which a short list of the most suitable applicants is drawn up. Bids are invited only from those applicants on the short list. This is a two-stage procedure.

The first stage allows the contracting authority to set the minimum criteria relating to technical, economic and financial capabilities that the potential bidders must satisfy and suppliers are alerted to express an interest to a contract opportunity by obtaining and submitting a Selection Questionnaire which is used to establish such aspects as their capability, experience and suitability.

The second stage involves shortlisted suppliers which meet the selection criteria being invited to tender. All tenders are evaluated in line with the methodology and award criteria set out in the tender documentation.

5.3.3. Competitive dialogue procedure

This may be used where the needs of the contract cannot be met with readily available solutions and the Open or Restricted procedures are not considered suitable. In this case applicants are short listed but the solution for the scheme is developed with the applicants, at which point a reduced number of applicants are asked to submit a final tender.

This procedure is appropriate for complex contracts where contracting authorities are not objectively able to define the technical means capable of satisfying their needs or objectives; and / or are not objectively able to specify the legal and / or financial make-up of a project.

This is a multi-stage procedure. The first stage is a pre-qualification to select the potential bidders to participate in the dialogue. In the second stage the contracting authority enters a dialogue with the potential bidders to identify and define the means best suited to satisfying their needs.

Any aspect of the contract may be discussed, including technical requirements for the works to be delivered and the commercial / contractual arrangements to be used. The dialogue may be conducted in successive phases with the remaining bidders being invited to tender.

By the end of the dialogue phase the contracting authority's requirements will have been determined such that the scheme can be tendered. In the final stage, the remaining bidders from the dialogue phase are invited to tender for the scheme.

5.3.4. Competitive procedure with negotiation

This relatively new procedure is intended to be used where minimum requirements can be specified but negotiations with bidders may be needed to improve the initial tenders. The grounds for using this procedure are as follows:

- Where needs cannot be met without adaptation of readily available solutions;
- Where the contract includes design or innovative solutions;
- Where the requirement is complex in nature, in its legal and financial makeup or because of its risks;
- Where the technical specifications cannot be established with sufficient precision; and
- In the case of unacceptable/irregular tenders.

Within this procedure, bidders initially submit tenders based on the information issued by the contracting authority. The contracting authority is then able to review the tenders it has received and negotiate with the bidders, following which the tenders will be resubmitted. This procedure may therefore be useful where the requirements are well developed initially and full tender documents can be produced, but it is felt that there may be advantage in retaining the ability to negotiate if there are certain aspects which bidders raise.

Summary

This scheme is likely to be procured using the Restricted Procedure because it will be possible to publish a well-defined tender package for bidders to price against. The Restricted Procedure also has defined timescales for each stage which will allow GCP to ensure that the tenders can be received by the dates required by the overall project programme. A Direct Award is unlikely to be justified and an Open Tender Procedure has potential to attract multiple submissions with a protracted length of time required to evaluate tenders.

Whilst the Restricted Procedure is the likely procurement procedure, this will not be confirmed until Outline Business Case (OBC) and / or Full Business Case (FBC) stage following further consideration of the procurement procedures available.

5.4. Procurement strategy

A procurement strategy has been prepared to address the output risks for the infrastructure options identified within the Strategic Case. As the scheme is at an early stage, routes to procurement are still open. The GCP is expected to procure many of its professional services through frameworks with suppliers that have been pre-selected by virtue of their capabilities, experience, capacity and behaviours.

Risks to operational performance should sit with the scheme promoter and the outline designer, whereas risk to time and costs, especially during implementation, would sit with the contractor.

Currently, operator involvement in providing infrastructure is generally limited and there are very few precedents of operator involvement in any public-private partnership infrastructure schemes or public transport infrastructure schemes in the UK. This is distinct from operators contributing to the capital or revenue costs of infrastructure, of which examples include an access charge (CGB), contribution to capital cost (Leeds) or profit share mechanism (South Hampshire Eclipse). Therefore, the procurement strategy for the Waterbeach to Cambridge Public Transport Scheme has considered parallel procurement routes for both capital works and public transport services.

CCC's '*Contract Procurement Rules*' allow for either the Infrastructure Conditions of Contract (ICC) or New Engineering Contact (NEC) standard from to be adopted for the delivery of major projects. In practice, CCC has adopted NEC for tendered civil engineering, maintenance and professional services contracts such as the CGB. As a result, the Council's internal support services and 'in-house' term consultants Skanska, have greater experience and capability procuring works under the NEC suite. The NEC3 suite of contracts has been used on similar schemes so is the most familiar. However, the NEC4 Contract Suite was introduced in 2017 and has subsequently been adopted by the Council and is therefore currently considered appropriate for administration of the scheme.

In the following Sections the term 'client' is used as this is the title given by many standard form construction contracts and is synonymous with 'scheme promoter' or the organisation via which the scheme promoter decides to enter into contract with construction organisations for the infrastructure works.

5.4.1. Capital works procurement strategy

The Capital Works Procurement Strategy must acknowledge appropriate risk allocation, work with the design strategy, and set the appropriate engagement of consultants and contractors for the detailed design and implementation. The capital works strategy is realised through the resulting project organisation, project management, contracting strategy and the consistency and coordination of the contract terms between the client and external organisations.

One of the fundamental decisions when addressing the procurement strategy for infrastructure works is how to source the design elements of the work. The design requirements for the infrastructure will vary between options. There may be elements in some of the options that are challenging and may present risk of delay either because of design complexity or necessary interface with third parties. Examples of risk accruing from relative technical complexity are:

- crossing the A14;
- a route across the landfill site (Revised Central route option);
- any online works to the A10;
- crossing of Milton Interchange;
- relative ground conditions in the different areas of interest; and
- relative archaeological investigations required in the different areas of interest.

Examples of risk accruing from design interfaces with third parties are:

- land assembly; and
- design approvals from the respective statutory bodies for planning and highways amendment consents.

Infrastructure design is a process with distinct but related stages. Operational design, sometimes referred to as 'Preliminary', 'Outline' or 'Reference', defines the performance criteria of the scheme and what the actual outputs will be, whereas detailed design defines the construction of the project and how it is delivered on the ground.

Given that the key external constraints and risks on the project (land assembly and statutory utilities diversions) are largely defined during the initial phases of the design of the selected option, the procurement strategy can be effective in partially managing these risks before the delivery mechanism is set in train.

In terms of the construction phase of the project, the key risks identified include the planning and logistics of crossing the A14 (all options), and the sensitivity to the quality and reliability of the operational life of the infrastructure. This latter risk accrues from a lack of direct control during construction of the junction signals, the park and ride facilities and the segregated public transport itself.

As the project progresses the risk assessment will be applied to decide on appropriate contracting strategies for the infrastructure under the 'sourcing options' requirement for the OBC. Based on work undertaken for previous similar corridors it is anticipated that the forms of contract that could be considered are:

- A **traditional arrangement**, where one contract secures a detailed design and specification for the construction, which is then tendered as a separate contract.
- **Design and Build**, where detailed design and construction are both undertaken by the same organisation.

- **Develop and Construct**, a hybrid of traditional and Design and Build where part of the design is prepared before the contractor is appointed.
- **Construction management**, where design by the client's consultants and construction of the works overlap. A fee-earning construction manager defines and manages the work packages. All contracts are between a client and the trade contractors. The final cost of the project may only be accurately forecast when all packages have been let.
- **Management Contracti**ng, where design by the client's consultant and construction overlap. A management contractor is appointed early to let elements of the work progressively by trade or package contracts ('work packages'). The contracts are between the management contractor and the works contractors. As with construction management, the final cost can only be forecast with reasonable certainty when the last package has been let.
- **Private Finance Initiative / Public-Private Partnership (PFI/PPP)** is typically where a public sector client buys services with defined outputs from the private sector on a long-term basis, typically for 25 years. This will typically involve constructing and maintaining the delivered asset, and consequently the supplier is incentivised in this model to have the highest regard to whole-life costing as it has the risk of future operation and maintenance costs for a substantial period of time.

Each of these arrangements have their advantages and disadvantages as outlined below. The final strategy will be developed at OBC stage taking into account lessons learnt from earlier GCP corridors.

Table 5-1 - Comparison of capital works procurement options

Procurement Type	Description	Risk Transfer	Advantages	Disadvantages
Traditional	Client completes a full detailed design followed by tendering for a contractor, who is passed the design to construct.	The contractor assumes responsibility and financial risk for the building works whilst the client takes the responsibility and risk for the design team performance. Therefore, if the contractor's works are delayed by the failure of the design team to meet their obligations, the contractor may claim against the client for additional costs and/or time to complete the project.	• Design-led, facilitating a higher level of control over the design; • Reasonable price certainty at contract award based on market forces; • The strategy is satisfactory in terms of public accountability; • The procedure is well known; and • Changes are easy to arrange and value.	• Overall programme may be longer than for other strategies; • Limited 'buildability' input by the contractor; and • The strategy often results in adversarial relationships developing.

Procurement Type	Description	Risk Transfer	Advantages	Disadvantages
Design and Build	Client goes to tender based on performance criteria for the asset design and logistical constraints, potentially with very limited design information. The successful contractor then becomes responsible for completing the design and construction in accordance with the stated requirements.	Design risk is carried by the contractor. The client develops a detailed knowledge of risk, enabling a more informed negotiation of risk transfer at the tender stage.	• The client only has to deal with one firm; • More construction efficiency benefits ('buildability') are prioritised in the design; • Price certainty is obtained before construction starts providing the client's requirements are adequately specified and changes are not introduced; and • Reduced total project time through early completion is possible because of overlapping activities. Detailed design is completed by the contractor to suit its own construction programme, with advanced site works being undertaken whilst the design for later activities is still in progress.	• There are very few true D&B construction organisations and what is usually being procured is a collaboration between a contractor and a design organisation; • The client is required to commit itself before the detailed designs are completed; • There is no design overview unless separate consultants are appointed by the client for this purpose; • Difficulties can be experienced by the client in preparing an adequate brief; • Bids are difficult to compare since each design, programme and cost will vary; • Client changes to project scope can significantly add to the scheme cost; and • Practical difficulties are possible if, despite contractual checks, a contractor is intent on implementing a programme of cost savings

Procurement Type	Description	Risk Transfer	Advantages	Disadvantages
Develop and Construct	The client submits for tender an outline design together with performance criteria for the asset together with other design and logistical constraints. The successful contractor then becomes responsible for the outline design that it has inherited and completes the detailed design and construction in accordance with that outline design modified as necessary to comply with all the contract requirements. It is typical under this model for the client's designer to the transferred to the contractor to maintain knowledge and continuity.	Generally as D&B above but the contractor's design is constrained with certain parameters derived and defined by the outline design already undertaken by the client.	• As D&B above but because of the pre-contract outline design and continuous checking of the developing detailed design the client has more control over the main characteristics of the asset as constructed.	• As D&B above, but the difficulties and uncertainties of outcomes arising from representing the brief purely in words is migrated by the client's 'pre-contract' partial design; • Loss of contractor buildability input into the outline design stage however this can be mitigated by inviting alternative proposals with tenders; and • Additional programme time spent before the tender although limited net delay to achievement of the construction completion.

Procurement Type	Description	Risk Transfer	Advantages	Disadvantages
Management Contracts	There are two different types of management contracts: 'management contracting' and 'construction management'. Procurement approaches, although technically different, are very similar. 'Construction management' is characterised by the provision of a construction management consultancy service and management contracting is effectively traditional contracting but with the contractor working for a fee based on the total value of the work packages procured and managed by it.	Under both regimes the work is let in separate work packages (generally by trade which may include design responsibility). Under the construction management regime, all work package contracts are placed directly by the client whereas under 'management contracting the contractor places these contracts.	• The strategy offers time saving potential for overall project time due to the overlapping procedures; • Buildability advice potential is inherent; • Breakdown of traditional adversarial barriers although a certain amount of contractor / client barriers remain under the 'management contracting' regime; • Parallel working is an inherent feature; • Clarity of roles, risks, and relationships for all participants; and • Changes in design can be accommodated later than with some other strategies, without paying a premium, provided the relevant trade packages have not been let and earlier awarded packages are not too adversely affected.	• Price certainty is not achieved until the last trade packages have been let; and • An informed, proactive client is required in order to operate such a strategy.

Procurement Type	Description	Risk Transfer	Advantages	Disadvantages
PFI/PPP	In this procurement route a public sector client typically buys services with defined outputs from the private sector on a long-term basis, typically 25 years. This will involve maintaining or constructing and maintaining the asset, and the supplier is incentivised to consider whole-life costing as it will benefit directly from reduced spending on maintenance.	All risk is carried by the PFI Operator	• Total cost of the scheme including maintenance and operation is effectively spread over the whole lifecycle of the project; and • Long-term investment in maintenance helps ensure quality driven approach to the design and construction of the scheme.	• Increased procurement process duration will lead to significantly later start date of construction and therefore potential for increased cost to completion; • Generally more expensive overall than self-funded procurement models; • Very long 'lock-in' time with the contractor may be problematic if relationships are not satisfactory; and • Strong differences of political opinion exist on the use of PFI models of procurement. This may generate political difficulty in obtaining sanction for use.

5.4.2. Operational public transport procurement strategy

As described in the Strategic Case, the intent is for the corridor to be used:

- Initially by CAM Phase 1 services, which are assumed to come under the same legal framework as local buses, plus local bus services where appropriate; and
- subsequently the full CAM service, plus again local bus services where appropriate.

The way these services are secured will be influenced by:

- the legal framework for commercial and tendered operation of local bus services;
- the legal framework for the full CAM service, if different (depending on the ultimate nature of the CAM system); and
- the GCP's and Combined Authority's overall approach to securing or procuring local transport services.

The public transport procurement strategy will be heavily influenced by the Transport Act 1985 which deregulated the provision of bus services outside of London. Any licensed bus operator is able to provide whichever bus service it chooses on a commercial basis, with the freedom to determine routes, frequencies, fares and vehicle type provided that it complies with relevant legislation and accepts any local or national requirements for concessionary travel. Stagecoach currently provides travel along the A10 corridor via the Citi2, Route 9 and Milton Park and Ride services. This regime has been modified by subsequent legislation: Transport Act 2000, Local Transport Act 2008, and Bus Services Act 2017. Each one of these pieces of legislation provides local transport authorities with the means of influencing the provision of bus services.

Local authorities also have other duties to consider in developing their procurement strategies. They have a legal duty to consider what, if any, additional services are required to supplement those provided commercially, and a related requirement under the Equality Act 2010, to ensure that no one group of people is disadvantaged by their actions. Ongoing engagement is taking place between the GCP and bus operators, along with CCC and the CPCA. Successful partnerships with Stagecoach and Whippet Coaches on the CGB are testament to this engagement. At this stage, and subject to any changes arising from the Bus Reform Strategy (see information below), it is considered that an arrangement similar to the CGB, where CCC own the infrastructure and provide access to operators, would be appropriate for the Waterbeach corridor as it is similar in nature to the CGB corridor. The Waterbeach corridor is an existing bus corridor with significant expectations of a strengthened public transport provision as a result of large-scale planned developments.

CPCA Bus Reform Strategy

In 2019 the CPCA established a Bus Reform Task Force to review and implement the region's bus strategy and thereby improving services. The project is exploring the best operating and delivery model for Cambridgeshire's public transport network to:

- establish an integrated framework to assess subsidy requirements;
- identify and implement tangible short-term improvements to bus services; and
- develop and examine the business case for a number of alternative delivery options in Cambridge and Peterborough.

As a result of the initial work, the CPCA has identified four options that could support the transition to an integrated transport network which include:

- deregulated bus services – the current structure for bus services;
- Advanced Quality Partnership Scheme (AQPS);
- an Enhanced Partnership (EP); and
- franchising.

The CPCA has also commissioned an Outline Business Case (OBC) to consider what the best option could be. A public consultation took place in September and December 2019.

The overarching Bus Reform Strategy will ultimately impact on the transport strategy for the area, including for CAM and the GCP public transport schemes.

5.5. Procurement to date

Procurement to date has solely been the commission of consultants Atkins to identify and prepare the preliminary scheme and SOBC. No contractors have yet been commissioned for delivery of the physical infrastructure, vehicles or services.

5.6. Procurement Timescales

Timescales for the procurement process will be developed within the OBC for the Waterbeach to Cambridge Public Transport Scheme. This will set out projected timescales for the procurement of infrastructure, vehicles and services.

5.7. Procurement frameworks

This section sets out the in-principle strategy for procurement of consultant and contractor services to deliver the Waterbeach to Cambridge Public Transport Scheme. Consultant services extend to design and advisory services to the GCP and contractor services include construction of the scheme.

The highways industry uses several recognised procurement methods for delivering civil engineering and highway schemes. Each procurement method can be used for selecting a Service Provider. Several procurement methods, in this instance Frameworks, will be further considered at the OBC and FBC stages.

5.8. Summary

This Commercial Case has set out the procurement options and objectives in line with the desired outcomes from the scheme. The procurement strategy is being developed with the outcomes and outputs at the forefront to ensure that the preferred route is the most suitable to achieve the desired end result. The Capital Works Procurement Strategy is based on a number of contract options, likely to be managed through an NEC4 contract, which have been assessed in terms of pros and cons to develop a rationale for selecting the preferred sourcing option.

The Operational Procurement Strategy is heavily influenced by local and national legislation and is likely to be further impacted by the CPCA Bus Reform Task Force, which is currently exploring the best operating and delivery model for Cambridgeshire's public transport network. Ongoing engagement and a successful partnership with bus operators will enable the scheme approach to adapt to changing strategies as they emerge to ensure the most effective operational strategy for the scheme. Following this SOBC, the Commercial Case for the Scheme will be further considered as part of the OBC. This will develop the strategies identified in this SOBC and consider the following:

- sourcing options;
- payment mechanisms;
- pricing framework and charging mechanisms;
- risk allocation and transfer;
- contract length;
- human resource issues; and
- contract management.

6. Management Case

6.1. Introduction

This Chapter sets out the Management Case for the north east Cambridge to Waterbeach Public Transport Scheme. The purpose of the Management Case is to assess if the proposal is deliverable. At SOBC stage the DfT document '*The Transport Business Cases*'[61] that the Management Case contains:

- an introduction outlining the approach taken to assess if the proposal is deliverable (Complete);
- evidence of similar projects to support the recommended project approach (Complete);
- a summary of programme / project dependencies including deliverables and decisions that are provided or received from other projects (Outline);
- a description of the governance, organisational structure and roles (Complete);
- a programme and project plan (Outline);
- an assurance and approvals plan (Complete);
- a communication and stakeholder management strategy (Outline);
- a description of programme and project reporting (Outline);
- a risk management strategy (Outline); and
- a summary of the overall approach for project management at this stage of the project (Outline).

The following aspects of the Management Case are not required at SOBC stage and will therefore be considered at OBC and beyond:

- implementation of workstreams;
- key issues for implementation;
- contract management;
- a benefits realisation plan;
- monitoring and evaluation; and
- a contingency plan.

6.2. Evidence of similar projects

Cambridgeshire Guided Busway

The CGB is a 42 kilometre long, open access route with high segregation that provides a high-quality public transport connection between Huntingdon and St Ives, to the north west of Cambridge and Addenbrookes Hospital and Trumpington to the south of Cambridge, with direct access to Cambridge city centre.

The route comprises 25 kilometres of guided busway and 17 kilometres of on-street routes, incorporating bus priority. Benefits of the scheme include travel time savings and road decongestion, modal shift in an area where the car is dominant, improved journey time reliability and increased interchange opportunities. The scheme also improved access to key services in rural areas, generates construction and operational jobs and enables development that was identified in the Regional Spatial Strategy and Structure Plan. A four-metre-wide bridleway runs alongside the guided busway sections of the route and has contributed to a significant level of benefit from improved walking, cycling and equestrian trips.

[61] The Transport Business Cases, Department for Transport, Table 5.1 – Contents of the Commercial Case. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/85930/dft-transport-business-case.pdf

Construction began in March 2007 and the busway opened on 7th August 2011 with 2.5 million journeys in the first year of operation. Whilst there are lessons learnt from the difficulties encountered, including track construction methodology and contract specification, the system delivered the desired outcomes in terms of service levels, service quality, mode shift and patronage. The commercial response by the operators has also been very positive, with very high frequency services being operated and additional destinations, such as Peterborough, being served.

Many of the elements of the CGB are directly comparable with this Scheme, in that they provide a shared corridor for public transport users, pedestrians, cyclist and equestrians. More recent sections of the busway close to Cambridge North Station have been delivered differently with an alternative approach to enforcement and track design based on a bus-only road with guiderails at the entry and exit to the route. This provides confidence that this scheme can be delivered.

Greater Cambridge Partnership corridor schemes and Cambridge Autonomous Metro

The north east Cambridge to Waterbeach Public Transport Scheme will form part of the wider strategy to be delivered under a coordinated framework with elements common to all corridors being proposed to form part of the CAM network.

Delivery achievements

The GCP undertook a gateway review in May 2020 and as a result of the 'significant success and progress' that the Partnership has made on its plans the Government have unlocked a further fund of £400 million for the GCP to create better transport infrastructure, support housing delivery and build sills for the future. Successes that contributed to this review are as follows:

- construction has commenced on the Histon Road scheme, creating a new bus lane and significantly improved walking and cycleways to make it quicker and easier for people to travel into the City from the A14;
- construction of the Milton Road scheme will commence upon completion of the Histon Road scheme and will provide improved public transport, walking and cycling connections along the corridor;
- the Abbey Chesterton Bridge, a key part of the Chisholm Trail that will provide a mainly off-road walking and cycling link between Cambridge Station and Cambridge North Station, will be installed later in 2020; and
- upgrades have been made across the proposed Greater Cambridge Greenways network, and Cross City Cycling schemes have been opened to improve cycle connectivity.

Lessons learnt

Several the GCP schemes such as Cambourne to Cambridge Better Bus Journeys and the Cambridge South-East Transport Study are more advanced in their programme than the Waterbeach to Cambridge Public Transport Scheme. Therefore, this provides an opportunity for sharing of key lessons learnt from other GCP schemes to help improve the scheme and streamline the programme. These include:

- building more detail into later stages of the project programme based on other projects;
- early structured and measured stakeholder, developer and public engagement to help secure buy-in as early in the process as possible – develop a robust communications strategy;
- defining assessment criteria early to allow scrutiny; and
- early identification of developer funding streams to allow for conditions to be made at the right planning stage.

The Cambridge Eastern Access Study is running in parallel to this study. This provides opportunity for joined up thinking and processes at several stages of the project including stakeholder engagement, option development and design.

6.3. Programme and project dependencies

Given the strategy coordination between GCP corridor schemes, CAM, and planned and consented development in the region the north east Cambridge to Waterbeach Public Transport Scheme has a number of programme and project dependencies. These are outlined and considered in terms of scheme risks in Table 6-1.

Table 6-1 - Programme and project dependencies

Project	Dependency	Risk for Waterbeach to Cambridge Public Transport Scheme
NEC Redevelopment	Developers are to provide a corridor within their site masterplan for the transit route.	Different route options through the site may emerge based on the redevelopment, with some more aligned to the Waterbeach to Cambridge options than others
CAM	The location of the tunnel head for access to the underground network	Location of tunnel head will determine the southern section of the route
Milton Road	Bus lanes and bus priority infrastructure on Milton Road	Required to continue the journey time and reliability benefits of the Scheme to the south of NEC into Cambridge city centre
Waterbeach New Town	Developers are to provide a corridor within their site masterplan for the transit route	Different route options through the site may emerge based on the redevelopment, with some more aligned to the Waterbeach to Cambridge options than others
Waterbeach Greenway	The Greenway is a walking, cycling and equestrian route to the east of the Study area which could align with the Revised Eastern high-quality public transport route option	The scheme would be required to provide a non-motorised user route alongside a Revised Eastern route option alignment.
A10 dualling	Any A10 route option that involves dualling the highway would require a crossing point for the West, Revised Central and Revised A10 route options. Online dualling of the A10 would interface with the Revised A10 high-quality public transport route option.	Public transport scheme delayed as a result of highway scheme programme or the highway scheme programme is in advance of the public transport scheme and therefore rules out certain route options due to land take
Science Park Redevelopment	Developers would be required to provide a corridor within their site masterplan for the transit route	Proposals for the development may not be far along enough to safeguard a route for the scheme however the scheme has the alternative use of the CGB which could serve the science park without traveling through it

6.4. Governance, organisational structure and roles

This Section describes the key roles and lines of accountability and how they will be resourced. The project processes and resources are set out in a separate Project Management Plan (PMP) and Project Initiation Document (PID) agreed by the Project Board. The project process is based on the DfT major scheme development methodology, which means the following key aspects:

- the overall scope of the project is set by the GCP Executive Board;
- the project is governed by a Project Board that will receive reports on project activity including spend, quality, programme and risks;
- the Project Board can request from the Project Manager all the information required for it to perform its governing role;

- the Project Manager must present all information to the Project Board that is required for the Board to perform their governing role;
- the two key project governance documents are the PMP and PID. They set out the need and aims of the project and the method for achieving the outcomes; and
- the Project Manager has full day to day responsibility for delivery of technical work streams and is employed by GCP.

Executive Board

The GCP Executive Board consists of the Leader or equivalent of each of the partner organisations, as the key decision-making group. There is also an Assembly with appropriate representation from the Local Authorities and other Stakeholders which plays an advisory and scrutiny role.

A key role of the Executive Board is to agree and oversee the delivery of a programme of major schemes that will help achieve the GCP aims and support the sustainable growth and continued prosperity of the Greater Cambridge region, in line with national and local policy objectives and the Local Enterprise Partnership's (LEP) overarching economic strategy for the area. In particular, the Executive Board:

- takes responsibility for ensuing value for money is achieved;
- identifies prioritised list of investments within the available budget;
- makes decisions on individual scheme approval, investment in decision making and release of funding, including scrutiny of individual scheme Business Cases;
- monitors the progress of Scheme delivery and spend; and
- actively manages the budget and programme to respond to changed circumstances (delay to programme, scheme alteration, cost increases etc).

Joint Assembly

CCC, CCiC and SCDC each have representatives on the Assembly, with political balance in each Authority's membership reflecting the balance of the political parties on the relevant Council. The other places on the Assembly are filled by members representing various stakeholder groups.

Programme Board

GCP is focussed on both programme and project level governance with the principle that issues of key importance are addressed at the highest levels of governance and that issues of a more technical nature are addressed by officers.

At the programme level, an officer technical group (Programme Board) made up of key officers and stakeholders develops the overall scheme prioritisation and seeks to manage programme level risks and capture shared benefits. This Board, in consultation with Chief Executives, raise programme level issues with the GCP Executive Board and Joint Assembly as required.

Project board and project team

At the project level a Project Team works up the scheme details and reports to a Project Board which will guide the overall development of the project at the technical level. At key project milestones, reports are made to the Executive Board on progress to seek decisions on key matters to allow the project to progress.

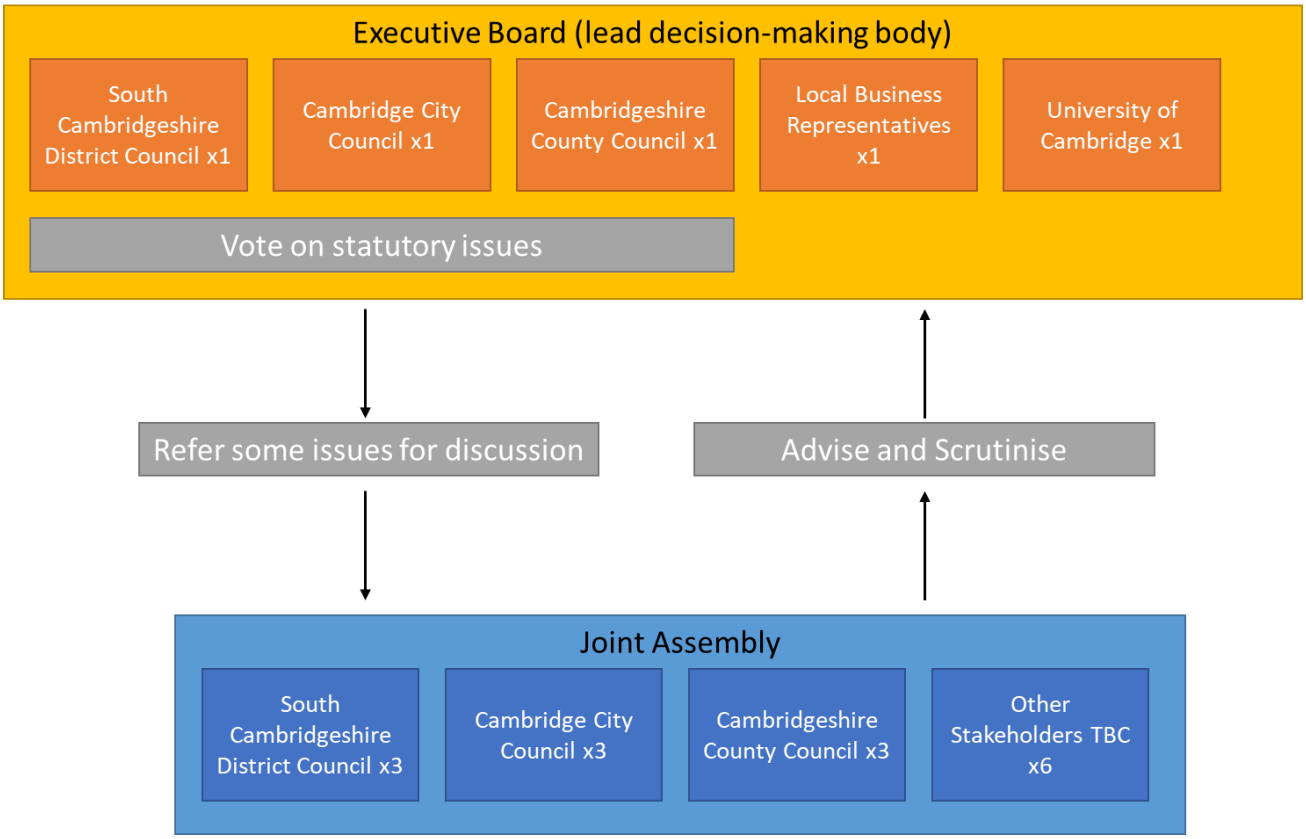
The Project Board has full decision-making powers within the scope of a project, except for 'key decisions' which are defined in Section 6.4.1. The Project Board consists, as a minimum, of senior representatives from the following organisations:

- Cambridgeshire County Council;
- South Cambridgeshire District Council;
- Cambridge City Council;
- the University of Cambridge; and
- Cambridge Network.

The Project Board can add to its membership as it sees fit to discharge its function. The Project Manager produces a monthly report for the Project Board which contains key activities undertaken and planned for the upcoming period, a budget update, a risk review and any new decisions under the four project decisions headings, outlined in Section 6.4.1.

Figure 6-1 sets out the GCP Governance Structure.

Figure 6-1 - GCP governance structure[62]



6.4.1. Decision making and change control

The Project Manger determines which of the following four categories a decision falls under:

- **Key Decision:** these decisions are major gateway decisions to allow the project to continue. These decisions form the outer scope of the project and define the 'project parameters'. Key decisions are the sole responsibility of the GCP Executive Board with advice provided from the GCP Assembly and Chief Executives.
- **Scope Change Decisions:** these decisions take the project out of scope of the 'project parameters' agreed at the key decision-making stage. They will impact on cost, quality time and/or will require a change of the PID. As such, these decisions are the sole responsibility of the GCP Executive Board with advice provided from the GCP Assembly and Chief Executives.
- **Major decisions within Scope:** these decisions are within the 'project parameters' but are still considered major decisions because they have an impact on cost, quality time and/or will require a change of the PID. A major decision is the sole responsibility of the Project Board.
- **Project Management Decisions:** these are decisions which do not impact cost/quality or time for example, a technical decision on detailed options. These decisions include moving budget between work streams and are the responsibility of the Project Manager.

[62] Style from: Tetra Tech (2021) Cambridge Eastern Access Strategic Outline Business Case Part 5: Management Case Page 18 (Figure 4.2).

6.5. Programme and project plan

This Section sets out the high-level approach to project planning with key milestones and progress, including the critical path. A more detailed, scheme specific project plan will be developed at OBC stage. The project will be governed using the PRINCE 2 project method and will pass through a number of gateways to ensure that progress is approved. The gateways are, as a minimum, in line with GCP key decision points. The Project Board may, at its discretion, create additional gateways if it considers this necessary for the effective governance and delivery of the project.

As such the project is divided into six phases that broadly align with the five key decisions and the construction phase as follows:

- Phase 1 – work needed to establish the project (leading to Key Decision 1);
- Phase 2 – work needed to identify outline concepts (leading to Key Decision 2);
- Phase 3 – work needed to identify a preferred option (leading to Key Decision 3);
- Phase 4 – work needed to achieve Full Business Case and Statutory Approvals (leading to Key Decision 4);
- Phase 5 – work needed to achieve the final design scheme for approval (leading to Key Decision 5); and
- Phase 6 – work needed to construct the scheme and hand over to a final operator.

Phases 2, 3, 4 and 5 are the main technical stages of the project and these are being taken forward using the DfT TAG major scheme development methodology. TAG sets out the scope of the two main assessments – OBC and Full Business Case (FBC). As such, Phases 2, 3, 4 and 5 are themselves split across the following TAG related Stages:

- Stage A – high level options assessment – identify feasible options;
- Stage B – identify preferred option on the basis of OBC;
- Stage C – FBC on preferred option; and
- Stage D – Approval of preferred option.

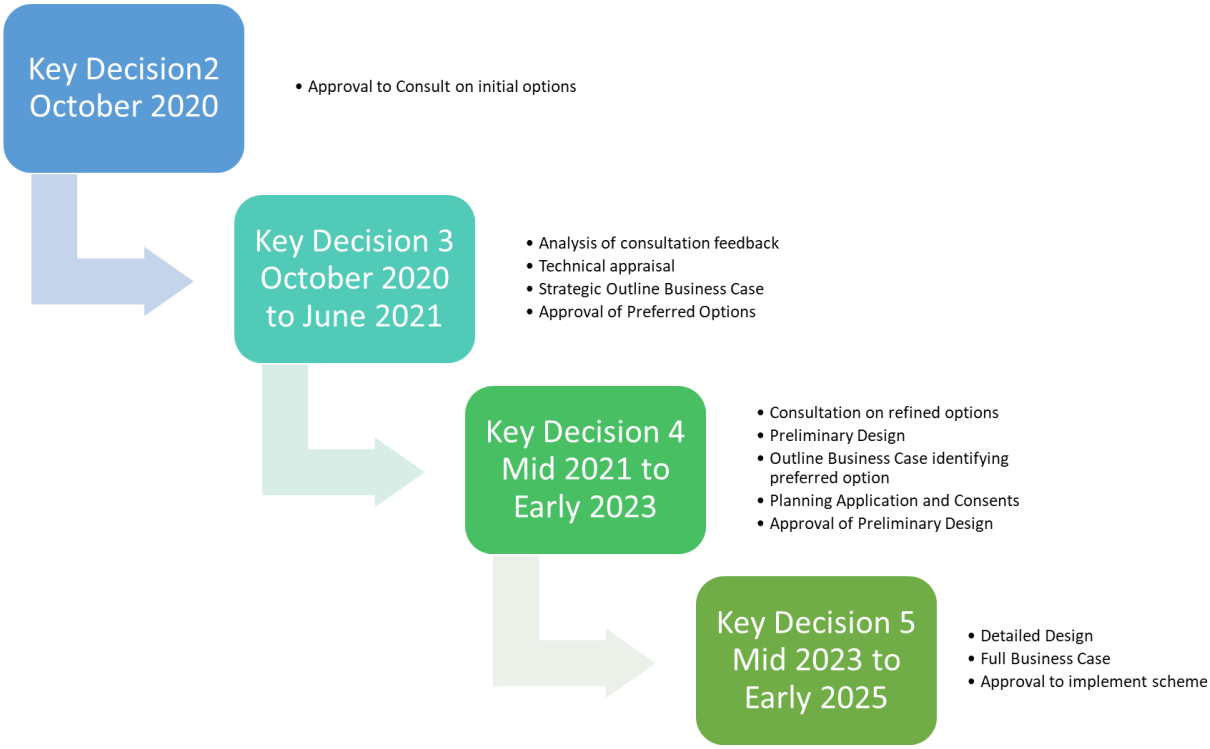
The relationship between Phases, Stages and key technical outputs is shown in Table 6-2.

Table 6-2 - Relationship between project and TAG stages

Project Phase	1	2	3	4	5
TAG Stage	A	A	B	C	D
Key Technical Output	Early economic assessment of benefits of a scheme	High level feasibility report recommending specific range of feasible concepts for further work	OBC for feasible concepts with recommended preferred option	FBC for preferred option	Detailed Scheme Design

The overall scheme programme including indicative timescales are set out in Figure 6-2.

Figure 6-2 - Overall Scheme Programme



The scheme is likely to require a Transport and Works Act (TWA) Order. Consents to enable delivery of the scheme would likely include compulsory purchase of land, planning permission, Traffic Regulation Orders (TRO) and Public Right of Way (PRoW) Orders.

The construction works may involve the following operations, depending on the preferred option:

- significant traffic management;
- construction of offline high-quality public transport route;
- construction of high-quality walking and cycling route alongside high-quality public transport route;
- construction of bridges, underpasses or other structures including upgraded junctions;
- construction of on-road public transport priority measures;
- signal upgrades;
- landscaping;
- construction of park and ride sites; and
- demolition of structures.

6.6. Assurance and approvals plan

There are several key milestones in the Project Plan where internal and/or external approvals will be required in order for the project to progress. As described above, the project will go through several key decision gateways to ensure that progress is approved.

The GCP have developed an Assurance Framework for the Greater Cambridge City Deal that outlines the proposed membership, responsibilities, processes, and principles to deliver a robust transport infrastructure programme as part of the overall City Deal aims of integrating transport and strategic planning. Local partners are committed to ensuring that robust systems and processes will be in place, in line with DfT guidance to develop and agree a deliverable programme that offers value for money.

The Framework ensures compliance with DfT's minimum requirements for Assurance Frameworks.

6.7. Communications and stakeholder management

This Section sets out the strategy for communications and stakeholder management on the project. All communication will be signed off by the Project Manager. The strategy ensures that all internal and external stakeholders are informed of relevant project information and that timely and accurate messages about the project are disseminated to a range of identified stakeholder groups. Stakeholders are outlined in Section 2.12 of the Strategic Case.

Key stakeholders will be identified and involved in the delivery of the project in a number of ways. Public and stakeholder engagement is an important means of solving problems and making decisions that directly impact upon those living, working, using services and doing business in the local area. Such engagement may include informing, consulting with, involving, collaborating with and empowering stakeholders to understand the issues to enable them to make informed choices.

The key communication objectives are to:

- provide all relevant stakeholders with clear, well-structured details of the GCP vision, project objectives and possible options, as well as being clear about that this project will not cover;
- create opportunities for stakeholders to freely and openly express their opinions, and encourage the opportunity to impact the outcome of the project;
- use an appropriate methodology for collecting the stakeholder responses and analysing them;
- ensure wide feedback from the public and stakeholders across the relevant areas to assist in decision making;
- create a consistent message across all projects to ensure stakeholders are aware that the north east Cambridge to Waterbeach public transport scheme is part of a wider vision set forward by the GCP;
- identify advocates for the project;
- manage any reputational risks associated with the project; and
- raise the profile of the GCP and its work.

Project communication is governed through the communications plan developed by GCP and outlined in Appendix B. Table 6-3 outlines the Stakeholder Engagement Overview timeline.

Table 6-3 - Stakeholder engagement overview

Phase	Time	Activity	Events
Pre-consultation Engagement			
Phase 1	November 2019-December 2019	Re-engagement with stakeholders important to the delivery of the project	Pre-consultation Workshop 1: 27th November 2019
Phase 2	January 2020 – September 2020	Light engagement during options stages with politicians/members, specialist audiences and national bodies (including those critical to the delivery of the project)	Meetings between project team and identified stakeholders
	July 2020	Pre-consultation Cam Consult	No events planned due to Covid-19 restrictions – consultation to be online only
Consultation Engagement (8 weeks)			
Phase 3	October 2020 – December 2020	Public Consultation with all audiences	Format of consultation TBC
Post-Consultation Engagement			
Phase 4	Early 2021	Publish consultation results	Results to be taken to Joint Assembly and Executive Board along with recommendations for next steps
SOBC Engagement			
Phase 5	TBC	TBC	TBC

The Project Manager will maintain a Communications Log for the lifetime of the project including the following information regarding engagement:

- meeting purpose;
- date;
- attendees;
- subject matter; and
- organisations represented.

Procurement of public transport services is discussed within the Commercial Case and the cooperation of the service operator(s) will be essential but potentially difficult. If a TWA approach is followed, then specified operator quality standards will have to be achieved to enable access to the infrastructure. The scheme will depend on the operators to:

- provide vehicles of appropriate quality, including features such as on-board Real Time Passenger Information (RTPI);
- operate the required routes;
- operate the required frequencies including operating sufficient vehicles at peak times to avoid overcrowding;
- operate for the required time periods including evenings and weekends; and
- agree appropriate ticketing arrangements.

The project team will engage closely with the operator(s) to plan and deliver high quality, reliable and frequent services. In the deregulated environment the service proposal must be commercially attractive to the operator(s) for them to deliver the required services and thus the system to work as planned.

6.8. Programme and project reporting

The Project Manager and the delivery team will continue to report to the Project Board and GCP Executive Board as described in the communications plan in Appendix B and provide regular updates to the GCP website.

6.9. Risk management strategy

The key risks to delivery are captured within a project risk register and have been quantified in accordance with their likelihood and impact. There are 11 types of risk:

- City Deal governance;
- consultation / communications;
- design;
- external and internal stakeholders;
- project funding;
- project management;
- project scope;
- resources;
- scheme development;
- statutory processes; and
- supply chain issues.

Risk management processes will be employed and recorded throughout the project lifecycle. The risk register will be monitored and, if necessary, updated at regular workshops and meetings. Roles, responsibilities and reporting lines for risk management should be clearly defined within the project team.

At key strategic project level risk will be the appointment of a contractor prior to full completion of statutory processes and formal approval. Mitigating this risk will be a key issue with the contractual arrangements. GCP schemes are very time sensitive with programme level issues around the timely delivery of successful schemes. In that context it is essential that the appointment of a main contractor is well considered and planned and that an effective form of engagement is put in place and managed.

Risks are already being mitigated through early engagement with key stakeholders, technical experts and project teams on those projects for with the north east Cambridge to Waterbeach Public Transport Scheme has dependencies.

The current project risk register is in Appendix J.

7. Conclusions and next steps

Atkins was commissioned by the GCP to undertake a study to explore the options to deliver the most effective public transport connections between north east Cambridge and the proposed New Town north of Waterbeach (also referred to as Waterbeach New Town). Preliminary work has shown that a segregated high-quality public transport route is the most effective option to deliver a high-quality link between key travel markets in the study area, including Waterbeach New Town and the NEC development.

This document presents a SOBC for this emerging scheme, which follows on from the Options Assessment Report (OAR).

The purpose of a SOBC is to demonstrate that there is a strong need for change and intervention which is caused by existing and emerging problems which is caused by current traffic levels and would be exacerbated by major growth plans. This need is evidenced in the Strategic Case and summarised in Section 7.1. An economic appraisal has been provided in line with WebTAG guidance and proportional to this stage of assessment and therefore indicates the relative performance between options under the current set of assumptions.

7.1. Need for change

The Cambridge region is growing rapidly, and Local Plans identify the need for more housing over the next decade to support this growth. Local policies (including Local Plans) have identified a need for an additional 33,000 homes and 44,000 jobs by 2031. More specifically to the study area, there are significant housing and employment developments at either end of the corridor, such as Waterbeach New Town (11,000 dwellings and 40,000 sqm of employment use) and the NEC area (8,000 dwellings and approximately 330,000 sqm of employment use). This means that the study area is a large contributor to local growth ambitions and targets, making this a focus area for development.

However, the study area encompasses a transport corridor that already experiences congestion, as identified in previous studies[63]. The current congestion on the A10 around Milton village causes journey time and reliability issues. This is likely to worsen with increased development, which could see demand jump to some 68,900 daily trips that are likely to use the corridor (either northbound or southbound) travelling between travel markets.

Development would therefore exacerbate transport capacity issues that are currently experienced during peak periods. Whilst it is recognised that there is a need for growth, the existing transport network is unlikely to be able to accommodate this without new sustainable transport infrastructure.

With the above in mind, there is a clear need for intervention within the local area with the following objectives.

- Accommodate additional jobs and homes growth: Additional growth proposed in the area is likely to result in worsened highway capacity issues in the future. To mitigate this, public transport infrastructure could provide quicker, more frequent and more reliable public transport journeys for key travel markets, specifically along the A10. A new high-quality public transport scheme would not only accommodate additional growth, but will be able to do so sustainably, support emerging environmental policy;
- Reduce dependency on private motor vehicles: Due to a lack of quick, frequent and reliable public transport links between Waterbeach and Cambridge, there is a dependency on private motor vehicles to make these journeys which causes large amounts of congestion at network pinch points (e.g. Milton Interchange). Potential interventions that increase north-south public transport links would significantly reduce the dependency on private car for these trips.
- Supporting local policy and strategies: Local plans and policies identify a need to reduce congestion and accommodate additional growth in the study area. The policies demonstrate that the Waterbeach to Cambridge corridor is a key economic growth area and should be supported by the appropriate level of infrastructure. Moreover, local and regional policies have set goals to reduce car dependence, for example the GCP has a target to reduce motor traffic levels in Cambridge by 10% compared to 2011 levels. To achieve this goal, investment is needed in sustainable transport modes to enable more people to travel by

63 Mott MacDonald, on behalf of the Greater Cambridge Partnership (2018) Ely to Cambridge Transport Study: Preliminary Strategic Outline Business Case

walking, cycling or public transport. A sustainable transport corridor between two major growth areas will help to reduce congestion and car dependence, connect more people to major employment areas, and enable the planned growth in housing to proceed.

7.2. Option development and assessment

7.2.1. Option development

Option Appraisal Report

The option development process was undertaken at the start of the project, the details of which can be found in in the OAR[64]. The process had three stages which are described below.

1. The **option generation** stage identified possible options that had the potential to meet the objectives and deliver the intended outcomes of the intervention. Option generation was not constrained by the findings of previous studies.
2. The identified options were **sifted** by assessing them using a criteria selected to ensure that the transport objectives of the study could be met. Options that were unable to meet these high-level criteria were discarded at this stage.
3. In the final stage, a **more detailed assessment** of the options remaining was undertaken, assessing their fit against each transport objective and outcome, and engineering and environmental constraints. This assessment informed a Multi Criteria Assessment Framework (MCAF) to record the evidence and score each option against the criteria. From this, sets of options were considered in combination to provide corridor options for full connectivity to and from each end of the study area.

Public consultation and Business Case development

Four route options were identified in the OAR and these were taken forward to the SOBC stage which included a public consultation. The public consultation took place virtually because of the Covid-19 pandemic but was well attended. The feedback from the public consultation, along with further technical work has been used to develop the SOBC.

The Business Case has identified a strong need for a new dedicated, high-quality public transport link between Waterbeach New Town and NEC. In addition, the analysis has demonstrated that two of the four options (Western and Revised Central route options) offer benefits in excess of their currently-estimated costs. Furthermore, the SOBC has demonstrated that the scheme is deliverable, commercially viable and can be funded.

7.2.2. Option performance

Following robust assessments undertaken to date, a summary of option performance has been presented in Table 7-1.

Table 7-1 - Option performance summary

Option	Opportunities	Issues
Western route option	• Serves Waterbeach New Town and NEC development directly • Least amount of construction risk i.e. using existing A14 underpass • Cost is cheaper than Revised A10 and Revised Central route options • Most supported route • ~2,300 additional public transport trips • The option is the joint best value for money with a BCR of 1.135	• Does not serve Milton village and potential users to south of Waterbeach are some distance from the route • Does not serve Milton Park and Ride • The junction CGB / high-quality public transport route would interact via a priority junction, the geometry of the junction means that the vehicle would be required to come to a complete stop, thereby increasing journey time, albeit by small amount

[64] Atkins (2020) *Options Appraisal Report*

Option	Opportunities	Issues
Revised Central route option	• Serves Milton Park and Ride • Offers similar journey times to the Western route option • Serves Waterbeach New Town and NEC development directly • The joint best value for money with a BCR of 1.134	• Constructions risk over landfill site • The junction CGB / high-quality public transport route would interact via a priority junction, the geometry of the junction means that the vehicle would be required to come to a complete stop, thereby increasing journey time, albeit by small amount
Revised A10 route option	• Offers significantly better transport benefits (increases public transport trips by around 4,200) • Serves all travel markets	• Cost of scheme significantly higher than all other options (£202.4m) • Significant construction risk due to the bridge and Milton Interchange 'flyover' • Results dependent on Milton Park and Ride remaining • Runs on-road through Waterbeach, reducing journey time and reliability • Offers poor value for money with a BCR of 0.619
Revised Eastern route option	• Could serve the new sporting lakes facility • This option is the cheapest with capital costs around £53.9 m	• Offers the worst value for money with a BCR of 0.565 • Does not serve key travel markets well • NEC landowners are against new high-quality public transport route through the eastern part of site causing deliverability issues • Does not serves new development as well as other options • Runs on-road through Waterbeach, reducing journey time and reliability

7.2.3. Preferred options

On the basis of the technical work that has been undertaken so far to assess the various merits of a number of route options, and on the basis of feedback from the public consultation, **the SOBC sets out the case to take forward a Western route option and a Revised Central route option as the preferred options** to the next stage of the project.

These two options provide the greatest user benefits compared to their costs and perform best in terms of their ability to deliver the required scheme outcomes. Whilst all four corridor options offer benefits to the users, the Revised A10 route option is significantly more expensive and less deliverable than the Western and Revised Central route options; whilst the Revised Eastern route option does not serve the travel markets as well as the Western and Revised Central route options.

The Western route option is a preferred option for the following reasons:

- It has a BCR of 1.135 representing the best value for money.
- It serves the key travel markets (NEC and Waterbeach New Town) using predominantly segregated infrastructure and thereby meets scheme objectives well.
- It is forecast to increase daily public transport trips by around 2,300.
- Evidence from this document shows that the Western route option would support the development of Waterbeach New Town and NEC within this corridor, therefore encouraging sustainable economic growth which could alleviate transport issues along the corridor.
- The results from the public consultation were supportive, with no major or specific concerns being raised.

The Revised Central route option is a preferred option for the following reasons:

- It has a BCR of 1.134 representing the best value for money.
- It serves the key travel markets (NEC and Waterbeach New Town) using predominantly segregated infrastructure and thereby meets scheme objectives well.
- It is forecast to increase daily public transport trips by around 2,500.
- Evidence from this document shows that the Revised Central route option would support the development of Waterbeach New Town and NEC within this corridor, therefore encouraging sustainable economic growth which could alleviate transport issues along the corridor.

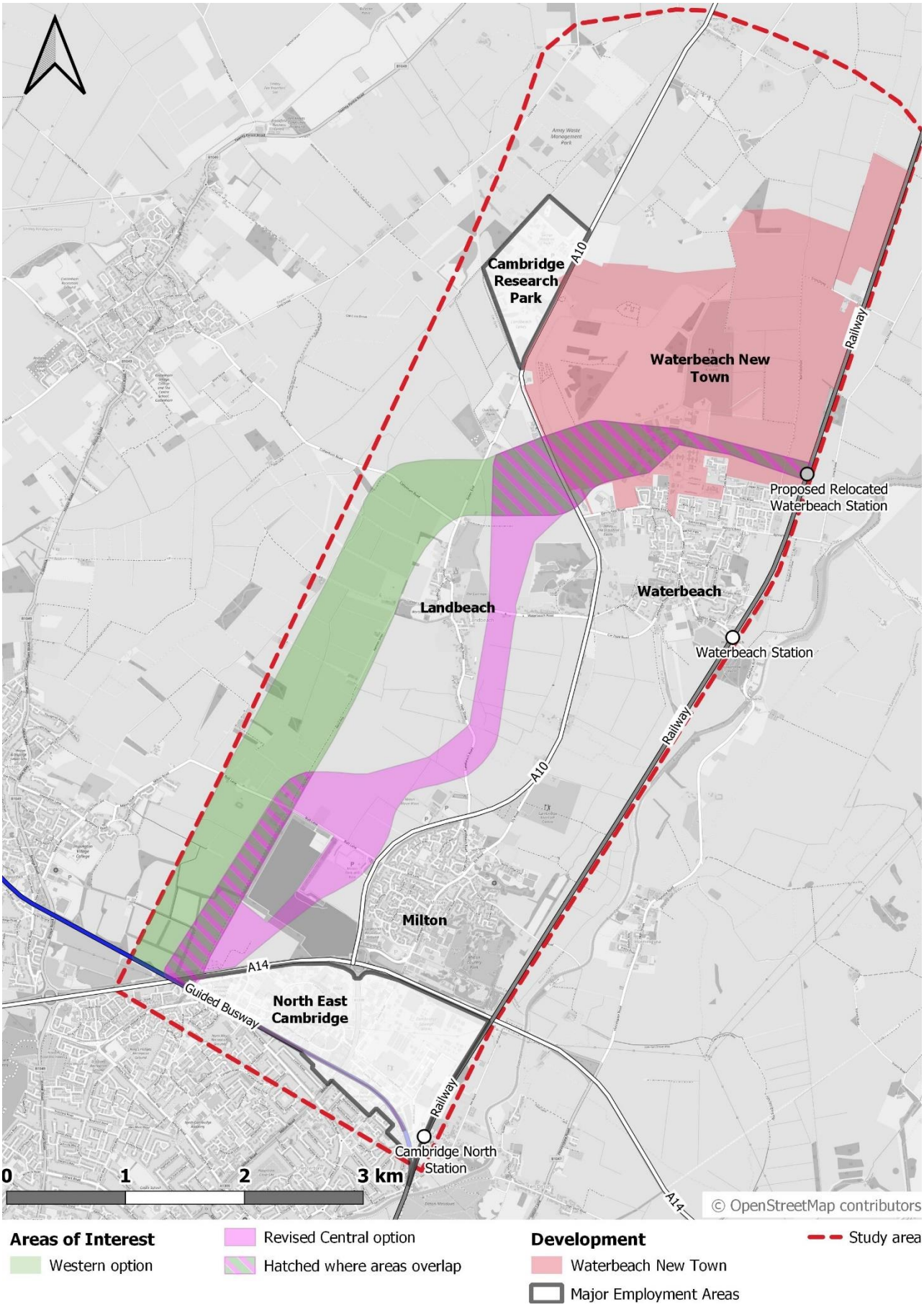
The Revised A10 route option has been discounted due to cost and deliverability. The provision of new infrastructure to cross the A14 and Milton Interchange results in significantly higher costs than other options and presents significant deliverability challenges.

The Revised Eastern has been discounted as it offers the fewest transport benefits and does not adequately serve the whole NEC development.

The options taken forward will facilitate services that route through Waterbeach New Town to also serve Waterbeach Relocated Station and Cambridge Research Park with alternate services from the local centre. This potential service pattern serves key markets well, with direct services and provides a balance between serving key demand hubs and providing a fast service.

Figure 7-1 shows the preferred options that are recommended to be taken forward to OBC stage. In addition, example service patterns have been shown.

Figure 7-1 - Preferred corridor options



7.2.4. Relationships and dependencies

At this stage there are still some unknowns which would impact upon the performance of the options and how they will be developed during the OBC stage. These include:

- Developments proposed in the study area, including the Cambridge Sport Lakes and Milton Police Station, which could conflict with scheme proposals. Moreover, the local planning authority has recently issued a 'Call for Sites' to inform the new local plan. If developments are committed, this could improve benefit streams due to the increased demand for the proposed scheme.
- A study examining the proposed A10 highway upgrade is ongoing. The alignment and nature of any modifications to the A10 could impact the route chosen for the high-quality public transport route and influence the design and cost of the high-quality public transport route, such as junction arrangements where the high-quality public transport route and highway intersect.
- The location and scale of provision for a new park and ride site is yet to be determined, linked to the above. It is also unclear whether Milton Park and Ride would remain should a new site be constructed.

Subsequently, further work will be required to determine how the north east Cambridge to Waterbeach Public Transport Scheme would work alongside other proposed developments and transport improvements.

7.3. Recommended next steps

This SOBC has concluded that there is a clear case for change in the north east Cambridge to Waterbeach corridor and has recommended that the Western and Revised Central route options are progressed for further assessment. The recommended next steps are as follows:

- **To progress the two preferred options to the next step in the Business Case process: the OBC stage**: The OBC will provide more detail, or allow progress, on the following issues:
  - more detailed patronage forecasting and traffic modelling;
  - more detailed cost estimation, including detailed assessment of how a route could traverse the Milton landfill site;
  - more detailed risk assessment;
  - further consideration of how the scheme would fit into the wider development context and masterplans for the Waterbeach New Town and NEC developments;
  - further consideration on how other transport interventions could impact on the study such as the operations at Milton Park and Ride;
  - further consideration of wider economic impacts (the scheme will offer significant benefits, such as enabling sustainable growth and connecting homes to jobs, however at SOBC, these impacts have been assessed qualitatively);
  - detailed design of the routing and scheme specifications; and
  - initial environmental assessments.
- **Public consultation on preferred route alignments:** Following development of the preferred options, including the routing and design specifications it is recommended that another public consultation is held.
- **Investigation into potential service patterns:** Whilst this SOBC has considered possible segregated high-quality public transport routes between Waterbeach New Town and NEC, bus operating companies may opt to run on-line services where there is demand for it. With this in mind, it is recommended that further assessment work regarding service patterns is undertaken to determine the impact of service routing. This should be coupled with ongoing correspondence with bus operating companies.
- **Continued liaison with stakeholders:** Given the significant growth that is planned for the area, continued correspondence with local authorities, scheme promoters and developers is recommended to ensure that there is a holistic approach to development within this corridor.

Appendices

Appendix A. Summary of previous studies as evidence base

Year	Title and author	Evidence base	Key findings
2009	**Bus Strategy – Bus Route Option Study (Capita Symonds)**	• Denny St Francis Eco-town Transport Strategy • Land ownership • Site reconnaissance surveys, Ordnance Survey data, aerial photographs	• Commissioned by RLW to assess the options for a busway between the new town of Waterbeach and Cambridge. • The study area was divided into east-west tranches comprising different parts of Waterbeach and the area between Waterbeach and the A14 • The preferred option was through the farm fields east of Denny End Industrial Estate, to the west of the Sport Lakes complex, across the A10 at the junction with Ely Road, and across the fields and restored landfill to the existing A14 underpass at Mere Way
2012	**A10 Transport Corridor Constraints Study (LDA)**	• GIS data, Tree Preservation Orders • Heritage study • Ecology study	• Assessed constraints in the corridor between Waterbeach and Cambridge • Built upon the 2009 Capita Symonds study, and also considered the realignment of the A10 • Assessed an area 100m either side of the A10 and included the A14 underpass at Mere Way
2014	**Waterbeach Busway Options Study (WSP / Clewlow)**	• Land ownership records, including council owned lands and property	• Further assessed the preferred busway option from the 2009 Capita Symonds study • A larger study area was assessed than the 2009 study • The preferred option from the 2009 study remained the highest scoring of the options assessed • Slight changes were made to the alignment of the preferred option so that where possible the route passed through council land
2016	**A10(N) Corridor Constraints Study (Mott MacDonald)**	• Planning records • Mapping of the following constraints: - Green belt - Agricultural land - Heritage/archaeological - Environmental and ecological designations - Townscape and landscape impact - Amenity considerations - Flooding and drainage - Physical considerations (e.g. contamination, land stability)	• Commissioned by CCC, SCDC and CCiC. • Assessed the existing environmental, physical and planning constraints within an adjacent to the Waterbeach to Cambridge corridor • Assessed three corridors: west (covering Mere Way and the Roman Road), central (A10 corridor) and east (along the railway line and through Waterbeach) • Constraints in the west and central corridor could be overcome through route alignment and detailed design incorporating mitigation measures, however the Revised Eastern route option would require further investigation as there are more widespread constraints

2018	**Ely to Cambridge Transport Study: Preliminary Strategic Outline Business Case (January 2018) (Mott MacDonald)**	Evidence Base Report accompanies the Strategic Case, which includes evidence on: • Populations commuting into Cambridge • House price and sales trends in Cambridge • Indices of multiple deprivation • Rail passenger growth • Existing peak period bus journey time delays • Peak traffic flows • Traffic delays during school term times • Recent and forecast population growth • Forecast traffic flow and junction delay changes resulting from development • Forecast distribution of trips on A10 by origin, with and without development • Forecast changes in traffic levels on routes parallel to A10, with development • Forecast journey time changes on A10, with development • Forecast changes in car mode share, with development • Forecast traffic, mode share and journey time impacts of the modelled improvement packages	The Strategic Case set out the issues and opportunities in the study area that demonstrated a need for intervention. These included: • Cambridge's role as the engine of the Cambridgeshire economy • Escalating demand for housing and the city's growing labour catchment • High and growing levels of rail demand, but with performance issues on key corridors • Journey time delays for buses, particularly in the AM peak • Relatively low, and declining, patronage at the Milton park-and-ride site • Relatively high levels of cycle commuting, corresponding to locations where high-quality infrastructure is provided, but the lack of cycle routes serving north-south journeys was a key weakness of the study corridor • Very significant highway congestion, which can extend almost the full length of the A10 from Ely to Cambridge in the AM peak and vice versa in the PM peak. • Key development areas included Cambridge Northern Fringe East, Cambridge Science Park, and north of Waterbeach. • Traffic levels were anticipated to grow, thus exacerbating the existing issues. Travel demand on the A10 and surrounding corridors would increase. A DM scenario (2031, with developments, but without mitigation) was modelled. It found that: • There would be further traffic growth on the A10 but the main impact would be an increase in traffic on nearby routes. This was because the effective capacity of the A10 had already been reached, even without the developments, and the new trips from the development sites would be at the expense of other existing traffic which would be displaced to other routes. (This also means some sections of the A10, north of Waterbeach, would see reduced traffic levels, as the longer-distance traffic would be displaced but the development traffic would not be primarily using those particular sections.) • Journey times would increase on key routes • Car mode share would fall within the study area, due to the concentration of developments in locations close to Cambridge with good public transport and walking and cycling access. However, there would still be a net generation of traffic. The study modelled the impact of five improvement packages for the corridor: 5. **Mode-shift (DS1):** Minimal highway network improvements, relocated Waterbeach station, segregated public transport links between the new town at

Year	Title and author	Evidence base	Key findings
		• Multi-criteria appraisal of the modelled improvement packages Other parts of the SOBC include: • Cost estimates for the modelled improvement packages • Economic appraisal of the modelled improvement packages	Waterbeach and Cambridge, comprehensive pedestrian and cycle network, parking restraints and travel planning measures at major development sites 6. **Junction+ (DS2):** Same as DS1, plus improvements to provide additional capacity at A10 junctions between Ely and Cambridge 7. **North-dual (DS3):** Same as DS1 and 2, plus dualling the A10 north of Waterbeach to Ely 8. **South-dual (DS4):** Same as DS1 and 2, plus dualling the A10 between Waterbeach and the A14 Milton interchange 9. **Full dual (DS5):** DS1 and 2, plus dualling the A10 between Ely and the A14 Milton interchange It found that while the mode-shift options without highway improvements provided additional travel capacity and had significant benefits, they did not substantially address the congestion and traffic displacement issues identified. Options with highway improvements were more effective in addressing these issues. The best value for money was found with DS2. However, none of the packages achieved the objectives to maintain traffic at or below 2011 levels. All five packages delivered a car mode share reduction, compared to the DM, with the mode-shift package (DS1) delivering the greatest reduction, and the full-dual package (DS5) the least. The study recommended a three-stage strategy of: • Policy, planning and regulation interventions, based around a demand-management approach and development trip budgets • Delivery of multi-modal 'quick wins' comprising both non-car-based service / infrastructure enhancements and active parking restraint, plus a sequence of prioritised on and off-line localised carriageway improvements to create capacity for additional trips and manage potential re-assignment of trips onto less suitable routes. This strand would include (among other things) early progression of the segregated transport corridor from Waterbeach to Cambridge's Northern Fringe. • Wider highways interventions involving increased carriageway capacity. This might be in the corridor itself, or on an alternative corridor, or potentially through improvements to both.

2018	**Ely to Cambridge Transport Study: Strand 2 New Town North of Waterbeach Transport Report (1 February 2018) (Mott MacDonald)**	• Existing transport network in and around the new town location • Existing highway congestion, in terms of percentage journey time increases compared to free flow • The proposed quantum of development DM (with development, no mitigation) traffic forecasts: • Forecast development trip generation • Forecast trips to/from the new town by mode and destination • Distribution of development traffic • Changes in traffic flow and junction delays • Relative contribution of new town and CFNE/ Cambridge Science Park development traffic to the overall level of development traffic, by link • Journey times on the A10, comparing free flow, without development and with development DS (with development and South-Dual package) traffic forecasts: • Distribution of development traffic • Changes in traffic flow and junction delays • Journey times on the A10	This report focused on the transport needs, trip generation and impacts of the proposed new town, in the context of other major developments and the overall SOBC. The DM traffic modelling found that the new town represented the majority of development flow contributions on the A10 and connecting routes to the north. Development flows from CNFE and Cambridge Science Park represented the majority contribution on the A14 and M11 and mostly within Cambridge. Milton interchange was the connecting point between these, as it combined the impacts from each. The overall conclusion for the proposed new town was that significant mitigation measures would be required to enable the development to function effectively without causing undue impact on surrounding transport networks. The study went on to look at the impact of the South-Dual (DS4) package on development travel behaviour and surrounding network performance. Compared to the DM, it forecast: • A slight increase in person trips during peak periods – due to trips being re-timed into peak hours due to the additional network capacity • A reduction in car mode share • An increase in external car trips, due to this increase in person trips. However, due to the decreased car mode share this increase in car trips was less than it otherwise would have been. The study considered that this underlined the importance of the interventions including a strong suite of non-car measures • An improvement in A10 journey times, mitigating the majority of the increase in journey times seen in the DM. Overall, the results suggested the package tested would help to mitigate the main local impacts of the new town development. The greatest benefits to the development were seen in the upgrading of the A10 and Milton Interchange, which would help to reduce pressure on parallel routes and on the A10 itself. The conclusions were as follows: Given its proximity to the economically strong centre of Cambridge, the proposed Waterbeach New Town provides opportunity for many new trips to be made in the area by non-car modes. However, with already congested A10 being the only means of accessing the development by highway, it is nonetheless predicted that 10,000 new homes plus ancillary development in this location will generate substantial flow and performance impacts on this key route. The study therefore shows that the non-car mode improvement options considered for the study area are essential for the sustainable delivery of this development and that they should be implemented from the outset of development construction and completed before more than 1,500 homes are built. It is proposed that these measures should be funded by the new developments which necessitate and benefit from them.

Year	Title and author	Evidence base	Key findings
			However, the study also shows that these measures will not be sufficient in themselves to mitigate the full development's impact on the A10 and on parallel routes and that potentially significant highway intervention will also be required. This, as a minimum, should comprise improvements to existing junctions along the routes, including at Milton interchange, but in the longer term is likely to also involve dualling at least the southern section of the A10, while locking in traffic flow reductions on parallel routes. The funding for these measures will be drawn from multiple sources according to the range of beneficiaries, including new developments and wider public funding streams. Lastly, it is noted that these findings should be reviewed in the event that other schemes come forward that are not within the study area but which could affect it, such as a new highway link between the A47 and the M11. Testing shows that such schemes could potentially reduce the highway intervention requirement within the study area.

Appendix B. Travel markets assessment

To help with identification of options to be tested further and the selection process for the preferred route, analysis was conducted on the potential markets for this transport corridor. The main aim of this analysis is to inform the strategic assessment of corridor options by showing the relative importance, in travel demand terms, of key markets in the corridor. This analysis also serves to verify other assessments of the transport impacts of the developments.

This analysis outlines the methods, results and conclusions of this analysis.

Markets

Travel markets comprising existing and proposed developments were assessed in this analysis. Travel markets have been grouped together around key areas, for example the two developments in Waterbeach New Town. The travel markets assessed as part of this exercise were:

- Waterbeach New Town, comprising the Waterbeach New Town (West) development by Urban & Civic and the Waterbeach New Town (East) development by RLW;
- Cambridge Research Park;
- Waterbeach village;
- Milton village; and
- NEC west: Cambridge Science Park; and
- NEC east: St John's Innovation Park, Cambridge Business Park, Chesterton Sidings, Trinity Hall Farm Industrial Estate, Nuffield Road Industrial Estate, and the Anglian Water Waste Water Treatment Plant site.

The NEC development has been divided into its east and west sections so as to better understand the impact of corridor options that only service one side of the NEC.

In these key areas, the level of future travel demand from housing and employment was estimated. The number of trips that would use the study area corridor and would therefore be in-scope for this scheme were then estimated. Quantifying the number of in-scope trips is important as these travel markets and land uses are the main drivers of peak time demand that the scheme is primarily focused on.

This analysis also does not cover park and ride demand, because this is expected to be accommodated at one or more appropriate locations along the route, irrespective of which corridor is selected.

Limitations

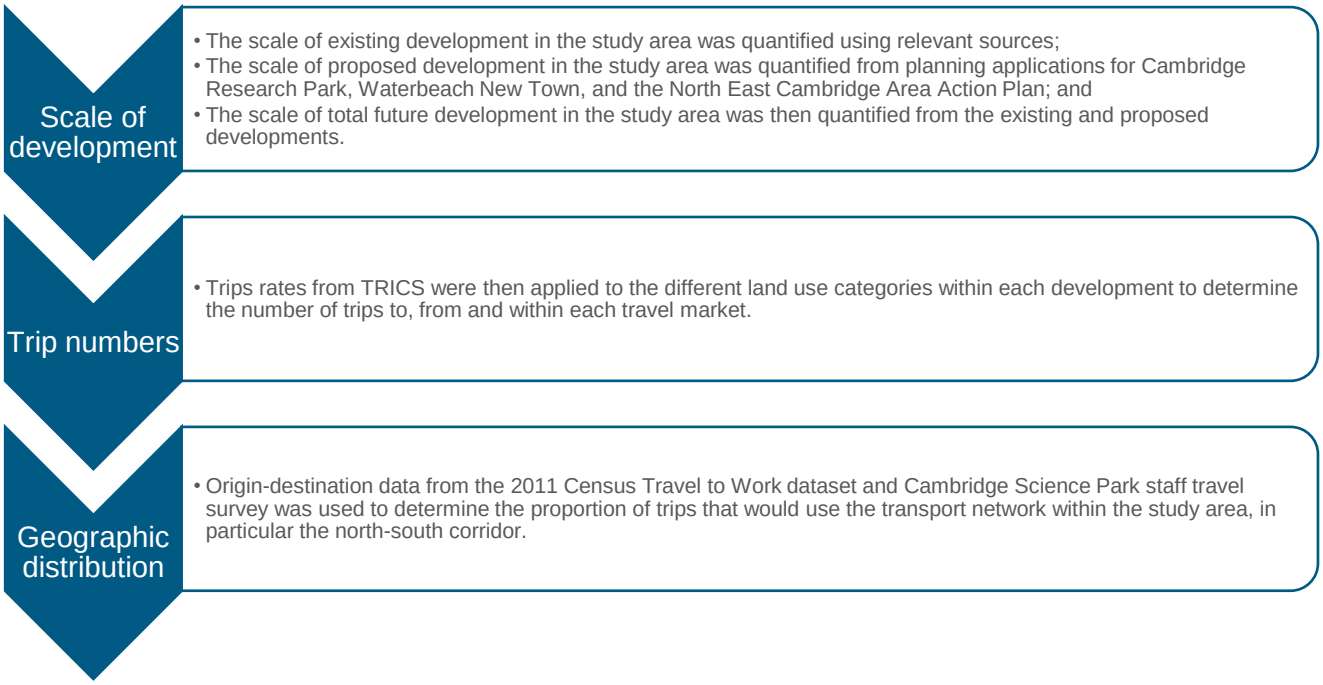
This analysis has the following limitations:

- Origins and destinations for trips were derived from 2011 Census Journey to Work data. Since 2011, areas of employment and housing have changed in the Cambridge region, for example with the opening of the University of Cambridge's West Cambridge campus, and new housing developments at Eddington, Trumpington Meadows and Northstowe. New transport infrastructure built since then would also influence where people choose to live and work, and how they travel in the corridor, for example the opening of Cambridge North station in 2017. Where more recent origin-destination data is available, for example the Cambridge Science Park staff travel surveys, this has been used instead where appropriate.
- The level of trip internalisation for the larger mixed-use developments (NEC and Waterbeach New Town) has been based on the assumptions made in the Transport Assessment for Waterbeach New Town (west) and in the NEC Area Action Plan (AAP) Transport Evidence Base. Actual levels of internalisation may be different to these assumptions, which would affect the number of external trips along the corridor.
- Some trips in this analysis will be counted twice, for example some residential departure trips in the morning peak period will also be employment arrival trips. Double counting has been retained in the analysis as the focus is on determining market sizes, not demand forecasts and therefore they are still considered relevant.
- A common method has been applied across all developments for simplicity and consistency, instead of using data from other sources, for example Transport Assessments or other studies. This allows easy

comparison between the markets. The trip numbers from this analysis have been checked against those from other sources where available.

Method

The following flowchart outlines the method used in this assessment:



Scale of development

The following table shows the scale of existing, proposed and total future development in the study area. The scale of existing residential and employment development in each of the markets was estimated using a range of sources, including employment centre websites, planning applications, the NEC AAP Transport Evidence Base and the Cambridge Science Park Transport Strategy. The scale of proposed development in the study area was estimated using information in planning applications and consultation documents for Waterbeach New Town, Cambridge Research Park and NEC.

Market area	Location or development	Data source	Existing		Proposed		Future total	
			Residential (dwellings)	Employment (sqm)	Residential (dwellings)	Employment (sqm)	Residential (dwellings)	Employment (sqm)
Cambridge Research Park		Cambridge Research Park planning application S/4615/18/OL Transport Assessment	None	41,660	None	27,885	None	69,545
Waterbeach New Town	West	Planning application S/0559/17/OL Design and Access Statement	None	None	6,500	15,000	6,500	15,000
	East	Planning application S/2075/18/OL Design and Access Statement	None	None	4,500	24,800	4,500	24,800
	Subtotal		**None**	**None**	**11,000**	**39,800**	**11,000**	**39,800**
Waterbeach village		Waterbeach Neighbourhood Plan draft 2018	2,070	Not available	Limited	Limited	2,070	Not available
Milton village		Census 2011 dataset KS401EW - Dwellings, household spaces and accommodation type	1,765	Not available	Limited	Limited	1,765	Not available
NEC (west)	Cambridge Science Park	Cambridge Science Park Transport Strategy 2018 (existing) Draft North East Cambridge Area Action Plan 2020 (proposed)	None	160,000	None	109,960	None	269,960
NEC (east)	Anglian Water Waste Water Treatment Plant	Draft North East Cambridge Area Action Plan 2020	None	Not available	5,500	23,500	5,500	23,500
	St John's Innovation Park	St John's Innovation Park website (existing)	None	24,137	None	35,000	None	59,137

Market area	Location or development	Data source	Existing		Proposed		Future total	
			Residential (dwellings)	Employment (sqm)	Residential (dwellings)	Employment (sqm)	Residential (dwellings)	Employment (sqm)
		Draft North East Cambridge Area Action Plan 2020 (proposed)						
	Cambridge Business Park	Cambridge Business Park website (existing) Draft North East Cambridge Area Action Plan 2020 (proposed)	None	30,193	500	68,000	500	98,193
	Chesterton Sidings	Draft North East Cambridge Area Action Plan 2020	None	None	730	55,000	730	55,000
	Trinity Hall Farm Industrial Estate	North East Cambridge Area Action Plan Transport Evidence Base 2019 (existing) Draft North East Cambridge Area Action Plan 2020 (proposed)	None	22,443	None	1,500	None	23,943
	Nuffield Road Industrial Estate		None		550	None	550	None
	Cowley Road Industrial Estate	Draft North East Cambridge Area Action Plan 2020	None	16,000	500	17,500	500	39,250
	Merlin Place and Milton Road Car Garage	Draft North East Cambridge Area Action Plan 2020	None	Not available	220	None	220	None
	Subtotal		**None**	**98,523**	**8,000**	**200,500**	**8,000**	**299,023**
North East Cambridge subtotal			**None**	**258,523**	**8,000**	**310,460**	**8,000**	**568,983**
Total			**3,835**	**300,183**	**19,000**	**378,145**	**22,835**	**678,328**

Development trips

Trip rates

The following table shows the TRICS land use categories and trip rates used to estimate the number of trips to and from each travel market in the study area.

Trip rates for residential, employment and school developments

Development type	TRICS land use for trip rate	Calculation factor	Person-Trip rate[65]								
			AM peak 07:00 – 10:00			PM peak 16:00 – 19:00			Daily 07:00 – 19:00		
			Arr.	Dep.	Total	Arr.	Dep.	Total	Arr.	Dep.	Total
Residential	3M – Mixed private/affordable housing	Per dwelling	0.58	1.52	2.10	1.35	0.69	2.04	3.58	3.81	7.40
Employment	2B – Business park	Per 100 sqm	3.62	0.54	4.16	0.44	3.16	3.60	5.82	5.80	11.61
Education	4A – Primary school	Per pupil	1.37	0.51	1.88	0.12	0.39	0.51	2.13	2.13	4.27

Number of trips

The number of trips for each travel market in the study area was estimated based on the trip rates above, as shown in the following table.

[65] Numbers for total trip rate may not be precisely the sum of the arrivals and departures due to rounding.

Market area	Land use	Future total (residential dwellings or employment sqm)	Person-Trips								
			AM peak 07:00-10:00			PM peak 16:00-19:00			Daily 07:00-19:00		
			Arr	Dep	Total	Arr	Dep	Total	Arr	Dep	Total
Cambridge Research Park	Residential	-									
	Employment	69,545	2,500	400	2,900	300	2,200	2,500	4,000	4,000	8,100
	Subtotal		**2,500**	**400**	**2,900**	**300**	**2,200**	**2,500**	**4,000**	**4,000**	**8,100**
Waterbeach New Town	Residential	11,000	6,400	16,700	23,100	14,800	7,600	22,400	39,400	42,000	81,400
	Employment	39,800	1,400	200	1,600	200	1,300	1,500	2,300	2,300	4,600
	School (pupils)	4,980	6,800	2,500	9,300	600	2,000	2,600	10,600	10,600	21,200
	Subtotal		**14,600**	**19,500**	**34,100**	**15,600**	**10,800**	**26,400**	**52,400**	**54,900**	**107,300**
Waterbeach village	Residential	2,070	1,200	3,100	4,300	2,800	1,400	4,200	7,400	7,900	15,300
	Employment										
	Subtotal		**1,200**	**3,100**	**4,300**	**2,800**	**1,400**	**4,200**	**7,400**	**7,900**	**15,300**
Milton village	Residential	1,765	1,000	2,700	3,700	2,400	1,200	3,600	6,300	6,700	13,100
	Employment										
	Subtotal		**1,000**	**2,700**	**3,700**	**2,400**	**1,200**	**3,600**	**6,300**	**6,700**	**13,100**
NEC (west)	Residential										
	Employment	269,960	9,800	1,400	11,200	1,200	8,500	9,700	15,700	15,600	31,300
	Subtotal		**9,800**	**1,400**	**11,200**	**1,200**	**8,500**	**9,700**	**15,700**	**15,600**	**31,300**
NEC (east)	Residential	8,000	8,600	12,200	20,800	12,400	5,500	17,900	28,700	30,500	59,200
	Employment	299,023	10,800	1,600	12,400	1,300	9,400	10,700	17,400	17,300	34,700
	Subtotal		**19,400**	**13,800**	**33,200**	**13,700**	**15,000**	**28,700**	**46,100**	**47,800**	**93,900**
NEC (total)	Residential	8,000	8,600	12,200	20,800	12,400	5,500	17,900	28,700	30,500	59,200
	Employment	568,983	20,600	3,000	23,600	2,500	17,900	20,400	33,100	32,900	66,000

Market area	Land use	Future total (residential dwellings or employment sqm)	Person-Trips								
			AM peak 07:00-10:00			PM peak 16:00-19:00			Daily 07:00-19:00		
			Arr	Dep	Total	Arr	Dep	Total	Arr	Dep	Total
	Subtotal		**29,200**	**15,200**	**44,400**	**14,900**	**23,400**	**38,300**	**61,800**	**63,400**	**125,200**
All markets	Residential	22,835	17,200	34,700	51,900	32,400	15,700	48,100	81,800	87,100	169,000
	Employment	678,328	24,500	3,600	28,100	3,000	21,400	24,400	39,400	39,200	78,700
	Grand total		***48,500***	***40,900***	***89,400***	***36,000***	***39,100***	***75,100***	***131,900***	***136,900***	***269,000***

Trip distribution

Once the number of trips was estimated based on the appropriate trip rates and the size of development, the trips were further analysed to assess the geographic distribution to estimate the number of trips in-corridor, internal to the developments and out-of-corridor, defined as follows:

- Internal capture: these are trips internal to the large mixed-use developments of Waterbeach New Town and NEC (east). These trips are not primarily targeted by this scheme, however the scheme may still capture some of these trips, especially short walking and cycling trips.
- In-corridor: these are the trips primarily targeted by the scheme, further split in to:
  - to/from the south; and
  - to/from the north.
- Out-of-corridor: these trips are not primarily targeted by the scheme, although the scheme may still capture some of these trips.

The trip distribution for each travel market was assessed using origins and destinations from the 2011 Census travel to work dataset. It is noted that since 2011, a lot of employment development has occurred in and around Cambridge, such as the West Cambridge site for the University of Cambridge and the growth of the Cambridge Biomedical Campus. Therefore, the distribution of origins and destinations of some trips will have changed since then, and will change with the proposed development in the corridor.

Cambridge Research Park

The trip distribution for Cambridge Research Park was estimated as follows:

- residential trips: None; and
- employment trips: distributed according to Census 2011 travel to work data for trips with a destination in the Lower Level Super Output Area (LSOA) containing Cambridge Research Park (South Cambridgeshire 004C). Cambridge Research Park is the main employment destination in this LSOA so the trip distribution is assumed to be representative of Cambridge Research Park commuter origins.

The trip distribution for Cambridge Research Park is shown in the table below. As Cambridge Research Park is at the very northern end of the study area, trips to and from the north of Cambridge Research Park were categorised as not using the corridor.

Trip distribution for Cambridge Research Park

Category	Origin postcode	Proportion of trips[66]
Internal	CB24, CB25	31%
Uses corridor – to/from the north	-	-
Uses corridor – to/from the south	CB1, CB2, CB3, CB4, CB5, CB8, CB21, CB22, CB23, PE28, PE29, SG8	48%
Does not use corridor	CB6, CB7, PE16	20%

Waterbeach New Town

The trip distribution for Waterbeach New Town was estimated as follows:

- Residential trips: distributed according to Census 2011 travel to work data for trips originating in the LSOAs containing the existing Waterbeach village (South Cambridgeshire 004B and South Cambridgeshire 004D).
- Employment trips: distributed according to Census 2011 travel to work data for trips with a destination in the LSOAs containing the existing Waterbeach village (South Cambridgeshire 004B and South Cambridgeshire 004D).

[66] Note that due to rounding, percentages do not add up to 100%

The trip distribution for Waterbeach New Town is shown in the table below. As Waterbeach New Town is at the northern end of the study area, trips to and from the north of Waterbeach New Town were categorised as not using the corridor. Since Waterbeach New Town and Cambridge Research Park share the same postcode district, trips between the two are classed as internal trips for the purpose of this analysis and not as using the corridor to/from the north.

Trip distribution for Waterbeach New Town

Category	Origin postcode	Proportion of trips
Internal	CB25	48%
Uses corridor – to/from the north	-	-
Uses corridor – to/from the south	CB1, CB2, CB3, CB4, CB5, CB8, CB21, CB22, CB23, CB24, PE27, PE28, SG8	31%
Does not use corridor	CB6, CB7	21%

Waterbeach village

The trip distribution for Waterbeach village was estimated as follows:

- Residential trips: distributed according to Census 2011 travel to work data for trips originating in the LSOAs containing the existing Waterbeach village (South Cambridgeshire 004B and South Cambridgeshire 004D).
- Employment trips: not included in the analysis at this time.

The trip distribution for Waterbeach village is shown below.

Trip distribution for Waterbeach village

Category	Origin postcode	Proportion of trips
Internal	CB25	27%
Uses corridor – to/from the north	CB6, CB7	2%
Uses corridor – to/from the south	CB1, CB2, CB4, CB8, CB9, CB10, CB21, CB22, CB23, CB24, SG8	43%
Does not use corridor	Other destinations (e.g. London, Peterborough)	28%

Milton village

The trip distribution for Milton village was estimated as follows:

- Residential trips: distributed according to Census 2011 travel to work data for trips originating in the LSOAs containing the Milton village (South Cambridgeshire 007A and South Cambridgeshire 007B).
- Employment trips: not included in the analysis at this time.

The trip distribution for Milton village is shown below.

Trip distribution for Milton village

Category	Origin postcode	Proportion of trips
Internal	CB24	31%
Uses corridor – to/from the north	CB6, CB7, CB25,	12%
Uses corridor – to/from the south	CB1, CB2, CB4, CB8, CB9, CB10, CB21, CB22, CB23, CB24, SG8	36%
Does not use corridor	Other destinations (e.g. London, Peterborough)	21%

North East Cambridge (west)

The trip distribution for NEC (west) was estimated as follows:

- residential trips: none; and
- employment trips: distributed according to a Cambridge Science Park staff travel survey conducted in 2016.

The trip distribution for NEC (west) is shown below. As NEC is at the southern end of the study area, trips to and from the south of NEC were categorised as not using the corridor. Trips between the east and west sides of NEC are classed as internal trips, but may use the high-quality public transport route and associated infrastructure for travel between the east and west of NEC and also to CRC.

Trip distribution for North East Cambridge (west)

Category	Origin postcode	Proportion of trips
Internal	CB4	15%
Uses corridor – to/from the north	CB6, CB7, CB24, CB25	24%
Uses corridor – to/from the south	-	-
Does not use corridor	CB1, CB2, CB3, CB5, CB8, CB9, CB11, CB21, CB22, CB23, CM23, IP28, PE19, PE27, PE28, PE29, SG8, SG19, Other	61%

North East Cambridge (east)

The trip distribution for NEC (east) was estimated as follows:

- Residential trips: distributed according to Census 2011 travel to work data for trips originating in the LSOAs containing NEC (South Cambridgeshire 007C and Cambridge 003B).
- Employment trips: distributed according to a Cambridge Science Park staff travel survey conducted in 2016.

The trip distribution for NEC (east) is shown the table below. As NEC is at the southern end of the study area, trips to and from the south of NEC were categorised as not using the corridor. Trips between the east and west sides of NEC are classed as internal trips, but may use the high-quality public transport route and associated infrastructure for travel between the east and west of NEC and also to CRC.

Trip distribution for North East Cambridge (east)

Category	Origin postcode	Proportion of trips
Internal	CB4	29%
Uses corridor – to/from the north	CB6, CB7, CB24, CB25	25%
Uses corridor – to/from the south	-	-
Does not use corridor	CB1, CB2, CB3, CB5, CB8, CB9, CB10, CB11, CB21, CB22, CB23, CM23, IP28, PE19, PE27, PE28, PE29, SG8, SG19, Other	46%

Distribution of trips

The geographic distribution of internal, in-corridor or out-of-corridor was then applied to the number of trips for each travel market, as shown below.

Trips to and from each travel market by category (internal, in-corridor, our-of-corridor)

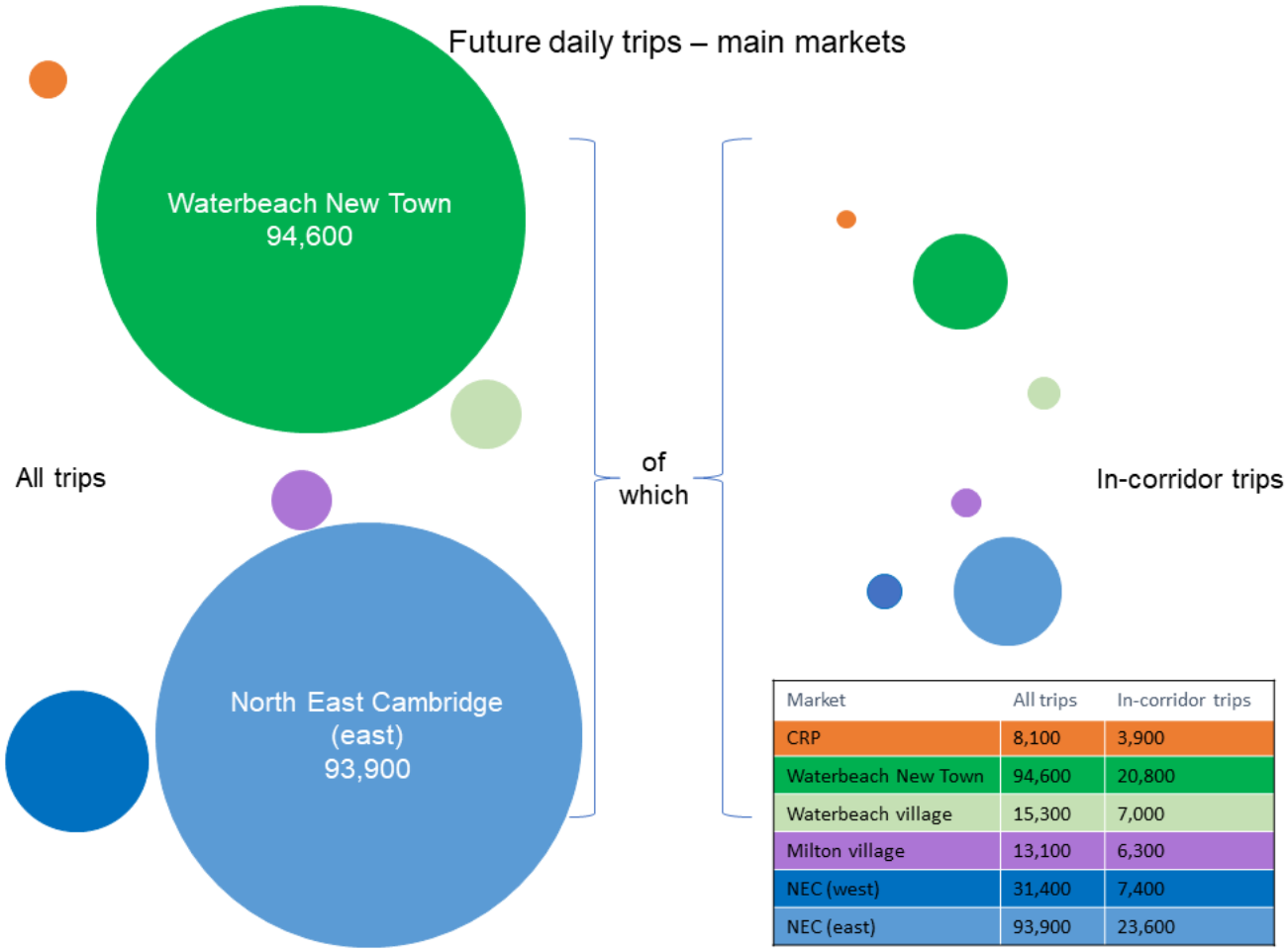
Market area	Distribution	Trips								
		AM peak 07:00 – 10:00			PM peak 16:00 – 19:00			Daily 07:00 – 19:00		
		Arr.	Dep.	Total	Arr.	Dep.	Total	Arr.	Dep.	Total
Cambridge Research Park	Internal	791	117	908	95	690	785	1,270	1,265	2,534
	Uses corridor – to/from the north	-	-	-	-	-	-	-	-	-
	Uses corridor – to/from the south	1,219	181	1,400	146	1,063	1,210	1,958	1,950	3,908
	Does not use corridor	510	76	585	61	445	506	819	815	1,634
	In-corridor subtotal	**1,219**	**181**	**1,400**	**146**	**1,063**	**1,210**	**1,958**	**1,950**	**3,908**
Waterbeach New Town	Internal	9,986	9,794	19,780	4,777	4,466	9,243	25,321	26,211	51,532
	Uses corridor – to/from the north	-	-	-	-	-	-	-	-	-
	Uses corridor – to/from the south	2,967	2,256	5,223	5,688	6,987	12,675	4,545	16,244	20,789
	Does not use corridor	173	3,968	4,141	4,438	2,411	6,849	10,797	11,471	22,268
	In-corridor subtotal	**2,967**	**2,256**	**5,223**	**5,688**	**6,987**	**12,675**	**4,545**	**16,244**	**20,789**
Waterbeach village	Internal	322	845	1,168	750	384	1,133	1,993	2,121	4,113
	Uses corridor – to/from the north	29	76	106	68	35	102	180	192	372
	Uses corridor – to/from the south	515	1,349	1,864	1,197	612	1,809	3,181	3,385	6,567
	Does not use corridor	334	876	1,210	777	398	1,174	2,065	2,197	4,262
	In-corridor subtotal	**544**	**1,426**	**1,970**	**1,264**	**647**	**1,911**	**3,361**	**3,577**	**6,938**
Milton village	Internal	316	829	1,145	735	376	1,111	1,954	2,080	4,034
	Uses corridor – to/from the north	124	325	449	288	147	435	766	815	1,581
	Uses corridor – to/from the south	369	968	1,337	858	439	1,297	2,281	2,428	4,709
	Does not use corridor	214	562	776	498	255	753	1,324	1,409	2,733
	In-corridor subtotal	**493**	**1,292**	**1,785**	**1,146**	**587**	**1,733**	**3,047**	**3,243**	**6,290**

Market area	Distribution	Trips								
		AM peak 07:00 – 10:00			PM peak 16:00 – 19:00			Daily 07:00 – 19:00		
		Arr.	Dep.	Total	Arr.	Dep.	Total	Arr.	Dep.	Total
NEC (west)	Internal	1,498	222	1,720	180	1,307	1,486	2,406	2,396	4,802
	Uses corridor – to/from the north	2,322	344	2,666	279	2,025	2,304	3,730	3,714	7,444
	Uses corridor – to/from the south	-	-	-	-	-	-	-	-	-
	Does not use corridor	5,960	883	6,844	716	5,199	5,914	9,573	9,534	19,107
	In-corridor subtotal	**2,322**	**344**	**2,666**	**279**	**2,025**	**2,304**	**3,730**	**3,714**	**7,444**
NEC (east)	Internal	5,571	4,956	10,526	4,155	3,144	7,299	13,131	13,635	26,765
	Uses corridor – to/from the north	4,651	3,340	7,991	3,629	3,803	7,432	11,528	12,029	23,557
	Uses corridor – to/from the south	-	-	-	-	-	-	-	-	-
	Does not use corridor	9,185	5,470	14,654	5,918	8,023	13,940	21,414	22,176	43,590
	In-corridor subtotal	**4,651**	**3,340**	**7,991**	**3,629**	**3,803**	**7,432**	**11,528**	**12,029**	**23,557**
All markets	Internal	18,484	16,763	35,246	10,692	10,366	21,058	46,075	47,707	93,782
	Uses corridor – to/from the north	7,126	4,086	11,211	4,264	6,011	10,274	16,204	16,750	32,954
	Uses corridor – to/from the south	5,070	4,753	9,823	7,889	9,103	16,991	11,966	24,007	35,973
	Does not use corridor	16,376	11,835	28,211	12,407	16,730	29,136	45,992	47,603	93,595
	In-corridor total	**12,196**	**8,839**	**21,035**	**12,153**	**15,113**	**27,266**	**28,169**	**40,757**	**68,927**

Summary

This analysis has used trip rates and geographic distribution for each of the travel markets to assess the relative importance of each market and the potential impact of future development on the transport network in the study area. Overall trips for each market area are shown in the figure below, along with the number of trips that are defined as in-corridor.

All trips and in-corridor trips for each of the travel markets in the study area



Market	All trips	In-corridor trips
CRP	8,100	3,900
Waterbeach New Town	94,600	20,800
Waterbeach village	15,300	7,000
Milton village	13,100	6,300
NEC (west)	31,400	7,400
NEC (east)	93,900	23,600

The figure above shows that Waterbeach New Town and NEC are the key drivers of demand in the corridor, with Waterbeach village, Milton village and Cambridge Research Park making smaller contributions to overall trips and trips in the corridor. This analysis has been conducted using travel data from the 2011 Census, which may not correspond to current or future travel patterns given the location of new housing and employment developments that have occurred since 2011 and will continue in the future. Some trips will have been double-counted, however these have been retained as this analysis is seeking to understand overall relative travel market sizes. Levels of trip internalisation in the larger mixed-use developments (Waterbeach New Town and NEC) will have an impact on the number of trips in the corridor. A consistent method has been applied to estimating the number of trips for each travel market to enable comparison, instead of using different external sources.

Appendix C. Strategic option assessment

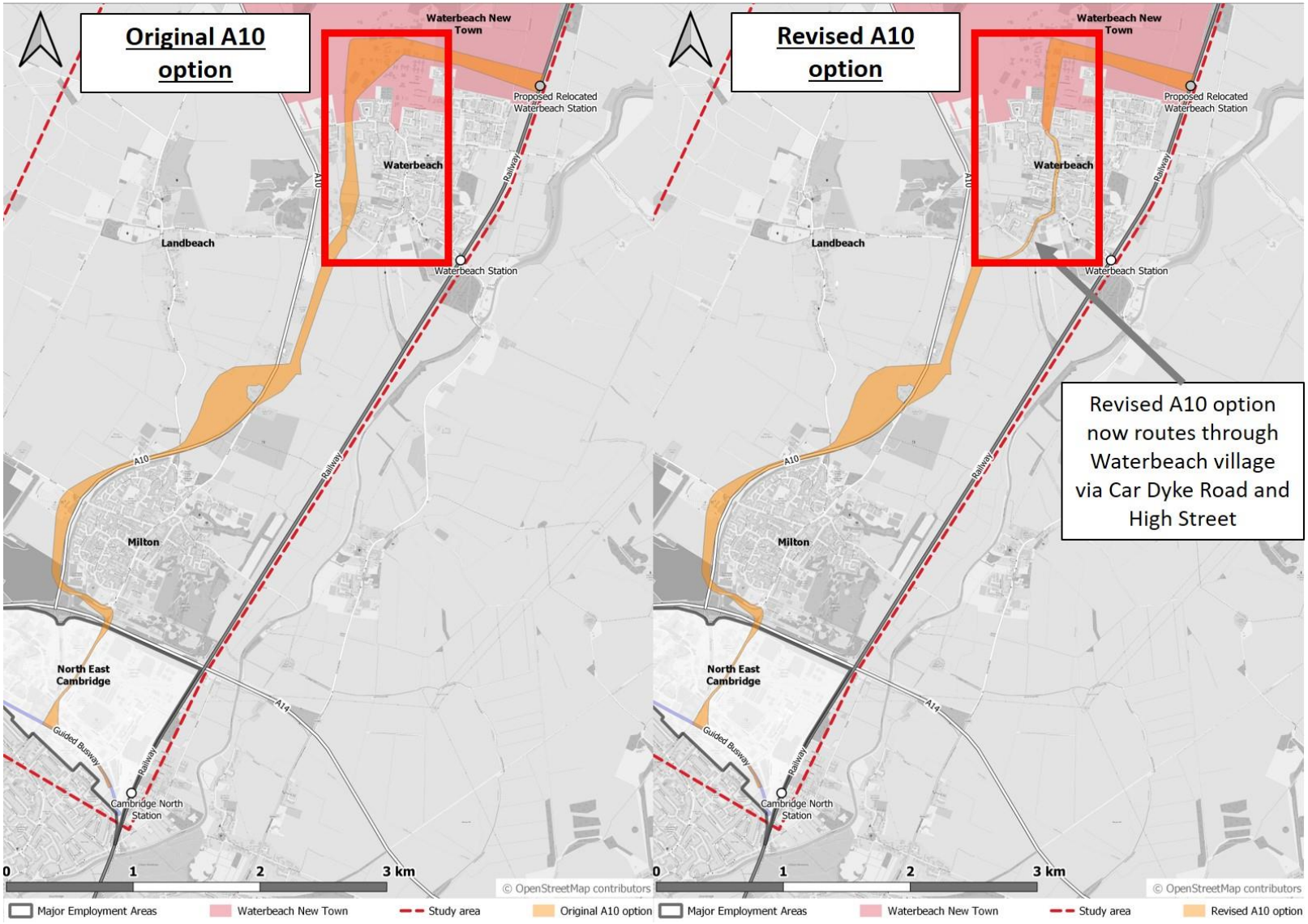
	Strategic approaches	Sifting Definitions				
		Major positive	Minor positive	Neutral	Minor negative	Major negative
Capacity	Increase in Public Transport Capacity	Fully matches future demand levels based on assessment of travel markets	Partially matches future demand based on assessment of travel markets	No change	Decreases public transport capacity	Significantly reduces public transport capacity
	Ability to contribute to 24% reduction in traffic levels	Makes non-car journeys attractive and reliable with travel times competitive to private car and serves the markets along the corridor	Meets two of the above points (attractiveness, reliability, markets served and journey time)	Does not reduce or increase traffic levels	Increases traffic levels	Significantly increases traffic levels
	Propensity to Reduce Congestion / Delay	High mode shift capture and no detrimental impact on highways.	Partial mode shift capture with no detrimental impact on highways, or a higher level of mode shift capture with slight impact on the highway	No change, or mode shift capture balances with impact on highway.	Some mode shift capture, but not enough to balance out detrimental impacts on the highway	Detrimental impact on highway, no mode shift capture.
Connectivity	Reduced Journey Time for Public Transport	Significant decrease in journey times; journeys by public transport are competitive or faster than by car	Decrease in journey times	No change	Increase in journey time	Significant increase in journey time
	Increased Reliability for Public Transport	Significant increase in reliability of public transport; no online sections of public transport routes.	Increase in reliability of public transport; some sections of routes are online on non-congested roads	No change	Decrease in reliability of public transport, some sections are online on congested roads.	Large decrease in reliability of public transport, large proportion of routes are online on congested roads.
	Ease of Interchange	Interchange between different modes is co-located with short distances (<200m) between modes and combined ticketing between all	Interchange between modes is at close proximity (<500m) between modes. Combined ticketing between some modes but not all.	No change to current ability to interchange	Ability to interchange is made worse by, for example, stops being located further from other modes.	Ability to interchange is made much worse, with stops located further than walking distance from other modes.
	Benefits to Active Travel	Attractive, direct, safe, accessible and coherent routes for people walking or cycling. High quality cycling facilities such as cycle	Improvement to existing routes but does not fully meet all of the above criteria	No change to existing routes	Existing routes made worse on up to three of the criteria (e.g. a route is made longer, or barriers are placed on the route)	Existing routes significantly worsened by more than three of criteria.
	Supports CAM	Integrates fully with the CAM network either by physically being a branch of the network, or by directly accessing a CAM station to allow interchange	No CAM branch included, but integrates partially with the CAM network by accessing a CAM station.	Does not support or hinder CAM	Hinders CAM or the ability of people to access CAM by not providing direct routes to a CAM station	Hinders CAM by not providing direct routes to a station and preventing another CAM branch from being built.
	Scale of Catchment (Jobs/Housing)	Serves a large proportion of the travel market.	Serves some of the travel markets, but misses out on some.	No change to markets served	Serves fewer markets than existing services	Serves none of the travel markets
	Ability to Unlock Growth	Connects proposed developments with other growth areas in and around Cambridge and creates opportunities for transit oriented	Does one of connecting proposed developments with other growth areas in and around Cambridge or creating opportunities for transit oriented developments.	Does not affected ability for growth to be delivered	Prevents growth by reducing quality of connections between growth areas.	Prevents growth by severing connections between growth areas.
Communities	Road Safety	Reduces levels of motor traffic and addresses issues at sites with identified patterns of collisions.	Reduces levels of motor traffic or addresses issues at sites with identified patterns of collisions.	No change to safety	Reduces safety by increasing motor traffic levels or making sites with identified patterns of collisions less safe	Reduces safety by increasing motor traffic levels, and creating new sites with potential for safety issues.
	Protection of Green Spaces	Increases available green space to a large scale, with green space incorporated into the transport infrastructure (e.g. linear parks.	Increases green space available by creating new green space, or replacing removed green spaces with a larger area of green space at a different location	No change to green spaces	Removes small portions of a few green spaces.	Removes green spaces in their entirety, or removes smaller portions of multiple green spaces.
	Environment, Air Quality and Carbon	High mode shift capture by serving travel markets with attractive alternatives to the car.	Some mode shift capture by serving travel markets with alternatives to the car.	No change	Reduces mode share of sustainable travel modes	Significantly reduces mode share of sustainable travel modes
	Quality of the Public Realm	Opportunity to significantly improve the public realm.	Opportunity to make some improvements to the public realm	No change to quality of public realm	Decreases quality of public realm	Significantly decreases quality of public realm
	Severance	Does not create new severance and restores previously severed links	Does not create new severance and reduces severance caused by existing infrastructure.	Does not change severance	Creates severance across minor transport or community links	Creates severance across major transport or community links.
Physical	Engineering Constraints	Is physically feasible and deliverable with no constraints or issues	Is physically feasible and deliverable with minor constraints or issues		Has some feasibility or deliverability issues	Has major feasibility or deliverability issues
	Environmental Constraints	Has no environmental constraints	Has minor environmental constraints that can be mitigated		Has minor environmental constraints that cannot be mitigated	Has major environmental constraints
Legal	Land Ownership	No land ownership issues	Minor land ownership issues that can be easily overcome (e.g. cooperative landowners)		Minor land ownership issues that can be overcome (e.g. CPO)	Major land ownership issues that cannot be overcome (e.g. public/stakeholder opposition, not eligible for CPO)
	Planning	No planning issues	Minor planning issues that can be easily overcome		Minor planning issues that would require more resources to overcome	Major planning issues that cannot be overcome
Support	Political / Public	High level of political and public support	Moderate level of political or public support	Neither support nor opposition from political/public groups, or support and opposition balance out	Minor political or public opposition	Major political and public opposition
	Stakeholders	High level of stakeholder support	Moderate level of stakeholder support	Neither support nor opposition from stakeholders	Minor level of opposition from stakeholders, or complicated process for obtaining support from stakeholders	Major opposition from stakeholders, or complicated process for obtaining support from stakeholders

	Strategic approaches	Strategic approaches and their scores						
		Improvements to bus services	Improvements to rail services	Improvements to walking, cycling and equestrian provision	Demand management	Park and Ride / Rural Travel Hub	Segregated transitway	Rail improvements with feeder bus network, travel hubs at rail stations and high quality walking and cycling links to rail stations.
Capacity	Increase in Public Transport Capacity	Major positive	Minor positive	Neutral	Neutral	Neutral	Major positive	Minor positive
	Ability to contribute to 24% reduction in traffic levels	Minor positive	Minor positive	Minor positive	Minor positive	Minor positive	Major positive	Minor positive
	Propensity to Reduce Congestion / Delay	Neutral	Minor positive	Minor positive	Minor positive	Minor positive	Major positive	Minor positive
Connectivity	Reduced Journey Time for Public Transport	Minor positive	Minor positive	Neutral	Neutral	Neutral	Major positive	Minor positive
	Increased Reliability for Public Transport	Minor positive	Minor positive	Neutral	Neutral	Neutral	Major positive	Minor positive
	Ease of Interchange	Major positive	Major positive	Minor positive	Neutral	Minor positive	Minor positive	Major positive
	Benefits to Active Travel	Minor positive	Minor positive	Major positive	Neutral	Minor positive	Major positive	Major positive
	Supports CAM	Minor positive	Minor positive	Minor positive	Neutral	Neutral	Major positive	Minor positive
	Scale of Catchment (Jobs/Housing)	Major positive	Minor positive	Major positive	Neutral	Minor positive	Minor positive	Major positive
	Ability to Unlock Growth	Major positive	Minor positive	Major positive	Neutral	Neutral	Major positive	Major positive
Communities	Road Safety	Minor positive	Minor positive	Major positive	Minor positive	Neutral	Major positive	Major positive
	Protection of Green Spaces	Neutral	Neutral	Major positive	Neutral	Minor positive	Minor positive	Neutral
	Environment, Air Quality and Carbon	Minor positive	Minor positive	Minor positive	Neutral	Neutral	Major positive	Major positive
	Quality of the Public Realm	Neutral	Neutral	Major positive	Neutral	Minor positive	Major positive	Neutral
	Severance	Neutral	Neutral	Minor positive	Neutral	Neutral	Minor positive	Minor positive
Physical	Engineering Constraints	Minor negative	Minor negative	Major positive	Minor positive	Minor positive	Minor positive	Neutral
	Environmental Constraints	Major positive	Major positive	Major positive	Major positive	Major positive	Major positive	Major positive
Legal	Land Ownership	Minor positive	Major positive	Minor positive	Major positive	Minor positive	Minor positive	Minor positive
	Planning	Minor positive	Major positive	Minor positive	Major positive	Minor positive	Minor positive	Minor positive
Support	Political / Public	Major positive	Major positive	Major positive	Minor negative	Minor negative	Major positive	Major positive
	Stakeholders	Minor negative	Minor negative	Major positive	Neutral	Minor negative	Major positive	Minor negative

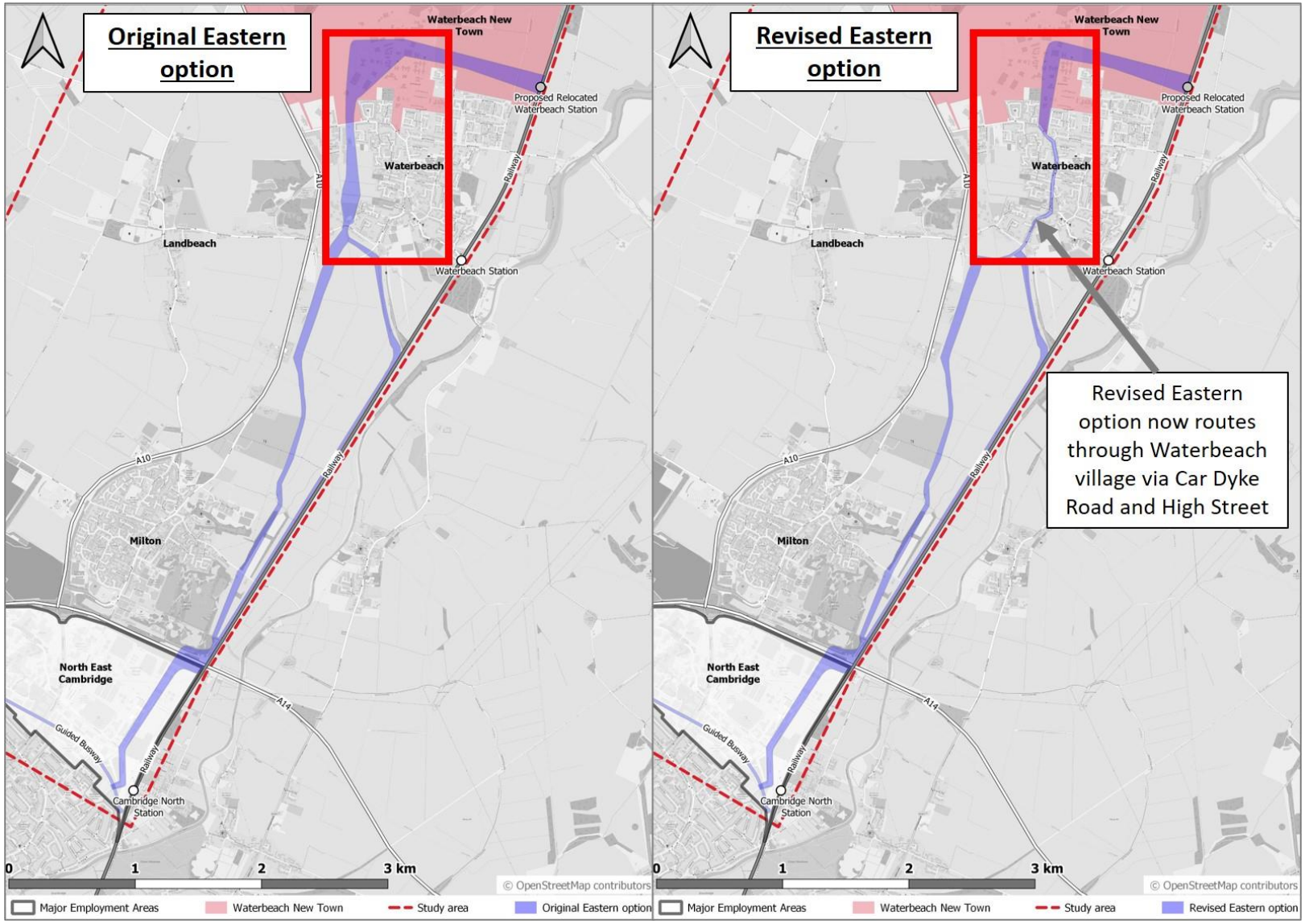
	Strategic approaches	Notes						
		Improvements to bus services	Improvements to rail services	Improvements to walking, cycling and equestrian provision	Demand management	P&R / RTH	Segregated transitway	Rail improvements with feeder bus network, travel hubs at rail stations and high quality walking and cycling links to rail stations.
Capacity	Increase in Public Transport Capacity	Potential capacity can be met by bus services at 4-6min frequencies (estimated)	Won't capture all trips that need to be made by public transport	Does not increase public transport capacity	Does not increase public transport capacity	Does not increase public transport capacity	Will have a large increase in public transport capacity due to connecting key travel markets and being an attractive option	Limited to ability for rail to increase capacity, also unknown variables around how much capacity would increase.
	Ability to contribute to 24% reduction in traffic levels	Addresses markets served (through new routes) and attractiveness (through more frequent services)	Addresses attractiveness and reliability (through more frequent services and higher capacity)	Addresses markets served, journey times, reliability and attractiveness	Would contribute to congestion reduction through restricting car usage	Would contribute to congestion reduction by being an alternative to driving into the city	Addresses markets served, journey times, reliability and attractiveness	Addresses markets served, journey times, reliability and attractiveness
	Propensity to Reduce Congestion / Delay	Will attract mode shift but this may be balanced out my impacts on the highway from bus lanes/bus gates	Will attract mode shift with no impact on the highway	Will attract mode shift that more than compensates for impact on highway	Would contribute to congestion reduction through restricting car usage	Would contribute to congestion reduction by being an alternative to driving into the city	Would attract mode shift with no impact on the highway	Will attract mode shift that more than compensates for impact on highway
Connectivity	Reduced Journey Time for Public Transport	Journey times would decrease slightly	Journey times would decrease slightly	No impact on public transport journey times	No impact on public transport journey times	No impact on public transport journey times	Journey times would be much faster than equivalent bus journeys	Journey times would decrease slightly
	Increased Reliability for Public Transport	Increased frequency and re-routing of services would improve reliability	Increased frequency and capacity would improve reliability of services	No impact on public transport reliability	No impact on public transport reliability	No impact on public transport reliability	Very reliable as completely offline	Increased frequency and re-routing of services would improve reliability
	Ease of Interchange	Combined ticketing and co-location of stops and services would make interchanging easier	Combined ticketing and co-location of stops and services would make interchanging easier	Improve routes to public transport/RTH would improve ease of interchange	No impact on ease of interchange	RTH would be a co-located interchange point	Listed as minor positive for now as CAM ticketing structure is unknown. If fully integrated with other public transport services then it would be a major positive.	Integrated bus and rail services with combined ticketing
	Benefits to Active Travel	Routes to bus stops and cycle parking at bus stops would improve	Routes to rail stations and cycle parking at rail stations would improve	Significant benefit to active travel through new routes and improvements to existing routes and facilities.	No impact on active travel	Improvements to cycle parking at P&R/RTH and improvements to routes to these locations	Route alongside mass transitway and excellent facilities at stops	
	Supports CAM	Bus network would tie into CAM network at stop/station interchange	Rail line would tie into CAM network at Cambridge North	Cycling and walking routes would tie into CAM network	No impact on CAM	No impact on CAM	Would deliver one branch of CAM and tie into rest of network	Would tie into CAM through bus and rail services
	Scale of Catchment (Jobs/Housing)	Bus network would be redesigned to better serve key travel markets	Improved cycling access to rail stations would better serve travel markets	Improve walking and cycling network would better serve travel markets	Does not directly serve travel markets, but would improve traffic congestion	Would be located to better serve some travel markets	All key travel markets served, some travel markets would be missed depending on which routing option is selected	Due to flexibility of mode combinations, all travel markets could be served
	Ability to Unlock Growth	Redesigned network could create new connections between growth areas	Improving rail could connect key growth areas (e.g. with Cambridge South Station)	Improved walking and cycling network could create new connections between growth areas	No impact on ability to unlock growth	No impact on ability to unlock growth	Would connect growth areas and potentially unlock new sites for transit oriented development	Redesigned bus, walking and cycling network and improvements to rail could connect key growth areas and unlock new areas for development
Communities	Road Safety	Could contribute to safety through traffic reduction	Could contribute to safety through traffic reduction	Will make significant improvements to safety for people walking and cycling through traffic-free and protected infrastructure	Could contribute to safety through traffic reduction	No change to safety	Will make significant improvements to safety for people walking and cycling through traffic-free and protected infrastructure	Will make significant improvements to safety for people walking and cycling through traffic-free and protected infrastructure
	Protection of Green Spaces	No change to green spaces	No change to green spaces	Opportunity to incorporate green space into walking and cycling routes, e.g. through linear parks, pocket parks, green bridges/underpasses etc.	No change to green spaces	Chance to create some green space at P&R/RTH sites	Opportunity to incorporate green space along the mass transit route	No change to green spaces
	Environment, Air Quality and Carbon	Improvements to environment, air quality and carbon emissions through traffic reduction	Improvements to environment, air quality and carbon emissions through traffic reduction	Improvements to environment, air quality and carbon emissions through traffic reduction	No change	No change	Improvements to environment, air quality and carbon emissions through traffic reduction: higher degree of potential mode shift	Improvements to environment, air quality and carbon emissions through traffic reduction: higher degree of potential mode shift
	Quality of the Public Realm	No change to quality of public realm	No change to quality of public realm	Opportunity to incorporate public realm improvements through better cycling facilities, walking facilities such as benches	No change to quality of public realm	Opportunity to create pleasant public realm at P&R/RTH sites	Opportunity to incorporate public realm improvements to CAM stations and the walking and cycling route alongside	No change to quality of public realm
	Severance	No severance issues	No severance issues	Opportunity to restore broken links by building new grade separated crossings	No severance issues	No severance issues	Opportunity to restore broken links by building new grade separated crossings, also opportunity to reduce severance created by the CGB if that is the preferred	Opportunity to restore broken links by building new grade separated crossings
Physical	Engineering Constraints	Some of the larger proposals would require engineering work, such as the Mere Way alternative bus route. Deliverability issues in working with	Deliverability issues in working with Network Rail	Physically deliverable and feasible	May have some minor deliverability issues (technology choice, etc)	Deliverable	Some engineering issues that can be overcome	Deliverability issues in working with Network Rail and other operators
	Environmental Constraints	No environmental constraints	No environmental constraints	No environmental constraints	No environmental constraints	No environmental constraints	No environmental constraints	No environmental constraints
Legal	Land Ownership	Potentially land ownership issues if routing down Mere Way to avoid the A10/A14 interchange	No land ownership issues	Potentially land ownership issues for new routes	No land ownership issues	Potentially land ownership issues for new sites	Potentially land ownership issues for the new route	Potentially land ownership issues for new walking and cycling routes
	Planning	Potentially some planning issues with using Mere Way route	No planning issues	Potentially some planning issues with new walking and cycling routes	No planning issues	Potentially some planning issues with new sites	Potentially some planning issues with new transit route	Potentially some planning issues with new walking and cycling routes
Support	Political / Public	High public and political support	High public and political support	High public and political support	Demand management initiatives in the Cambridge have had some political and public opposition in the past	P&R sites have had some public opposition in the past	High political support, high public support if framed as CAM and not a busway	High public and political support
	Stakeholders	Potential issues with working with bus operators to redesign network or new routes	Potential issues with working with Network Rail	Stakeholder support for walking and cycling routes in the study area is strong	No issue with stakeholders	Potential issues with working with bus operators to serve new P&R/RTH	High level of stakeholder support	Potential issues with working with bus operators and Network Rail

Appendix D. Option Amendments

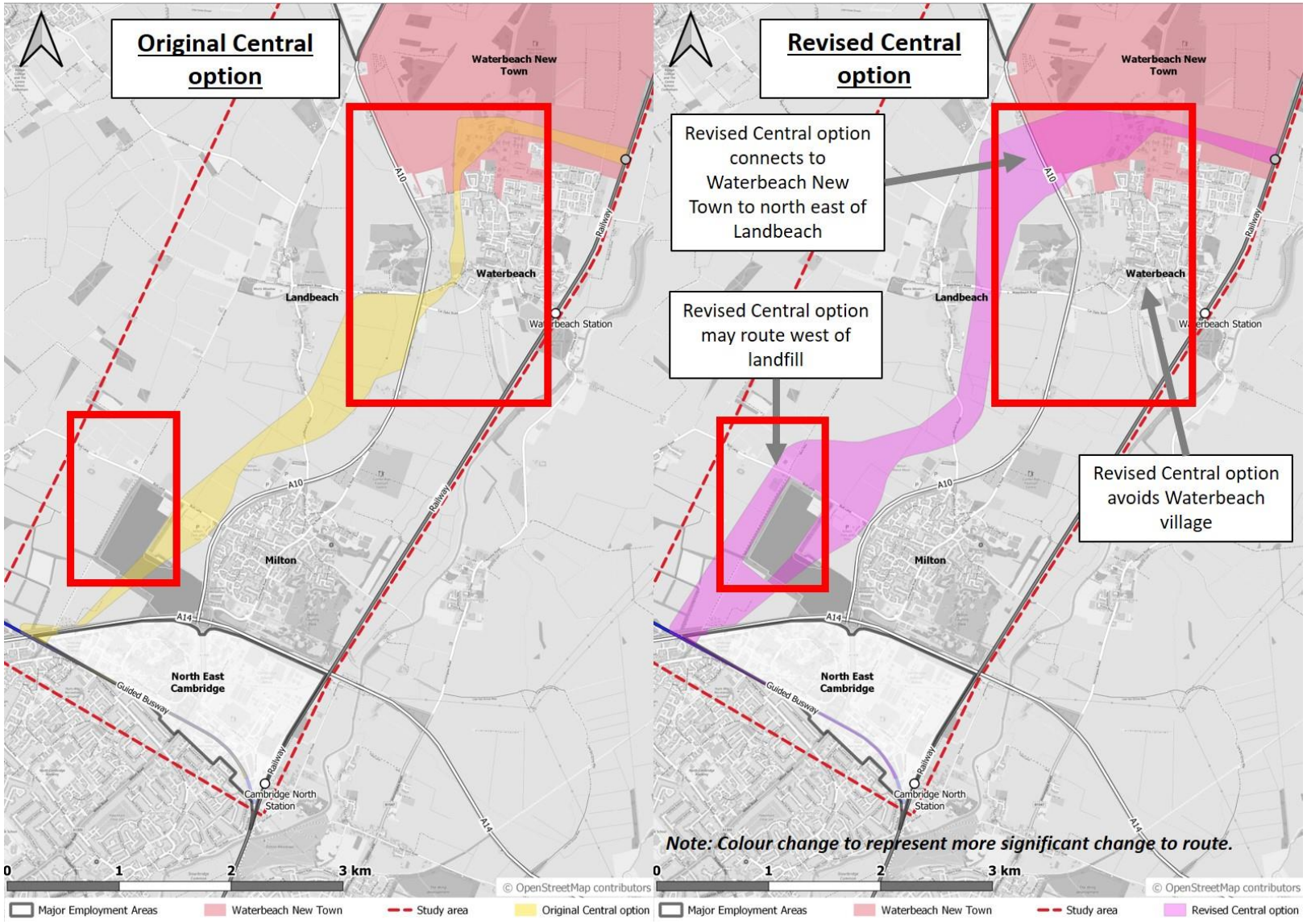
Comparison between the original and revised A10 route options



Comparison between the original and revised Eastern route options



Comparison between the original and revised Central route options



Appendix E. Alignment to policy and objectives

Alignment to policy and objectives

Policy / Objective	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Local, Regional and National Policy				
South Cambridgeshire Local Plan – 2018	The Western route option aligns to this policy as it supports the development of Waterbeach New Town (SS/6) and new employment provision near Cambridge (E/1) by providing a sustainable transport options (also aligning to (TI/2).	The Revised Central route option aligns to this policy as it supports the development of Waterbeach New Town (SS/6) and new employment provision near Cambridge (E/1) by providing a sustainable transport options (also aligning to (TI/2).	The Revised A10 route option aligns to this policy as it supports the development of Waterbeach New Town (SS/6), Cambridge Northern Fringe East (SS/4) and new employment provision near Cambridge (E/1) by providing a sustainable transport options (also aligning to (TI/2).	The Revised Eastern route option aligns to this policy as it supports the development of Waterbeach New Town (SS/6), Cambridge Northern Fringe East (SS/4) and new employment provision near Cambridge (E/1) by providing a sustainable transport options (also aligning to (TI/2).
Cambridge Local Plan – 2018	This option aligns with the Cambridge Local Plan as it provides sustainable transport connections to strategic sites such as the Cambridge Science Park (Policies 2 and 5). This option also supports policy 82 which seeks to reduce car demand within the corridor, thereby supporting parking management in new developments.	This option aligns with the Cambridge Local Plan as it provides sustainable transport connections to strategic sites such as the Cambridge Science Park (Policies 2 and 5). This option also supports policy 82 which seeks to reduce car demand within the corridor, thereby supporting parking management in new developments.	This option aligns with the Cambridge Local Plan as it provides some sustainable transport connections to strategic sites such as the Cambridge Science Park (Policies 2 and 5). This option also supports policy 82 which seeks to reduce car demand within the corridor, thereby supporting parking management in new developments.	This option aligns with the Cambridge Local Plan as it provides some sustainable transport connections to strategic sites such as the Cambridge Science Park (Policies 2 and 5). This option also supports policy 82 which seeks to reduce car demand within the corridor, thereby supporting parking management in new developments.
Cambridgeshire Local Transport Plan 2011-2031 – 2015	This option aligns with the Cambridgeshire Local Transport Plan by supporting the delivery and growth of sustainable communities by providing public transport, pedestrian and cycle links.			

Policy / Objective	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Cambridgeshire Local Transport Plan 2011-2031: Long Term Transport Strategy – 2015	This option supports this policy as it seeks to extend the busway network to serve new developments, such as Waterbeach New Town whilst providing high quality public transport. This option will also support the development of a new railway station by improving links from the station to employment areas such Cambridge Research Park and Cambridge Science Park. Moreover the strategy outlines aspirations for the area including a busway link between Waterbeach Station and town centre to north Cambridge and a park and ride along the A10 which this scheme can provide.			
Cambridgeshire and Peterborough Local Transport Plan – 2021	This option is considered to be resilient and adaptive and therefore provides journey time reliability. In addition to providing environmentally friendly infrastructure to support climate change and environmental policy, specifications for the scheme will include non-motorised user infrastructure such as footways and cycleways and therefore also supporting the policy relating to health and wellbeing.			
Transport Strategy for Cambridge and South Cambridgeshire – 2014	This option supports sustainable growth and therefore aligns with Policy TSCSC 7.			
Waterbeach Supplementary Planning Document – 2019	This option will align with the Waterbeach SPD and will serve the site. The exact way in which it will serve the site is subject to ongoing discussions with the Waterbeach New Town developers and assessment.			
CAM Objectives[67]				
Promote economic growth and opportunity	This option will promote economic growth by connecting employment and residential areas by a high-quality transport system. By connecting these areas, this option is improving opportunity for those living in rural Cambridgeshire who may not be able to access Cambridge as easily as those with a car.			
Support the acceleration of housing delivery	This option directly supports the development of Waterbeach New Town by proving good transport links to North East Cambridge which is one of the conditions for the site. This option also provides transport links to the proposed development in and around the North East Cambridge area.			
Promote Equity	This option improves equality for those living in rural Cambridgeshire who may not be able to access Cambridge as easily as those with a car.			
Promote sustainable growth and development	This option is providing a high-quality public transport system that connects strategic sites in Cambridge and South Cambridgeshire. The scheme therefore promotes sustainable growth by encourage public transport and active travel trips as opposed to a private car trips.			
Scheme Objectives				
Deliverable option which will improve the reliability, safety, capacity and speed of sustainable transport connections	This option will improve the reliability, safety, capacity and speed of sustainable transport connections between North East Cambridge, Waterbeach New Town and other existing development in the study area. The scheme is a segregated where possible and therefore can operate reliably and with speed.			
To identify measures that allow for the relocation of	This option will serve the relocated Waterbeach railway station			

[67] It is noted that a number of sub-objectives underpin the main four objectives. For brevity, the options have been assessed against the four main objectives.

Policy / Objective	Western route option	Revised Central route option	Revised A10 route option	Revised Eastern route option
Waterbeach railway station				
To ensure integrated walking and cycling routes are inherent in all proposals	All proposals will ensure walking and cycling routes are provided alongside the proposed high-quality public transport route			
To generate options that support the reduction of traffic levels in Cambridge to 10%-15% below 2011 levels	This option reduced car trips on the local network.			
To generate sustainable options that address transport demand from Waterbeach New Town	This option directly supports the development of Waterbeach New Town by proving good transport links to North East Cambridge which is one of the conditions for the site. This option also provides transport links to the proposed development in and around the North East Cambridge area.			
To generate options for 'quick-wins'	Quick wins have been provided in the OAR (See Chapter 7).			
To improve connectivity between existing settlements and to work stakeholders to identify the best package of measures.	This option will improve connectivity between existing settlements such as Waterbeach, Cambridge Research Park and Cambridge Science Park. Atkins and GCP are working extensively with stakeholders and the public to identify the best package of measures which is being set out in this SOBC.			

Appendix F. Waterbeach New Town routing considerations

The dedicated high-quality public transport route infrastructure would, as a minimum, extend as far as the proposed New Town centre. The current planning assumption is that it would continue eastwards to the relocated Waterbeach Station if and when the latter is delivered. Transit services themselves would not be confined to the dedicated infrastructure and would also be able to serve other areas of the New Town, and/or continue north towards Cambridge Research Park or beyond, as required to meet travel needs.

This analysis outlines work undertaken to understand the most effective service routing to the north of the study area including whether a service using the high-quality public transport route should serve the relocated Waterbeach Station and/or Cambridge Research Park. Ultimately the final high-quality public transport route routing is dependent bus operators and public sector funding however, at this stage, this analysis aims to help identify the right infrastructure to support the right range of services to feed into future scheme assessment.

Do Minimum bus network

This Section sets the scene in terms of existing and planned bus services in the local bus network that, without the high-quality public transport route, would make up the DM bus network.

The main existing routes in the local bus network include:

- Stagecoach Citi 2, which during peak hours travels between Ely and Cambridge Biomedical Campus via Cambridge Research Park, Waterbeach, Cambridge Science Park and Cambridge city centre; and
- Stagecoach route 9, which travels between Ely and Cambridge city centre, serving Cambridge Research Park, Waterbeach, Milton and Cambridge Science Park.

Committed under Section 106 agreements[68] as part of the Waterbeach New Town Development are the following services:

- A - extension of Milton Park and Ride bus or another service or a new service to link Waterbeach New Town and Cambridge. Free parking at Waterbeach New Town and route using Landbeach to avoid congestion on the A10;
- B - New bus service on weekdays between Cambridge Research Park, the site and the existing Waterbeach Station timed to coincide with trains. To be routed through the site via the Barracks area to the A10 (7am-7pm); and
- C - A new service within the site using the same vehicles as Bus service B during hours to be determined through a review of the framework Travel Plan.

The GCP Cambridge Bus Network Planning 'Future Bus Network Concept'[69] sets out the principles which can be used to guide detailed development of bus services in and around Cambridge. In terms of the Waterbeach corridor, the concept identifies the future 'key bus corridor' as Cambridge to Ely and Littleport, via Waterbeach and Waterbeach New Town. This includes a segregated corridor between Cambridge Science Park and a new Waterbeach Park and Ride. Under the proposed future scenario, the following additional core services would be introduced:

- *"a direct service providing 4 buses per hour from Waterbeach New town to CBC and Trumpington via the city centre. This service would call at both the new Waterbeach and existing Milton Road P&R sites, making us of the new segregated route, and would also serve the Science Park. The existing busway would also be used between the city centre and the CBC; and*

68 Planning Obligation by Deed of Agreement under Section 106 of the Town and Country Planning Act 1990. Relating to land at Waterbeach Barracks and Airfield Site, Waterbeach, Cambridgeshire. 25th September 2019

69 Greater Cambridge Partnership Cambridge Bus Network Planning 'Future Bus Network Concept (Systra, 17.1.2020) Greater Cambridge Partnership Media Assets Library - download (filecamp.com)

- *a direct service providing 4 buses per hour between Ely and the West Cambridge site, via the Science Park. This service would also call at both the new Waterbeach and existing Milton Road P&R sites, making use of the new segregated route in between"*[70].

Market analysis

Market analysis has been undertaken to inform the SOBC for the scheme to understand demand within the study area and the potential demand that the scheme could capture. This analysis has been developed further for the purposes of understanding potential demand for accessing the relocated Waterbeach Station via the Waterbeach to Cambridge Scheme. A qualitative and quantitative assessment has been undertaken to gain a holistic view of potential future demand. The following Sections present the narrative for serving the relocated Waterbeach Station and Cambridge Research Park from the perspective of the markets that the high-quality public transport route service could serve.

Waterbeach relocated station

Existing Waterbeach residents

Existing residents of Waterbeach village could use the scheme to access the relocated Waterbeach Station if the route followed the Revised A10, Revised Central or Revised Eastern route option alignment. Should the Western route option alignment be preferred, the residents of the existing Waterbeach village would not be served by the scheme and therefore the scheme would not capture potential demand from the existing Waterbeach village to the Station.

Existing residents of Waterbeach village would be most likely to travel to the relocated Station by foot or cycle. The existing Waterbeach Station is located to the southeast of the village and is approximately 2.1 kilometres from the furthest residential area within Waterbeach. The relocated Station, proposed to the northeast of the village, will be located approximately 2.4 kilometres from the furthest residential area. Inevitably the relocated Station will be closer than the existing Station for some residents (e.g. those who live in the north of the village) and further away for others (e.g. those to the south of the village). These distances lend themselves well to journeys by foot or cycle. However, it is recognised that some station users may wish to access the Station by public transport.

A high-quality public transport route stop is likely to be located within or close to Waterbeach village. Depending on the location this could require a walk of up to 1.5 kilometres, potentially in the opposite direction to the Station. If these residents were choosing to access the Station by public transport, they are unlikely to want to walk or cycle this distance when they could access a local stopping bus service close to their place of residence. Therefore, depending on the relative frequency of the high-quality public transport route compared to the stopping service, it is assumed that the majority of the existing Waterbeach residents who would access the relocated Station by public transport would do so via a local stopping service. The high-quality public transport route would be viable for those who live close to the western side of the village.

The 2011 Census recorded a total of 94 people within Waterbeach who use the existing Station for journeys to work. This is likely to equate to 188 rail trips a day (94 departures and 94 arrivals). It is important to recognise that there has been significant growth since 2011 and that the census values only account for journeys to work. Therefore, this does not represent total use of Waterbeach Station. The Office of Rail and Road estimates that in 2018-19, over 400,000[71] entries and exits were recorded at Waterbeach railway station. Given the qualitative analysis, it is likely that the majority of these residents would access the relocated Station by foot or cycle with a small proportion using public transport, whether that be the high-quality public transport route or a stopping service within Waterbeach village.

In summary, Waterbeach village represents a small market for the high-quality public transport route when serving the relocated Waterbeach Station.

70 Greater Cambridge Partnership Cambridge Bus Network Planning 'Future Bus Network Concept (Systra, 17.1.2020) (para 4.6.9 page 116/177)

71 Estimates of station usage | ORR Data Portal (entries and exits are defined by ORR as the total number of people travelling to or from the station)

Waterbeach New Town residents

All potential high-quality public transport route options will serve Waterbeach New Town. Residents of Waterbeach New Town are likely to walk or cycle to the relocated Station, as the majority of the proposed development will be within 2km. As with Waterbeach village residents, a small proportion will wish to access the Station by public transport. Those that live close to the high-quality public transport route stop at the local centre within the New Town, will likely use the service for their journey. However, those that live further away would be more likely to use a local stopping service, whether that be a 'normal bus' or a specific local transit service operating around Waterbeach New Town, where the stop is closer to their place of residence.

The Transport Assessment for Waterbeach New Town (Urban & Civic's application for 6,500 dwellings[72]) includes analysis on the predicted number of rail trips to be generated by the full development build out (10,000 dwellings), including those dwellings bought forward by RLW, during the peak hours. The table below summarises the additional rail trips generated by the new development.

Additional rail trips generated by Waterbeach New Town

No. of dwellings	New rail trips in morning peak hour (outbound)	New rail trips in evening peak hour (inbound)
6,500	107	87
10,000	165	134

Source: Waterbeach New Town Transport Assessment

A proportion of the 299 (165+134) new rail trips predicted to access the Station from Waterbeach New Town following full build out will use public transport. The Waterbeach New Town Transport Assessment predicts that 5% of internal development trips will be made by public transport. This equates to approximately 15 trips across the peak hours, of which some will use the high-quality public transport route.

In summary, Waterbeach New Town represents a small market for the high-quality public transport route when serving the relocated Waterbeach Station.

Employees of Cambridge Research Park

If the high-quality public transport route served the relocated Station and Cambridge Research Park there is potential for it to capture trips by rail of employees at the Research Park should the services provide a direct connection between the two locations. Analysis is based on the capacity of the Research Park when fully developed to determine the maximum potential demand.

Market analysis, taking into account the full build out of Cambridge Research Park, has shown that 14% of employees who live in postcode CB1 (Cambridge East including Teversham), 7% of employees who live in postcode CB2 (South Cambridge including Trumpington), and 3% of employees who live in postcode CB6 (Ely and villages to the west) access Cambridge Research Park by rail. This equates to a total of 91 people who would be likely to make 91 arrival trips at the Station in the morning peak and 91 departure trips at the Station in the evening peak. Therefore, there is potential that this demand, plus any visitors who use rail, to use the high-quality public transport route to travel the approximately 3km journey between the Station and the Research Park.

Cambridge Research Park currently operate a complementary shuttle bus (minibus) between Cambridge North Station and Cambridge Research Park during the AM peak period, lunchtime, and the PM peak period. Should this continue post-development, demand for the high-quality public transport route between the relocated Station and Cambridge Research Park could be reduced to those who travel from Ely only (approximately 13 arrival trips and 13 departure trips across the peak hours) as these commuters would be more likely to get the train to Waterbeach than Cambridge North Station. Use of the high-quality public transport route or shuttle bus by these Cambridge Research Park employees is dependent on a number of currently unknown factors:

- rail stopping patterns at Cambridge North Station and the relocated Waterbeach Station and their suitability for Cambridge Research Park employees;
- the attractiveness of the high-quality public transport route compared to the shuttle bus from Cambridge North Station e.g. frequency, journey time and relative fares; and

[72] Table 16.3 and Section 13

- Cambridge Research Parks future shuttle strategy e.g. whether they relocate to the new Waterbeach Station.

In summary, there is likely to be a small demand for public transport between the relocated Waterbeach Station and Cambridge Research Park. The level of demand is dependent on whether the Research Park continue to operate their shuttle bus from Cambridge North Station, relocate it to Waterbeach or cease operations.

Other markets

The Transport Assessment for the relocated Waterbeach Station suggests that by 2021 62% of demand for the existing Station will originate from within Waterbeach village [73]. This means that 38% of demand will originate from other areas, most likely Landbeach, Milton and Horningsea. Horningsea is outside the study area for this scheme and therefore will not be served by the high-quality public transport route.

Milton could be served by a high-quality public transport route following the Revised A10, Revised Central or Revised Eastern route option alignment. Following the relocation of the Station residents of Milton who currently use Waterbeach Station may be more likely to use Cambridge North Station, especially if they are travelling south, depending on the rail stopping pattern. The increased distance to Waterbeach Station coupled with the improved connections across the A14 as a result of the Waterbeach Greenway could make this a more attractive option for rail travel from Milton. Those travelling north towards Ely may still wish to travel from Waterbeach Station and could be captured by the high-quality public transport route, for those whose place of residence is near the stop, or by a local service.

Landbeach could be served by a high-quality public transport route following a Revised Central or Western alignment option. The likely demand from Landbeach is likely to have a similar pattern to that of Milton, i.e. those travelling south may prefer to travel from Cambridge North Station and those travelling north may prefer to travel from the relocated Waterbeach Station and could access the Station by the high-quality public transport route, for those whose place of residence is near the stop, or by a local service.

A high-quality public transport route service to the relocated Waterbeach Station also has the potential to intercept car trips to the Station should it serve a park and ride located within the study area. This would be dependent upon the location of any Park and Ride, the cost of parking at the site, the high-quality public transport route fare, the cost of parking at the relocated Waterbeach Station, and the connections between the highway network (particularly the A10) and the high-quality public transport route. Should these locations offer good connectivity, then this may increase the attractiveness of the relocated Station to those ravelling from surrounding villages, seeking onward rail travel towards London.

In summary, other markets that could be captured by the high-quality public transport route if it served Waterbeach relocated Station consist of Landbeach and Milton. Serving these markets depends on the preferred route alignment.

Impact if the relocated Waterbeach station is not served

If the relocated Waterbeach Station is not served the following would be likely:

- Existing residents of Waterbeach, Milton and Landbeach would be required to walk, cycle, drive or use a local bus service to access the site. Those that still choose to use the high-quality public transport route would be required to walk the first/last one kilometre of their journey from the Waterbeach New Town local centre to the Station.
- No fast, direct connection from Waterbeach relocated Station to Cambridge Research Park. This may encourage more trips by car as the Research Park expands. Public transport journeys between the Station and the Research Park will still be possible via a separate local service through Waterbeach New Town.
- Potential for more journeys within Waterbeach New Townsite by car for people who access the Station from outside of the development or cannot walk or cycle between their origin and the Station.
- Lack of direct connectivity between key transport hubs (i.e. relocated Waterbeach railway station and the high-quality public transport route) and destinations (Waterbeach New Town itself and other local destinations including Cambridge Research Park) within the study area.
- Adding additional interchange, or change of mode, for users of the high-quality public transport route to access the relocated Station.

[73] Section 5.4.2 (existing demand plus infill developments in Waterbeach up to 2021)

- Shorter end to end journey times for the scheme vehicles and therefore a requirement for less vehicles on the route.
- Potential for a lower scheme capital costs, depending on the level of infrastructure proposed within Waterbeach New Town and who is responsible for paying for it, and operating costs.

Cambridge Research Park

Similar to the assessment for the relocated Station, market analysis has been undertaken to understand the potential demand for accessing Cambridge Research Park via the Waterbeach to Cambridge Scheme. Analysis is based on the capacity of the Research Park when fully developed to determine the maximum potential demand.

2011 Census data was interrogated to show the distribution of origins for journeys to work in the Lower Super Output Area (LSOA) containing Cambridge Research Park (South Cambs 004C). An employment trip rate, obtained from the TRICS database, was applied to determine the number of future trips from each origin LSOA. Those that are considered within the catchment for the high-quality public transport route, i.e. those that are in the catchment for the CAM network, are summarised below.

Future trips to Cambridge Research Park within the catchment for the high-quality public transport route

Origin	All Day (07:00-19:00)	
	Arrivals	Departures
NEC/Chesterton/Kings Hedge/Arbury	522	520
Cambridge East including Teversham	451	449
Waterbeach	368	366
West of Cambridge including Cambourne	225	225
Newmarket Road and Fen Ditton	214	213
South Cambridge	208	207
West Cambridge	95	95
Milton	93	92
South of Cambridge including Foxton	65	65
East of Cambridge including Fulbourn	47	47
North of Huntingdon including Alconbury	47	47
Royston and surrounding villages	42	41
Newmarket and surrounding villages	24	24
Huntingdon and Godmanchester	18	18
Total	***2,419***	***2,409***

Source: Scaled 2011 Census

The table above shows that approximately 2,400 two-way trips will originate within the high-quality public transport route catchment and access Cambridge Research Park across the day. The high-quality public transport route has the potential to capture these trips should it provide a fast, frequent, reliable, and direct service.

Existing bus mode share to Cambridge Research Park is low (approximately 2%[74]) as a result of good highway connectivity, ample parking and the existing level and quality of bus service. Existing bus services 9 (Littleport-Cambridge) and 2 (Waterbeach-Addenbrooke's) currently serve Cambridge Research Park and call at NEC, Milton, Landbeach and Waterbeach. Journeys from the centre of Cambridge to Cambridge Research Park are timetabled to take over 30 minutes with no direct, fast service available. The high-quality public transport route could provide a fast, direct alternative to these services depending on which route alignment is preferred, which could lead to a higher uptake of public transport to the site. Residents of villages closer to the Research Park, including Milton and Waterbeach, may however wish to access a service close to their homes rather than walk to the high-quality public transport route stop therefore the markets from each of the villages is likely to be small. The market from Cambridge to the Research Park is likely to be higher, with larger numbers of people originating from the City as well as greater journey time benefits as a result of the longer distance and a direct route when compared to existing services.

There is currently demand for a direct service from NEC to Cambridge, evidenced by the Research Park Shuttle bus that operates during the morning peak period, lunchtime, and the evening peak period. The Research Park Newsletter[75] suggests that this service is used by those travelling by rail to Cambridge North Station as well as those who cycle as far as Cambridge North and then complete the last section of their journey by bus. Proposals to improve cycle connections north as part of the Waterbeach New Town development and the Waterbeach greenway may encourage some users to continue to cycle to Cambridge Research Park. Other users are not likely to transfer to the high-quality public transport route as long as the shuttle bus remains complimentary.

In summary, should the High Quality-Public Transport Route serve Cambridge Research Park it has the potential to capture a large number of trips across the day from within the Greater Cambridge area.

Impact if Cambridge Research Park is not served

If Cambridge Research Park is not served the following would be likely:

- low public transport mode share to the site and the reliance on the private car would be likely to continue impacting the sustainability of the site for further development;
- a lack of quick, frequent and reliable public transport connections to a key employment destination within the corridor;
- a lack of quick, frequent and reliable public transport connectivity between key employment centres for business trips such as trips between Cambridge Biomedical Campus, NEC and Cambridge Research Park;
- the high-quality public transport route would fail to capture trips to a key demand generator on the corridor;
- those passengers accessing Cambridge Research Park by bus in the current circumstances and after future development would be able to do so via the existing Ely to Cambridge bus service (9 or X9);
- shorter end to end journey times for the scheme vehicles and therefore a requirement for less vehicles on the route; and
- potential for a lower scheme capital costs, depending on the level of infrastructure proposed within Waterbeach New Town and who is responsible for paying for it, and operating costs.

Journey time analysis and routing

Journey time analysis has been undertaken for the Study to estimate overall journey times for each section of the potential route alignments. For the purposes of this assessment journey times have been calculated from the approximate location of the proposed local centre within Waterbeach New Town[76] to the relocated Station and to Cambridge Research Park.

74 2011 Census data

75 Discover Cambridge Research Park Newsletter Winter 2020

76 Exact location of the local centre and the exact route to the relocated station are unknown at this stage and are subject to site masterplanning

Two speeds have been used to provide a range of journey times depending on which infrastructure is used for the high-quality public transport route within Waterbeach New Town. If the high-quality public transport route operates with general traffic then a speed of 22km/h[77] is assumed in an urban area. If the high-quality public transport route is segregated from general traffic a speed of 27km/h is assumed in an urban area.

The outcome of this assessment is shown in the table below.

Journey times from local centre to the relocated Waterbeach Station and Cambridge Research Park

Destination	With general traffic	Segregated from general traffic
Waterbeach Relocated Station	5 minutes	4 minutes
Cambridge Research Park	11 minutes	9 minutes
Cambridge Research Park via Waterbeach Relocated Station	16 minutes	13 minutes

The table above shows that serving the relocated Waterbeach Station directly would add a 4 to 5 minute additional journey time from the local centre to the relocated Station and back to the local centre (round trip). Providing that the services only access the relocated Station, from the Waterbeach New Town local centre, only those passengers travelling to or from the relocated Station would be subject to the additional journey time therefore no other users would be disadvantaged in terms of journey time to their destination.

A journey from the local centre within Waterbeach New Town to Cambridge Research Park main entrance and back to the local centre will take between 9 and 11 minutes, depending on the location of the local centre and routing within the New Town. Providing that the services only access the Research Park, from the Waterbeach New Town local centre, only those passengers travelling to or from the Research Park would be subject to the additional journey time therefore no other users would be disadvantaged in terms of journey time to their destination.

Routing via both Cambridge Research Park and Waterbeach Relocated Station has a significant impact on journey times at the northern end of the route. This would disadvantage passengers continuing to Cambridge Research Park who are not stopping at the Station and vice versa, however would benefit those accessing Cambridge Research Park by rail.

Splitting the high-quality public transport route service at the local centre would provide direct, fast access to both the relocated Station and Cambridge Research Park without disadvantaging any passengers in terms of journey time. This would also provide the maximum number of services on the core high-quality public transport route between Waterbeach New Town local centre and Cambridge. However, this arrangement would not provide a fast, direct link between the Station and Cambridge Research Park.

An alternative would be to route some buses up the A10 to Cambridge Research Park without serving the local centre in Waterbeach New Town, therefore providing faster journeys for those directly accessing the Research Park, however this has been discounted for the following reasons:

- this route would not capture trips to Waterbeach New Town on half of the high-quality public transport route;
- there is less scope to accommodate trips between Waterbeach relocated Station and Cambridge Research Park as a result of additional distance that services and passengers would be required to take; and
- terminating the service at the research park would not allow for a bus layover.

It is important to note that existing and proposed local services will also serve key origins and destinations within the study area. For example, committed under Section 106 agreements[78] as part of the Waterbeach New Town Development are the following services:

- A - extension of Milton Park and Ride bus or another service or a new service to link Waterbeach New Town and Cambridge. Free parking at Waterbeach New Town and route using Landbeach to avoid congestion on the A10;

77 Speeds used in this assessment have been taken from the journey time assessment conducted for the end to end scheme.

78 Planning Obligation by Deed of Agreement under Section 106 of the Town and Country Planning Act 1990. Relating to land at Waterbeach Barracks and Airfield Site, Waterbeach, Cambridgeshire. 25th September 2019

- B - New bus service on weekdays between Cambridge Research Park, the site and the existing Waterbeach Station timed to coincide with trains. To be routed through the site via the Barracks area to the A10 (7am-7pm); and
- C - A new service within the site using the same vehicles as Bus service B during hours to be determined through a review of the framework Travel Plan.

These local stopping services will provide connectivity between areas not directly served by the high-quality public transport route, including between Waterbeach Relocated Station and Cambridge Research Park, should users not wish to use the high-quality public transport route and change services in the local centre.

Summary

In summary, analysis has shown that trips to and from the relocated Waterbeach Station represent a small potential market for the high-quality public transport route however the additional journey time (4-5 minutes) associated with serving the Station directly is considered small and would not add additional time to other high-quality public transport route users' journeys.

Trips to and from Cambridge Research Park represent a significant potential market for the high-quality public transport route, which makes the additional journey time (9-11 minutes) associated with serving the Research Park directly beneficial to the overall catchment of the scheme. Serving the Research Park directly would also not add additional time to other high-quality public transport route users' journeys.

One service, calling at the relocated Station and Cambridge Research Park would capture some trips to the Research Park by rail but would add a significant additional journey time (13-16 minutes) for users, over the direct service.

Therefore, in order to adhere to the aims of the Study and provide a fast, frequent and reliable service between Waterbeach and Cambridge the preferred option for routing towards the north of the study area would be to serve Waterbeach Relocated Station and Cambridge Research Park with alternate services from the local centre. This option serves key flows well with direct services and provides a balance between serving key demand hubs and providing a fast service. Although this solution wouldn't allow for a fast, direct service between the relocated Waterbeach Station and Cambridge Research Park, demand for this connection is likely to be covered by a local stopping service and/or the Research Park shuttle.

The next step involves engagement with the Waterbeach New Town Developers to secure routes within the site for the high-quality public transport route. This engagement is summarised in Section 5.

Appendix G. Appraisal Summary Tables

Appraisal Summary Table

Date produced:	24	3	2021

Contact:	
Name	Sam Appleton
Organisation	Atkins
Role	Project Manager

Name of scheme:	Waterbeach - Western Option
Description of scheme:	Public transport connection between Waterbeach New Town and North East Cambridge. The western option originates near Cambridge North Station and follows the Cambridgeshire Guided Busway under the A14, then turns northeast and continues to the west of Mere Way. The route then bears east north of Landbeach and crosses the A10 at the proposed access roundabout to Waterbeach New Town.

Impacts		Summary of key impacts	Assessment: Quantitative	Assessment: Qualitative	Assessment: Monetary £(NPV)	Assessment: Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	Business users and transport providers are predicted to experience benefits of £4.6 million. This is the result of a reduction in congestion and increased public transport connectivity between business areas which will in turn improve journey times. As a result transportation times of goods will improve, making businesses more efficient.	**Value of journey time changes(£)** £4.6m **Net journey time changes (£)** 0 to 2min: 9.7 / 2 to 5min: 0.1 / > 5min: 1.7	Improved efficiency through improved transport links.	£4.6 million	
	Reliability impact on Business users	Reliability of business users in unlikely to be directly affected by the scheme. However, reduced congestion on the A10 and on the approach to Milton Interchange should lead to a fall in delays across the network and improved journey time reliability.		Reduced congestion leading to reductions in delays.		
	Regeneration	Not assessed - not anticipated to be significant.		Not assessed - not anticipated to be significant.		
	Wider Impacts	The main benefits for the WEI arise from improvements in the movement in labour and increased static clustering. This is because the transitway connects the CSP, CRP and Cambridge North railway station. The scheme also offers improved access to education facilities at CRC.		Improvements in the movement of labour and static clustering.		
Environmental	Noise	Noise impacts, calculated using MEC, are predicted to experience benefits of £0.04 million. This is a result of the reduction of traffic on the network caused by the mode shift to Park and Ride, Public Transport and NMU.		A reduction in vehicles on the network leads to noise impact benefits.	£0.04 million	
	Air Quality	Air Quality, calculated using MEC, impacts are predicted to experience benefits of £0.08 million. This is a result of the reduction on traffic on the network caused by the mode switch to Park and Ride, Public Transport and NMU.		A reduction in vehicles and congestion on the network leads to air quality impact benefits.	£0.08 million	
	Greenhouse gases	Greenhouse gas impacts are predicted to experience benefits of £0.9m. This is a result of the mode shift from private vehicle to Park and Ride, Public Transport and NMU.	Change in non-traded carbon over 60y (CO2e): -20492 tonnes Change in traded carbon over 60y (CO2e): -437 tonnes	A reduction in vehicles and congestion on the network leads to Greenhouse gas benefits.	£0.9 million	
	Landscape	There could be small adverse impacts on the landscape. This is because the transitway will be built through existing greenspace.		Not currently assessed.		
	Townscape	There impact of townscape is yet to be determined. This will depend on the standard of finish of the infrastructure when new facilities are implemented into current towns and villages.		Not currently assessed.		
	Historic Environment	There could be small adverse impacts on the historic environment. This is because the transitway will be built through existing greenspace.		Not currently assessed.		
	Biodiversity	There could be small adverse impacts on the biodiversity in the local area. This is because the transitway will be built through existing greenspace. To limit the impacts biodiversity impacts further assessments will be carried out.		Not currently assessed.		
	Water Environment	There is not likely to be any significant impacts on the water environment following implementation of the scheme.		Not currently assessed.		
Social	Commuting and Other users	Commuting and other users are predicted to experience benefits of £23.2 million .This is the result of the journey times savings for commuting and other users following implementation of the scheme.	**Value of journey time changes(£)** £23.2m **Net journey time changes (£)** 0 to 2min: 35.4 / 2 to 5min: 1.1 / > 5min: 22.0	Journey time savings offered by the scheme.	£23.2m	
	Reliability impact on Commuting and Other users	There will be reliability benefits for commuting and other users as a segregated transitway. This is because the transitway will ensure that delays on the network will not affect services using the scheme.		Improvement for users due to the transitway being segregated.		
	Physical activity	The physical activity benefits of the scheme are predicted to be £4.1million. This is a result of increases in walking and cycling following the provision of new NMU infrastructure.	£4.1 million	This physical activity benefit is due to the additional NMU facilities implemented by the scheme.	£4.1 million	
	Journey quality	The journey quality benefits of the scheme are predicted to be £25.5million. This is a result of the implementation of a segregated NMU path along the transitway, whereas currently there is limited infrastructure along this route.	£25.5 million	This journal activity benefit is due to the additional NMU facilities implemented by the scheme.	£25.5 million	
	Accidents	The accident cost savings are predicted to be £0.4 million, calculated using MEC. This is the result of the mode switch from private vehicles to public transport or Park and Ride. In turn, the number of vehicles on the network is reduced.		The small accident cost savings benefit is a result of the reduction of vehicles on the network.	£ 0.4 million	
	Security	Small security benefits are expected. This is a result from increased lighting and CCTV along the transitway and at new public transport facilities		Small security benefits are expected due to CCTV and lighting along new infrastructure.		
	Access to services	There is likely to be positive access to services benefits. This is the result of increased connectivity between Waterbeach New Town and other local villages to Cambridge. This provides residents with access to leisure / tourist facilities as well as health centres such as Papworth Hospital and education facilities within Cambridge.		Slight positive impacts due to increased connectivity.		
	Affordability	There is likely to be positive affordability benefits. This is because public transport fares are non taxable goods unlike fuel. Also transitway services are often cheaper than railway equivalents.		Slight positive impacts due to the non-taxable nature of public transport.		
	Severance	There will be positive severance affects. This is because currently there is limited accessibility along the corridor other than the road network. There is also an absence of NMU facilities.		Slight positive impacts due to the current reliance of the road network and lack of NMU facilities.		
	Option and non-use values	There will be positive benefits in non-use values. This is because the air quality will improve in the local area due to a reduction in congestion and traffic on the road network.		Slight positive impacts due to improvements in air quality.		
Public Accounts	Cost to Broad Transport Budget	Present Value Cost (PVC) of £46.5 million			£46.5 million	
	Indirect Tax Revenues	The Indirect tax revenue is predicted to be £4.4 million. An increase in indirect taxation as a result of a reduction in the amount of fuel used by users and therefore a subsequent increase in the amount of disposable income that users have. Therefore new spending on luxury goods exceeds the taxation saved through reduced spend on fuel.		An increase in indirect taxation results from an increase in disposable income following less tax paid on fuel. This is because more disposable income leads to more spending on luxury goods which are taxable.	£4.4 million	

Appraisal Summary Table

Date produced:	24	3	2021

Contact:	
Name	Sam Appleton
Organisation	Atkins
Role	Project Manager

Name of scheme:	Waterbeach - Central Alternative Option
Description of scheme:	Public transport connection between Waterbeach New Town and North East Cambridge. The central option originates near Cambridge North Station and follows the Cambridgeshire Guided Busway under the A14m where it turns east and traverses the agricultural land between Landbeach and Milton. It then heads due north to a mid-point between Landbeach village and the A10 avoiding private and commercial properties. The option would link into the proposed roundabout at Waterbeach New Town on the A10 and would follow the same alignment as the western option through Waterbeach New Town to the proposed relocated Waterbeach Station and Cambridge Research Park.

Impacts		Summary of key impacts	Assessment: Quantitative	Assessment: Qualitative	Assessment: Monetary £(NPV)	Assessment: Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	Business users and transport providers are predicted to experience benefits of £5.6 million. This is the result of a reduction in congestion and increased public transport connectivity between business areas which will in turn improve journey times. As a result transportation times of goods will improve, making businesses more efficient.	**Value of journey time changes(£)** £5.6m **Net journey time changes (£)** 0 to 2min: 10.4; 2 to 5min: 0.2; > 5min: 2.4	Improved efficiency through improved transport links.	£5.6 million	
	Reliability impact on Business users	Reliability of business users in unlikely to be directly affected by the scheme. However, reduced congestion on the A10 and on the approach to Milton Interchange should lead to a fall in delays across the network and improved journey time reliability.		Reduced congestion leading to reductions in delays.		
	Regeneration	It is unlikely there will be any regeneration impacts following the scheme.		Not assessed - not anticipated to be significant.		
	Wider Impacts	The main benefits for the WEI arise from improvements in the movement in labour and increased static clustering. This is because the transitway connects the CSP, CRP and Cambridge North railway station. The scheme also offers improved access to education facilities at CRC.		Improvements in the movement of labour and static clustering.		
Environmental	Noise	Noise impacts, calculated using MEC, are predicted to experience benefits of £0.06 million. This is a result of the reduction on traffic of the network caused by the mode shift to Park and Ride, Public Transport and NMU.		A reduction in vehicles on the network leads to noise impact benefits.	£0.06 million	
	Air Quality	Air Quality impacts, calculated using MEC, are predicted to experience benefits of £0.07 million. This is a result of the reduction of traffic on the network caused by the mode shift to Park and Ride, Public Transport and NMU.		A reduction in vehicles and congestion on the network leads to air quality impact benefits.	£0.07 million	
	Greenhouse gases	Greenhouse gas impacts are predicted to experience benefits of £1.4m. This is a result of the mode shift from private vehicle to Park and Ride, Public Transport and NMU.	Change in non-traded carbon over 60y (CO2e): -31303 tonnes Change in traded carbon over 60y (CO2e): -679 tonnes	A reduction in vehicles and congestion on the network leads to Greenhouse gas benefits.	£1.4 million	
	Landscape	There could be small adverse impacts on the landscape. This is because the transitway will be built through existing greenspace.		Not currently assessed.		
	Townscape	There impact of townscape is yet to be determined. This will depend on the standard of finish of the infrastructure when new facilities are implemented into current towns and villages.		Not currently assessed.		
	Historic Environment	There could be small adverse impacts on the historic environment. This is because the transitway will be built through existing greenspace.		Not currently assessed.		
	Biodiversity	There could be small adverse impacts on the biodiversity in the local area. This is because the transitway will be built through existing greenspace. To limit the impacts biodiversity impacts further assessments will be carried out.		Not currently assessed.		
	Water Environment	There is not likely to be any significant impacts on the water environment following implementation of the scheme.		Not currently assessed.		
Social	Commuting and Other users	Commuting and other users are predicted to experience benefits of £24.1 million. This is the result of the journey times savings for commuting and other users following implementation of the scheme.	**Value of journey time changes(£)** £24.1m **Net journey time changes (£)** 0 to 2min: 41.3; 2 to 5min: 2.1; > 5min: 22.1	Journey time savings offered by the scheme.	£24.1m	
	Reliability impact on Commuting and Other users	There will be reliability benefits for commuting and other users as a segregated transitway. This is because the transitway will ensure that delays on the network will not affect services using the scheme.		Improvement for users due to the transitway being segregated.		
	Physical activity	The physical activity benefits of the scheme are predicted to be £1.5 million. This is a result of increases in walking and cycling following the provision of new NMU infrastructure.	£1.5 million	This physical activity benefit is due to the additional NMU facilities implemented by the scheme.	£1.5 million	
	Journey quality	The journey quality benefits of the scheme are predicted to be £25.1million. This is a result of the implementation of a segregated NMU path along the transitway, whereas currently there is limited infrastructure along this route.	£25.1 million	This journal activity benefit is due to the additional NMU facilities implemented by the scheme.	£25.1 million	
	Accidents	The accident cost savings are predicted to be £0.38 million, calculated using MEC. This is the result of the mode switch from private vehicles to public transport or Park and Ride. In turn, the number of vehicles on the network is reduced.		The small accident cost savings benefit is a result of the reduction of vehicles on the network.	£ 0.38 million	
	Security	Small security benefits are expected. This is a result from increased lighting and CCTV along the transitway and at new public transport facilities		Small security benefits are expected due to CCTV and lighting along new infrastructure.		
	Access to services	There is likely to be positive access to services benefits. This is the result of increased connectivity between Waterbeach New Town and other local villages to Cambridge. This provides residents with access to leisure / tourist facilities as well as health centres such as Papworth Hospital and education facilities within Cambridge.		Slight positive impacts due to increased connectivity.		
	Affordability	There is likely to be positive affordability benefits. This is because public transport fares are non taxable goods unlike fuel. Also transitway services are often cheaper than railway equivalents.		Slight positive impacts due to the non-taxable nature of public transport.		
	Severance	There will be positive severance affects. This is because currently there is limited accessibility along the corridor other than the road network. There is also an absence of NMU facilities.		Slight positive impacts due to the current reliance of the road network and lack of NMU facilities.		
	Option and non-use values	There will be positive benefits in non-use values. This is because the air quality will improve in the local area due to a reduction in congestion and traffic on the road network.		Slight positive impacts due to improvements in air quality.		
Public Accounts	Cost to Broad Transport Budget	Present Value Cost (PVC) of £49.4 million			£49.4 million	
	Indirect Tax Revenues	The Indirect tax revenue is predicted to be £5.8million. An increase in indirect taxation as a result of a reduction in the amount of fuel used by users and therefore a subsequent increase in the amount of disposable income that users have. Therefore new spending on luxury goods exceeds the taxation saved through reduced spend on fuel.		An increase in indirect taxation results from an increase in disposable income following less tax paid on fuel. This is because more disposable income leads to more spending on luxury goods which are taxable.	£5.8 million	

Appraisal Summary Table

Date produced:	24	3	2021

Contact:	
Name	Sam Appleton
Organisation	Atkins
Role	Project Manager

Name of scheme:	Waterbeach - A10 option
Description of scheme:	Public transport connection between Waterbeach New Town and North East Cambridge. The A10 route originates near Cambridge North Station and travels along Cowley Road to Milton Road. From here, the route bears north and crosses the A14 at a new crossing near Jane Coston Bridge, then bears west to the south of Milton Tesco supermarket. The route crosses the northern arm of the Milton Interchange before bearing north to the west of the A10. The route crosses the A10 southwest of Waterbeach on Cambridge Road then bears north and travels on road through Waterbeach through to Denny End Road and Waterbeach New Town.

Impacts		Summary of key impacts	Assessment: Quantitative				Assessment: Qualitative	Assessment: Monetary £(NPV)	Assessment: Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	Business users and transport providers are predicted to experience benefits of £7.6 million. This is the result of a reduction in congestion and increased public transport connectivity between business areas which will in turn improve journey times. As a result transportation times of goods will improve, making businesses more efficient.	Value of journey time changes(£) £7.6m Net journey time changes (£) 0 to 2min: 9.7 / 2 to 5min: 0.2 / > 5min: 5.4				Improved efficiency through improved transport links.	£7.6 million	
	Reliability impact on Business users	Reliability of business users in unlikely to be directly affected by the scheme. However, reduced congestion on the A10 and on the approach to Milton Interchange should lead to a fall in delays across the network and improved journey time reliability.					Reduced congestion leading to reductions in delays.		
	Regeneration	It is unlikely there will be any regeneration impacts following the scheme.					Not assessed - not anticipated to be significant.		
	Wider Impacts	The main benefits for the WEI arise from improvements in the movement in labour and increased static clustering. This is because the transitway connects the CSP, CRP and Cambridge North railway station. The scheme also offers improved access to education facilities at CRC.					Improvements in the movement of labour and static clustering.		
Environmental	Noise	Noise impacts, calculating using MEC, are predicted to experience benefits of £0.02 million. This is a result of the reduction of traffic on the network caused by the mode shift to Park and Ride, Public Transport and NMU.					A reduction in vehicles on the network leads to noise impact benefits.	£0.02 million	
	Air Quality	Air Quality impacts, calculated using MEC, are predicted to experience benefits of £0.04 million. This is a result of the reduction of traffic on the network caused by the mode shift to Park and Ride, Public Transport and NMU.					A reduction in vehicles and congestion on the network leads to air quality impact benefits.	£0.04 million	
	Greenhouse gases	Greenhouse gas impacts are predicted to experience benefits of £2.3m.This is a result of the mode shift from private vehicle to Park and Ride, Public Transport and NMU.	Change in non-traded carbon over 60y (CO2e) -53990 tonnes Change in traded carbon over 60y (CO2e) -1293 tonnes				A reduction in vehicles and congestion on the network leads to Greenhouse gas benefits.	£2.3 million	
	Landscape	There could be small adverse impacts on the landscape. This is because the transitway will be build through existing greenspace although for the majority of the route this is alongside the existing A10.					Not currently assessed.		
	Townscape	There impact of townscape is yet to be determined. This will depend on the standard of finish of the infrastructure when new facilities are implemented into current towns and villages.					Not currently assessed.		
	Historic Environment	There could be small adverse impacts on the historic environment. This is because the transitway will be built through existing greenspace although this is along the existing A10 for the majority of the route.					Not currently assessed.		
	Biodiversity	There could be small adverse impacts on the biodiversity in the local area. To limit the impacts biodiversity impacts further assessments will be carried out.					Not currently assessed.		
	Water Environment	There is not likely to be any significant impacts on the water environment following implementation of the scheme.					Not currently assessed.		
Social	Commuting and Other users	Commuting and other users are predicted to experience benefits of £28.6 million. This is the result of the journey times savings for commuting and other users following implementation of the scheme.	Value of journey time changes(£) £28.6m Net journey time changes (£) 0 to 2min: 45.3 / 2 to 5min: 5.9 / > 5min: 48.0				Journey time savings offered by the scheme.	£28.6m	
	Reliability impact on Commuting and Other users	There will be reliability benefits for commuting and other users as a segregated transitway. This is because the transitway will ensure that delays on the network will not affect services using the scheme. Some reliability disbenefit may occur as a result of the on-road sections through Waterbeach village.					Improvement for users due to the transitway being segregated.		
	Physical activity	The physical activity benefits of the scheme are predicted to be £8.0million. This is a result of increases in walking and cycling following provision of new NMU infrastructure.	£8.0 million				This physical activity benefit is due to the additional NMU facilities implemented by the scheme.	£8.0 million	
	Journey quality	The journey quality benefits of the scheme are predicted to be £19.0million. This is a result of the implementation of a segregated NMU path along the transitway, whereas currently there is limited infrastructure along this route.	£19.0 million				This journal activity benefit is due to the additional NMU facilities implemented by the scheme.	£19.0 million	
	Accidents	The accident cost savings are predicted to be £0.25 million. This is the result of the mode switch from private vehicles to public transport or Park and Ride. In turn, the number of vehicles on the network is reduced.					The small accident cost savings benefit is a result of the reduction of vehicles on the network.	£ 0.25 million	
	Security	Small security benefits are expected. This is a result from increased lighting and CCTV along the transitway and at new public transport facilities					Small security benefits are expected due to CCTV and lighting along new infrastructure.		
	Access to services	There is likely to be positive access to services benefits. This is the result of increased connectivity between Waterbeach New Town and other local villages to Cambridge. This provides residents with access to leisure / tourist facilities as well as health centres such as Papworth Hospital and education facilities within Cambridge.					Slight positive impacts due to increased connectivity.		
	Affordability	There is likely to be positive affordability benefits. This is because public transport fares are non taxable goods unlike fuel. Also transitway services are often cheaper than railway equivalents.					Slight positive impacts due to the non-taxable nature of public transport.		
	Severance	There will be positive severance affects. This is because currently there is limited accessibility along the corridor other than the road network. There is also an absence of NMU facilities.					Slight positive impacts due to the current reliance of the road network and lack of NMU facilities.		
	Option and non-use values	There will be positive benefits in non-use values. This is because the air quality will improve in the local area due to a reduction in congestion and traffic on the road network.					Slight positive impacts due to improvements in air quality.		
Public Accounts	Cost to Broad Transport Budget	Present Value Cost (PVC) of £167.6 million						£167.6 million	
	Indirect Tax Revenues	The Indirect tax revenue is predicted to be £9.5million. An increase in indirect taxation as a result of a reduction in the amount of fuel used by users and therefore a subsequent increase in the amount of disposable income that users have. Therefore new spending on luxury goods exceeds the taxation saved through reduced spend on fuel.					An increase in indirect taxation results from an increase in disposable income following less tax paid on fuel. This is because more disposable income leads to more spending on luxury goods which are taxable.	£9.5 million	

Appraisal Summary Table

Date produced:	24	3	2021

Contact:	
Name	Sam Appleton
Organisation	Atkins
Role	Project Manager

Name of scheme:	Waterbeach - Eastern Option
Description of scheme:	Public transport connection between Waterbeach New Town and North East Cambridge. The Eastern option originates near Cambridge North Station and bears north through the eastern side of NEC, crossing the A14 south of Milton Country Park. The route traverses the borders of the Country Park on the eastern side, before heading north to the west of the proposed sports lake development and east of the existing Footgolf area. The route reaches Waterbeach at Car Dyke Road, then continues on road through Waterbeach through to Denny End Road and Waterbeach New Town.

Impacts		Summary of key impacts	Assessment: Quantitative				Assessment: Qualitative	Assessment: Monetary £(NPV)	Assessment: Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	Business users and transport providers are predicted to experience benefits of £4.1 million. This is the result of a reduction in congestion and increased public transport connectivity between business areas which will in turn improve journey times. As a result transportation times of goods will improve, making businesses more efficient.	Value of journey time changes(£)	£4.1m			Improved efficiency through improved transport links.	£4.1 million	
			Net journey time changes (£)						
			0 to 2min	2 to 5min	> 5min				
			7.6	0.1	2.8				
	Reliability impact on Business users	Reliability of business users in unlikely to be directly affected by the scheme. However, reduced congestion on the A10 and on the approach to Milton Interchange should lead to a fall in delays across the network and improved journey time reliability.					Reduced congestion leading to reductions in delays.		
	Regeneration	It is unlikely there will be any regeneration impacts following the scheme.					Not assessed - not anticipated to be significant.		
	Wider Impacts	The main benefits for the WEI arise from improvements in the movement in labour and increased static clustering. This is because the transitway connects the CSP, CRP and Cambridge North railway station. The scheme also offers improved access to education facilities at CRC.					Improvements in the movement of labour and static clustering.		
Environmental	Noise	Noise impacts, calculated using MEC, are predicted to experience benefits of £0.02 million. This is a result of the reduction of traffic on the network caused by the mode shift to Park and Ride, Public Transport and NMU.					A reduction in vehicles on the network leads to noise impact benefits.	£0.02 million	
	Air Quality	Air Quality impacts, calculated using MEC, are predicted to experience benefits of £0.01million. This is a result of the reduction of traffic on the network caused by the mode shift to Park and Ride, Public Transport and NMU.					A reduction in vehicles and congestion on the network leads to air quality impact benefits.	£0.01 million	
	Greenhouse gases	Greenhouse gas impacts are predicted to experience benefits of £0.9m .This is a result of the mode shift from private vehicle to Park and Ride, Public Transport and NMU.	Change in non-traded carbon over 60y (CO2e)	-20568 tonnes			A reduction in vehicles and congestion on the network leads to Greenhouse gas benefits.	£0.9 million	
			Change in traded carbon over 60y (CO2e)	-493 tonnes					
	Landscape	There could be small adverse impacts on the landscape. This is because the transitway will be build through existing the existing Waterbeach greenway.					Not currently assessed.		
	Townscape	There impact of townscape is yet to be determined. This will depend on the standard of finish of the infrastructure when new facilities are implemented into current towns and villages.					Not currently assessed.		
	Historic Environment	There could be small adverse impacts on the historic environment. This is because the transitway will be built through existing greenspace.					Not currently assessed.		
	Biodiversity	There could be small adverse impacts on the biodiversity in the local area. This is because the transitway will be built through existing greenspace. To limit the impacts biodiversity impacts further assessments will be carried out.					Not currently assessed.		
	Water Environment	There is not likely to be any significant impacts on the water environment following implementation of the scheme.					Not currently assessed.		
Social	Commuting and Other users	Commuting and other users are predicted to experience benefits of £18.6 million. This is the result of the journey times savings for commuting and other users following implementation of the scheme.	Value of journey time changes(£)	£18.6m			Journey time savings offered by the scheme.	£18.6m	
			Net journey time changes (£)						
			0 to 2min	2 to 5min	> 5min				
			31.5	0.7	22.1				
	Reliability impact on Commuting and Other users	There will be reliability benefits for commuting and other users as a segregated transitway. This is because the transitway will ensure that delays on the network will not affect services using the scheme. Some reliability disbenefit may occur as a result of the on-road sections through Waterbeach village.					Improvement for users due to the transitway being segregated.		
	Physical activity	The physical activity impacts of the scheme are predicted to be -£0.3 million. This is a result of the transitway running adjacent to the Waterbeach greenway, which would not provide additional NMU facilities on top of those that already exist.	-£0.3 million				This physical activity disbenefit is due to the lack of NMU provision on top of that which already exists.	-£0.3 million	
	Journey quality	The journey quality impacts of the scheme are predicted to be neutral. This is a result of the Waterbeach Greenway. As a result no additional NMU facilities will be added as part of this scheme.	-				This journey quality benefit is neutral due to the lack of additional NMU facilities implemented by the scheme.	£0 million	
	Accidents	The accident cost savings are predicted to be £0.06 million. This is the result of the mode switch from private vehicles to public transport or Park and Ride. In turn, the number of vehicles on the network is reduced.					The small accident cost savings benefit is a result of the reduction of vehicles on the network.	£ 0.06 million	
	Security	Small security benefits are expected. This is a result from increased lighting and CCTV along the transitway and at new public transport facilities					Small security benefits are expected due to CCTV and lighting along new infrastructure.		
	Access to services	There is likely to be positive access to services benefits. This is the result of increased connectivity between Waterbeach New Town and other local villages to Cambridge. This provides residents with access to leisure / tourist facilities as well as health centres such as Papworth Hospital and education facilities within Cambridge.					Slight positive impacts due to increased connectivity.		
	Affordability	There is likely to be positive affordability benefits. This is because public transport fares are non taxable goods unlike fuel. Also transitway services are often cheaper than railway equivalents.					Slight positive impacts due to the non-taxable nature of public transport.		
	Severance	There will be positive severance affects. This is because currently there is limited accessibility along the corridor other than the road network. There is also an absence of NMU facilities.					Slight positive impacts due to the current reliance of the road network and lack of NMU facilities.		
	Option and non-use values	There will be positive benefits in non-use values. This is because the air quality will improve in the local area due to a reduction in congestion and traffic on the road network.					Slight positive impacts due to improvements in air quality.		
Public Accounts	Cost to Broad Transport Budget	Present Value Cost (PVC) of £41.9 million						£41.9 million	
	Indirect Tax Revenues	The Indirect tax revenue is predicted to be £4.4 million. An increase in indirect taxation as a result of a reduction in the amount of fuel used by users and therefore a subsequent increase in the amount of disposable income that users have. Therefore new spending on luxury goods exceeds the taxation saved through reduced spend on fuel.					An increase in indirect taxation results from an increase in disposable income following less tax paid on fuel. This is because more disposable income leads to more spending on luxury goods which are taxable.	£4.4 million	

Appendix H. Supplementary information from economic appraisal

H.1. User benefits by time period

User benefits by time period

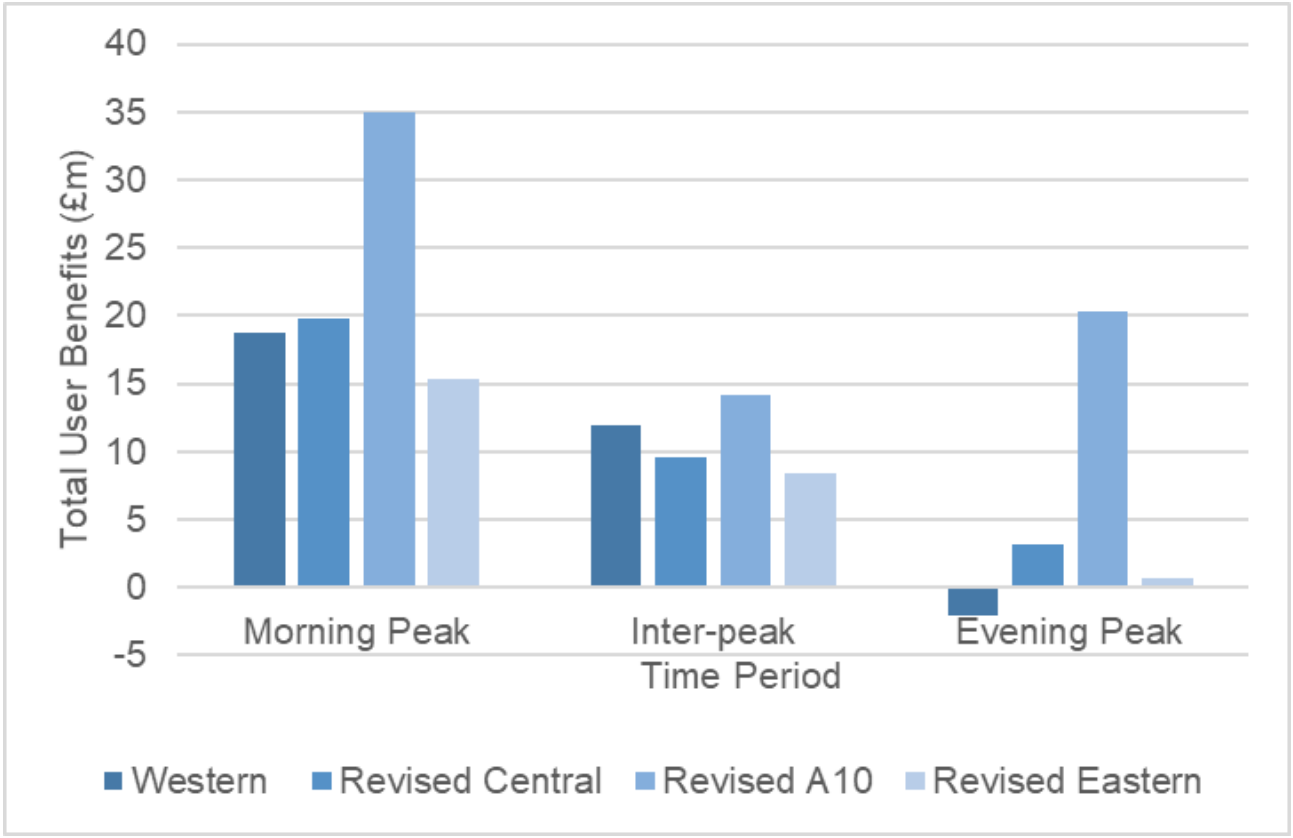
The analysis for user benefits by time period is summarised.

The largest user time savings are forecast for the morning peak for all options. This is due to the tidal nature of demand along the corridor within the study area that sees a number of commuters heading south, towards Cambridge in the morning peak period. The user time savings are generally smaller in the evening peak as commuters leave Cambridge. The congestion in the evening is worse towards the northern end of the A10 which is not affected by the scheme. Therefore, the user time savings in the evening peak are less significant.

In some options there are negative time savings forecast for the inter-peak. This is due to an increase in the number of junctions on the existing A10. This means that journey times are slower, than when traffic is at its free flow speed, due to the increased number of stops. This is not the case for the Revised A10 route option, where the direct connectivity to Milton Park and Ride along its current corridor means that there are benefits accrued by existing users of the site to return to the site quickly via the bus leg of the journey in the evening peak period, avoiding congestion on Milton Road. This benefit stream then counteracts the disbenefits associated with the increased congestion at the Ely end of the corridor, where the increases in highway traffic from returning park and ride users adds to existing highway congestion.

The tables below set out the user benefits disaggregated by time period, over the appraisal period. The figure below summarises the user benefits by time period.

Summary of user benefits by time period



User benefits by time period – Western route option (£m)[79]

Time period	User time savings	User charges	Vehicle operating costs
Morning peak (3 hours)	£18.4	-£0.8	£1.1
Inter-peak (6 hours)	£10.9	-£0.3	£1.2
Evening peak (3 hours)	-£1.4	-£0.5	-£0.1

User benefits by time period – Revised Central route option (£m)[80]

Time period	User time savings	User charges	Vehicle operating costs
Morning peak (3 hours)	£19.0	-£0.5	£1.3
Inter-peak (6 hours)	£8.1	-£0.3	£1.7
Evening peak (3 hours)	£2.7	-£0.1	£0.5

User benefits by time period – Revised A10 route option (£m)[81]

Time period	User time savings	User charges	Vehicle operating costs
Morning peak (3 hours)	£32.3	£0.5	£2.2
Inter-peak (6 hours)	£12.4	£0.2	£1.6
Evening peak (3 hours)	£17.4	£0.8	£2.1

User benefits by time period – Revised Eastern route option (£m)[82]

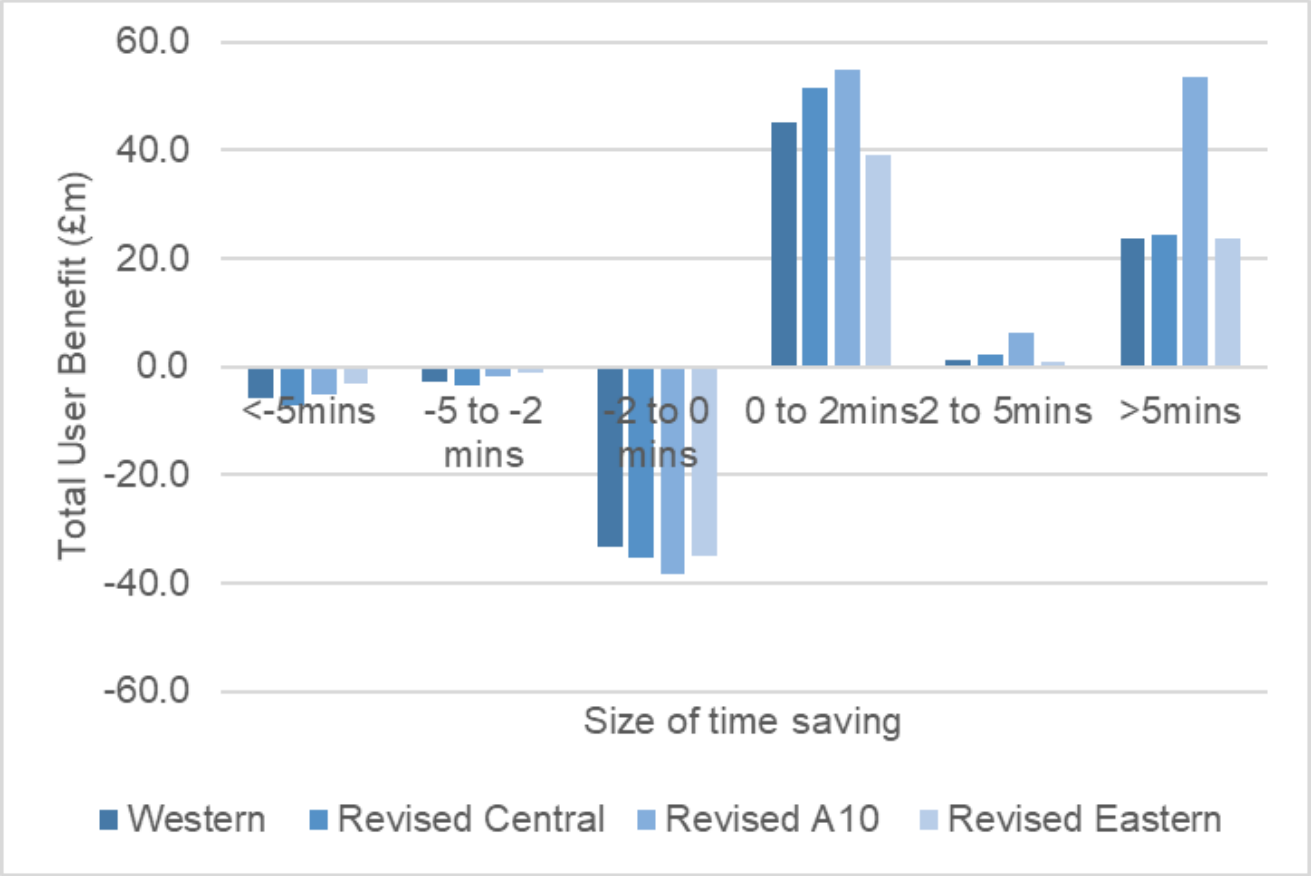
Time period	User time savings	User charges	Vehicle operating costs
Morning peak (3 hours)	£14.5	-£0.2	£1.0
Inter-peak (6 hours)	£7.6	-£0.1	£0.9
Evening peak (3 hours)	£0.6	-£0.2	£0.2

H.2. User benefits by time savings

The tables below set out the user benefits disaggregated by size of time saving. These figures are only the time savings and do not include vehicle operating costs and user charges, so the totals here differ from totals in other tables which include both elements. The figure below summarises the user benefits by size of time saving.

79 £m, 2010 values and prices. Source: TUBA Runs for T1001A compared to T1000D
80 £m, 2010 values and prices. Source: TUBA Runs for T1005 compared to T1000D
81 £m, 2010 values and prices. Source: TUBA Runs for T1004 compared to T1000D
82 £m, 2010 values and prices. Source: TUBA Runs for T1002 compared to T1000D

Summary of user benefit by size of time saving



User benefits by size of time saving – Western route option (m)[83]

Mode	<-5mins	-5 to -2 mins	-2 to 0 mins	0 to 2mins	2 to 5mins	>5mins
Road	£0.0	-£0.9	-£28.4	£41.5	£0.0	£0.0
Public transport	-£5.6	-£1.4	-£3.7	£2.9	£0.3	£11.9
Park and Ride	£0.0	-£0.2	-£0.9	£0.6	£0.5	£6.1
Active modes	£0.0	-£0.2	-£0.1	£0.1	£0.4	£5.7

User benefits by size of time saving – Revised Central route option (m)[84]

Mode	<-5mins	-5 to -2 mins	-2 to 0 mins	0 to 2mins	2 to 5mins	>5mins
Road	£0.0	-£2.0	-£31.1	£47.4	£0.0	£0.0
Public transport	-£5.7	-£1.4	-£3.6	£3.1	£0.3	£12.4
Park and Ride	-£1.5	-£0.2	-£0.7	£0.8	£1.3	£10.7
Active modes	£0.0	£0.0	£0.0	£0.3	£0.7	£1.4

[83] 2010 values and prices. Source: TUBA Runs for T1001A compared to T1000D

[84] 2010 values and prices. Source: TUBA Runs for T1005 compared to T1000D

User benefits by size of time saving – Revised A10 route option (m)[85]

Mode	<-5mins	-5 to -2 mins	-2 to 0 mins	0 to 2mins	2 to 5mins	>5mins
Road	£0.0	-£0.2	-£33.3	£48.6	£0.0	£0.0
Public transport	£5.0	-£1.4	-£4.2	£4.6	£0.9	£16.3
Park and Ride	-£0.1	-£0.1	-£0.7	£1.0	£1.7	£32.7
Active modes	£0.0	£0.0	£0.0	£0.9	£3.4	£4.4

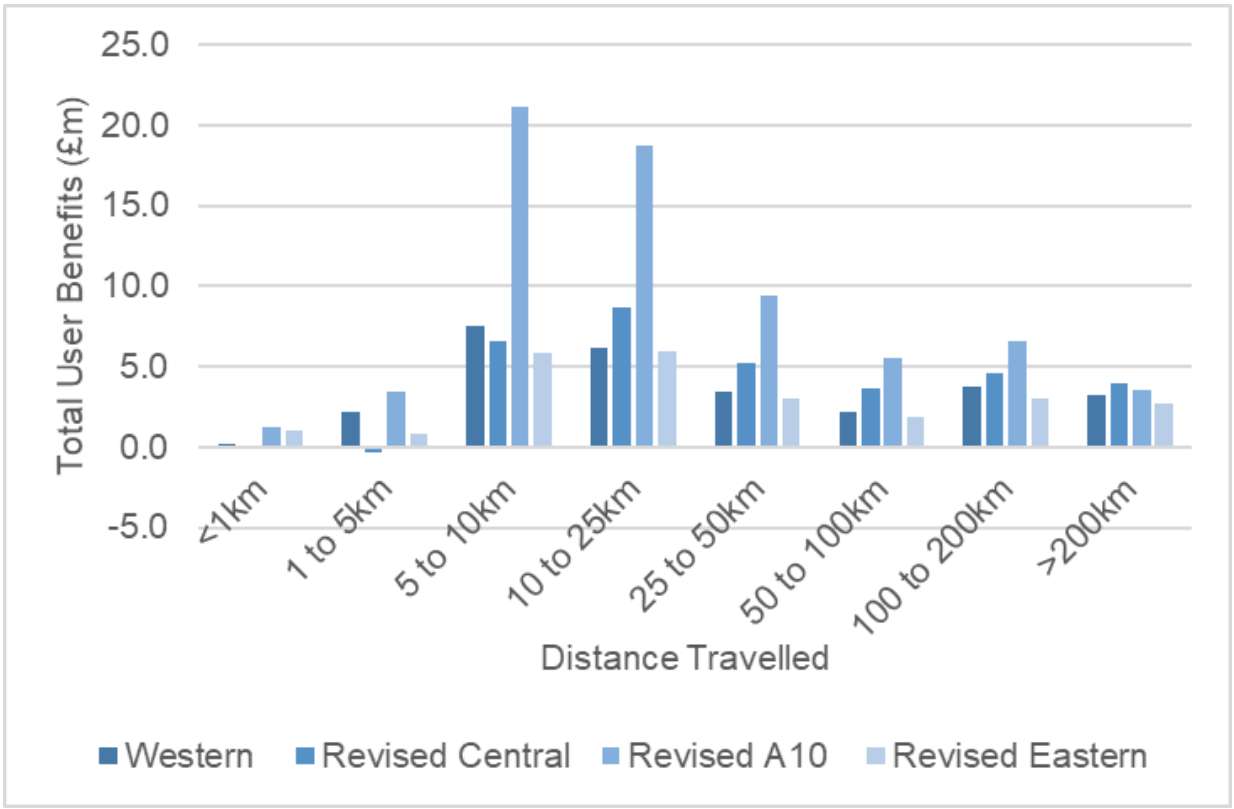
User benefits by size of time saving – Revised Eastern route option (m)[86]

Mode	<-5mins	-5 to -2 mins	-2 to 0 mins	0 to 2mins	2 to 5mins	>5mins
Road	£0.0	-£0.1	-£30.2	£35.3	£0.0	£0.0
Public transport	-£3.1	-£0.9	-£4.0	£2.9	£0.4	£9.5
Park and Ride	£0.0	-£0.3	-£0.9	£0.7	£0.2	£14.1
Active modes	£0.0	£0.0	£0.0	£0.2	£0.2	£0.3

H.3. User benefits by distanced travelled

The tables below summarise the user benefits disaggregated by distance travelled. The distances are grouped into bands as defined by TUBA. The main benefits for road users are driven by medium to long journeys in the range of 25km to 200km. Having said this the Revised A10 route option also experiences benefits from shorter journeys of 10km to 25km as well as longer journeys of more than 200km. The figure below summarises user benefits by distance travelled.

Summary of user benefits by distance travelled



[85] 2010 values and prices. Source: TUBA Runs for T1004 compared to T1000D

[86] 2010 values and prices. Source: TUBA Runs for T1002 compared to T1000D

User benefits by distance travelled – Western route option (m)[87]

Mode	<1km	1 to 5km	5 to 10km	10 to 25km	25 to 50km	50 to 100km	100 to 200km	>200km
Road	£0.1	£0.3	£1.0	£1.2	£1.9	£1.9	£3.1	£2.8
Public transport	£0.0	£0.6	£1.9	£2.0	-£0.3	-£0.1	£0.2	-£0.1
Park and Ride	£0.0	£0.1	£0.8	£2.1	£1.7	£0.4	£0.4	£0.5
Active modes	£0.0	£1.3	£3.8	£0.8	£0.0	£0.0	£0.0	£0.0

User benefits by distance travelled – Revised Central route option (m)[88]

Mode	<1km	1 to 5km	5 to 10km	10 to 25km	25 to 50km	50 to 100km	100 to 200km	>200km
Road	£0.1	-£0.1	£0.2	£1.9	£2.6	£2.6	£3.6	£3.5
Public transport	£0.0	£0.3	£2.7	£2.5	-£0.3	-£0.1	£0.2	£0.0
Park and Ride	£0.0	-£1.0	£2.1	£3.9	£2.9	£1.2	£0.8	£0.5
Active modes	£0.0	£0.4	£1.6	£0.4	£0.0	£0.0	£0.0	£0.0

User benefits by distance travelled – Revised A10 route option (m)[89]

Mode	<1km	1 to 5km	5 to 10km	10 to 25km	25 to 50km	50 to 100km	100 to 200km	>200km
Road	£0.2	£0.0	£0.8	£2.7	£2.9	£2.5	£3.0	£2.9
Public transport	£0.0	£0.3	£7.9	£2.6	-£1.2	£0.1	£1.6	-£0.1
Park and Ride	£0.9	£0.9	£7.3	£12.1	£7.6	£3.0	£2.0	£0.7
Active modes	£0.0	£2.3	£5.1	£1.3	£0.0	£0.0	£0.0	£0.0

User benefits by distance travelled – Revised Eastern route option (m)[90]

Mode	<1km	1 to 5km	5 to 10km	10 to 25km	25 to 50km	50 to 100km	100 to 200km	>200km
Road	£0.1	-£0.2	£0.3	-£0.9	£0.4	£1.1	£2.3	£2.2
Public transport	£0.0	£0.4	£3.0	£1.8	-£0.4	-£0.1	£0.1	£0.0
Park and Ride	£1.0	£0.3	£2.4	£5.0	£3.0	£0.9	£0.7	£0.6
Active modes	£0.0	£0.4	£0.2	£0.1	£0.0	£0.0	£0.0	£0.0

H.4. Transport Economic Efficiency (TEE) table

The following tables show the impacts on transport users and providers, also known as the economic efficiencies of the transport system.

87 2010 values and prices. Source: TUBA Runs for T1001A compared to T1000D
88 2010 values and prices. Source: TUBA Runs for T1005 compared to T1000D
89 2010 values and prices. Source: TUBA Runs for T1004 compared to T1000D
90 2010 values and prices. Source: TUBA Runs for T1002 compared to T1000D

Table 7-2 – TEE table – Western route option

Economic Efficiency of the Transport System (TEE)

Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	9392		3162		4896			1334
Vehicle operating costs	685		685					
User charges	-19		-3		-16			
During Construction & Maintenance	0							
COMMUTING	10058	*(1a)*	3844		4880	0		1334
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	13822		3434		5833			4555
Vehicle operating costs	952		952					
User charges	-1600		0		-1600			
During Construction & Maintenance	0							
NET NON-BUSINESS BENEFITS: OTHER	13174	*(1b)*	4386		4233	0	0	4555
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	4683		2405	1029	1247			2
Vehicle operating costs	560		577	-17				
User charges	44			0	44			
During Construction & Maintenance	0							
Subtotal	5287	*(2)*	2982	1012	1291	0	0	2
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	15892				15768			124
Operating costs	-13360				-13360			
Investment costs	-5031				-5031			
Grant/subsidy	0							
Subtotal	-2499	*(3)*			-2623	0	0	124
Other business impacts								
Developer contributions	0	*(4)*						
NET BUSINESS IMPACT	2788	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	26020	*(6) = (1a) + (1b) + (5)*						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

£m, 2010 values and prices.

Source: TUBA Runs for T1001A compared to T1000D

Table 7-3 - TEE table – Revised Central route option

Economic Efficiency of the Transport System (TEE)

Non-business: Commuting	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**		
Travel time	11713		4209	6972			532
Vehicle operating costs	1431		1431				
User charges	628		4	624			
During Construction & Maintenance	0						
COMMUTING	13772	*(1a)*	5644	7596	0		532
Non-business: Other	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**		
Travel time	12404		2721	7867			1816
Vehicle operating costs	1259		1259				
User charges	-1688		0	-1688			
During Construction & Maintenance	0						
NET NON-BUSINESS BENEFITS: OTHER	11975	*(1b)*	3980	6179	0	0	1816
Business							
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**
Travel time	5636		2589	1259	1788		
Vehicle operating costs	850		848	2			
User charges	150			0	150		
During Construction & Maintenance	0						
Subtotal	6636	*(2)*	3437	1261	1938	0	0
Private sector provider impacts						**Freight**	**Passengers**
Revenue	19417				19297		120
Operating costs	-13360				-13360		
Investment costs	-5031				-5031		
Grant/subsidy	0						
Subtotal	1026	*(3)*			906	0	0
Other business impacts							
Developer contributions	0	*(4)*					
NET BUSINESS IMPACT	7662	*(5) = (2) + (3) + (4)*					
TOTAL							
Present Value of Transport Economic Efficiency Benefits (TEE)	33409	*(6) = (1a) + (1b) + (5)*					

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

£m, 2010 values and prices.

Source: TUBA Runs for T1005 compared to T1000D

Table 7-4 - TEE table – Revised A10 route option

Economic Efficiency of the Transport System (TEE)

Non-business: Commuting	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**		
Travel time	33415		5407	25995			2013
Vehicle operating costs	3774		3774				
User charges	2077		21	2056			
During Construction & Maintenance	0						
COMMUTING	39266	*(1a)*	9202	28051	0		2013
Non-business: Other	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**		
Travel time	20999		801	13499			6699
Vehicle operating costs	1703		1703				
User charges	-1055		-11	-1044			
During Construction & Maintenance	0						
NET NON-BUSINESS BENEFITS: OTHER	21647	*(1b)*	2493	12455	0	0	6699
Business							
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	7640		1886	1031	4723			0
Vehicle operating costs	480		474	6				
User charges	456		0	-2	458			
During Construction & Maintenance	0							
Subtotal	8576	*(2)*	2360	1035	5181	0	0	0
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	29847				29696			151
Operating costs	-11278				-11278			
Investment costs	-4402				-4402			
Grant/subsidy	0							
Subtotal	14167	*(3)*			14016	0	0	151
Other business impacts								
Developer contributions	0	*(4)*						
NET BUSINESS IMPACT	22743	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	83656	*(6) = (1a) + (1b) + (5)*						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

£m, 2010 values and prices.

Source: TUBA Runs for T1004 compared to T1000D

Table 7-5 - TEE table – Revised Eastern route option

Economic Efficiency of the Transport System (TEE)

Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	11908		966		10785			157
Vehicle operating costs	1226		1226					
User charges	40		-3		43			
During Construction & Maintenance	0							
COMMUTING	13174	*(1a)*	2189		10828	0		157
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	6712		277		5902			533
Vehicle operating costs	476		476					
User charges	-653		-6		-647			
During Construction & Maintenance	0							
NET NON-BUSINESS BENEFITS: OTHER	6535	*(1b)*	747		5255	0	0	533
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	4114		1228	592	2294			0
Vehicle operating costs	333		329	4				
User charges	124		0	0	124			
During Construction & Maintenance	0							
Subtotal	4571	*(2)*	1557	596	2418	0	0	0
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	16717				16554			163
Operating costs	-9768				-9768			
Investment costs	-3773				-3773			
Grant/subsidy	0							
Subtotal	3175	*(3)*			3012	0	0	163
Other business impacts								
Developer contributions	0	*(4)*						
NET BUSINESS IMPACT	7746	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	27455	*(6) = (1a) + (1b) + (5)*						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

£m, 2010 values and prices.

Source: TUBA Runs for T1002 compared to T1000D

H.5. Public Accounts (PA) table

The following tables show a summary of how the scheme could impact on public accounts

Table 7-6 – Public Accounts table – Western route option

Public Accounts (PA) Table

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	0		0			0
Operating Costs	4963		4963			
Investment Costs	41504		41504			
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	46468	*(7)*	46468	0	0	0
Central Government Funding: Transport						
Revenue	0					
Operating costs	0					
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	0	*(8)*	0	0	0	0
Central Government Funding: Non-Transport						
Indirect Tax Revenues	4376	*(9)*	1822	2554		
TOTALS						
Broad Transport Budget	46468	*(10) = (7) + (8)*				
Wider Public Finances	4376	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

£m, 2010 values and prices.

Source: TUBA Runs for T1001A compared to T1000D

Table 7-7 - Public Accounts table – Revised Central route option

Public Accounts (PA) Table

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	0		0			0
Operating Costs	6911		6911			
Investment Costs	42463		42463			
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	49373	*(7)*	49373	0	0	0
Central Government Funding: Transport						
Revenue	0					
Operating costs	0					
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	0	*(8)*	0	0	0	0
Central Government Funding: Non-Transport						
Indirect Tax Revenues	5841	*(9)*	2763	3078		
TOTALS						
Broad Transport Budget	49373	*(10) = (7) + (8)*				
Wider Public Finances	5841	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

£m, 2010 values and prices.

Source: TUBA Runs for T1005 compared to T1000D

Table 7-8 - Public Accounts table – Revised A10 route option

Public Accounts (PA) Table

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	0					
Operating Costs	6890		6890			
Investment Costs	160680		160680			
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	167571	*(7)*			0	0
Central Government Funding: Transport						
Revenue	0					
Operating costs	0					
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	0	*(8)*			0	0
Central Government Funding: Non-Transport						
Indirect Tax Revenues	9560	*(9)*	4996	4564		0
TOTALS						
Broad Transport Budget	167571	*(10) = (7) + (8)*				
Wider Public Finances	9560	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

£m, 2010 values and prices.

Source: TUBA Runs for T1004 compared to T1000D

Table 7-9 - Public Accounts table – Revised Eastern route option

Public Accounts (PA) Table

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	0					
Operating Costs	4992		4992			
Investment Costs	36937		36937			
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	41929	*(7)*			0	0
Central Government Funding: Transport						
Revenue	0					
Operating costs	0					
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	0	*(8)*			0	0
Central Government Funding: Non-Transport						
Indirect Tax Revenues	4448	*(9)*	1878	2570		0
TOTALS						
Broad Transport Budget	41929	*(10) = (7) + (8)*				
Wider Public Finances	4448	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

£m, 2010 values and prices.

Source: TUBA Runs for T1002 compared to T1000D

H.6. Analysis of Monetised Cost and Benefits (AMCB) table

The following tables present the analysis of monetised costs and benefits for the four options.

Analysis of Monetised Cost and Benefits – Western route option

Analysis of Monetised Costs and Benefits

Noise	37	
Local Air Quality	75	*(13)*
Greenhouse Gases	887	*(14)*
Journey Quality	25538	*(15)*
Physical Activity	4148	*(16)*
Accidents	424	*(17)*
Economic Efficiency: Consumer Users (Commuting)	10058	*(1a)*
Economic Efficiency: Consumer Users (Other)	13174	*(1b)*
Economic Efficiency: Business Users and Providers	2788	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	-4376	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	52753	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	46468	*(10)*
Present Value of Costs (see notes) (PVC)	46468	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	6285	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.135	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

£m, 2010 values and prices.

Source: TUBA Runs for T1001A compared to T1000D

Analysis of Monetised Cost and Benefits – Revised Central route option

Analysis of Monetised Costs and Benefits

Noise	59	*(12)*
Local Air Quality	71	*(13)*
Greenhouse Gases	1356	*(14)*
Journey Quality	25090	*(15)*
Physical Activity	1478	*(16)*
Accidents	378	*(17)*
Economic Efficiency: Consumer Users (Commuting)	13772	*(1a)*
Economic Efficiency: Consumer Users (Other)	11975	*(1b)*
Economic Efficiency: Business Users and Providers	7662	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	-5841	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	55999	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	49373	*(10)*
Present Value of Costs (see notes) (PVC)	49373	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	6626	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.134	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

£m, 2010 values and prices.

Source: TUBA Runs for T1005 compared to T1000D

Analysis of Monetised Cost and Benefits – Revised A10 route option

Analysis of Monetised Costs and Benefits

Noise	19	*(12)*
Local Air Quality	43	*(13)*
Greenhouse Gases	2326	*(14)*
Journey Quality	18951	*(15)*
Physical Activity	7983	*(16)*
Accidents	250	*(17)*
Economic Efficiency: Consumer Users (Commuting)	39266	*(1a)*
Economic Efficiency: Consumer Users (Other)	21647	*(1b)*
Economic Efficiency: Business Users and Providers	22743	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	-9560	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	103669	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	167571	*(10)*
Present Value of Costs (see notes) (PVC)	167571	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	-63902	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	0.619	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

£m, 2010 values and prices.

Source: TUBA Runs for T1004 compared to T1000D

Analysis of Monetised Cost and Benefits – Revised Eastern route option

Analysis of Monetised Costs and Benefits

Noise	16	*(12)*
Local Air Quality	10	*(13)*
Greenhouse Gases	887	*(14)*
Journey Quality	0	*(15)*
Physical Activity	-288	*(16)*
Accidents	64	*(17)*
Economic Efficiency: Consumer Users (Commuting)	13174	*(1a)*
Economic Efficiency: Consumer Users (Other)	6535	*(1b)*
Economic Efficiency: Business Users and Providers	7746	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	-4448	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	23697	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	41929	*(10)*
Present Value of Costs (see notes) (PVC)	41929	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	-18231	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	0.565	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

£m, 2010 values and prices.

Source: TUBA Runs for T1002 compared to T1000D

Appendix I. Communications plan

Audience	Communication Aims	Channels and Approach	Owner
Manage Closely			
Executive Board	Detailed understanding and shared support for programme aims; detailed understanding of programme elements to reach consensus, ensure co-ordinated approach Advocacy	Executive Board meetings: at least four per year Informal Board briefings: monthly Board/Joint Assembly workshops: bi-monthly Officer meetings and briefings Visits: issue/project-specific Officer reports: meeting cycle Internal e-mail update: weekly	CEO, Transport Director, GCP Core Team, Project Team Leader
Joint Assembly	Understanding and shared support for programme aims Clear on group/individual roles and responsibilities Shared information Advocacy programme/elements	Joint Assembly meetings: at least four per year Executive Board meetings Meeting papers Informal Board/Joint Assembly workshops: bi-monthly Officer briefings, meetings, visits: issue/project specific Regular Programme Director meetings and briefings Weekly e-mail update	CEO, Transport Director GCP Core Team, Project Team Leader
Parish Councils	Understanding and support for wider programme Acceptance/support for project; group/individual roles responsibilities Benefit/impact on constituencies Act as two-way conduit for GCP vision and public sentiment Participation in consultation	South Cambs Parish Council Forum: annual South Cambs parish e-bulletin: monthly Information pack circulated for consultations Officer briefing at start of consultations Attendance at Parish Council meetings as required	Transport Director, Team Leader, Project Manager
Bus Operators	Awareness and understanding of GCP wider aim Their contribution to a functioning and competitive transport network for Greater Cambridge Risks/opportunities for service delivery – short, medium and long-term Shared information Public support for improved travel and services in GCP initiatives	Planned meetings/calls: at least bi-monthly Workshop attendance Reports and papers Executive Board /Joint Assembly meetings	Transport Director, Team Leader, Project Manager
Combined Authority	Public support for improved travel and services in Greater Cambridge Partnership initiatives	CEO and Transport Director meeting	CEO, Transport Director

Audience	Communication Aims	Channels and Approach	Owner
Councillors (local)	Understanding and support for wider programme Acceptance/support for project Group/individual role responsibilities Benefit/impact on constituencies Act as two-way conduit for GCP vision and public sentiment	Full Council/Executive Committee reports Annual all member GCP briefing – City/South Cambs possible by an annual conference Campaign/project specific member briefings Reports/collateral Intranet/website GCP email updates Executive Board /Joint Assembly meetings	Joint Assembly Project Team Leader
Councillors (wider)	Awareness and understanding of GCP wider aim Act as two-way conduit for GCP vision and public sentiment	Full Council/Executive Committee reports Annual all member GCP briefing – City/South Cambs possible by an annual conference Campaign/project specific member briefings Reports/collateral Intranet/website GCP email updates Executive Board /Joint Assembly meetings	Project Manager, Communications Manager
GCP Partners	Awareness and understanding of GCP wider aim Act as two-way conduit for GCP vision and public sentiment.	Full Council/Executive Committee reports Annual all member GCP briefing – City/South Cambs possible by an annual conference Campaign/project specific member briefings Reports/collateral Intranet/website GCP email updates Executive Board /Joint Assembly meetings	Project Manager, Communications Manager
GCP Staff	Detailed understanding, support and advocacy of wider programme and partnership Information to effectively carry out role/support successful programme delivery Awareness and management of programme issues/risks	Fortnightly team meetings Programme board meetings One-to-one manager meetings Induction, training and appraisal Away days/visits Weekly emails GCP Manager meetings GCP Transport Board GCP full team briefing Executive Board / Joint Assembly meetings	CEO, Transport Director, Project Manager, Communications Manager

Audience	Communication Aims	Channels and Approach	Owner
Highways England	Detailed understanding and shared support for programme aims	Specific meetings as required	Transport Director, Project Team Leader, Project Manager
Landowners	Awareness and understanding of GCP wider aims Detailed understanding of the project Engagement in consultation	Specific meetings as required	Project Team Leader; Project Manager
'Place based' Engagement	Awareness and understanding of wider GCP aims Detailed understanding of the project Engagement in consultation	'Place based' engagement even during consultation Information pack circulated for consultations	Transport Director, Project Team Leader, Project Manager
Media	Awareness and understanding of wider GCP aims Detailed understanding of the project Amplifying GCP key messages and facilitating public understanding, engagement and feedback Acting as a credible third party information source Collaborative opportunities and advertising	Regular meetings / calls with key journalists Press releases, interview / photo opportunities and media launches Media briefings Board / Assembly meetings Community Meetings	Board members Communications Manager Communications Team / Officers Communications Group
Residents Associations	Awareness and understanding of wider GCP aims Detailed understanding of the project	'Place based' engagement even during consultation Information pack circulated for consultations GCP email updates	Project Manager, Community Engagement Manager Communications Manager

Audience	Communication Aims	Channels and Approach	Owner
Technical Consultants	Understanding of wider programme aims Their contribution to successful delivery Programme, deadline and reporting requirements Understanding, identifying and reporting key risks and issues Effectively representing City Deal values to stakeholders	Procurement documentation and contracts Government Frameworks – TAG City Deal fact-file / information pack Project Initiation Documents Project meetings Website Executive Board / Joint Assembly meetings	CEO, Transport Director, Project Manager
		Keep Satisfied	
Business Organisations	Awareness / Support for wider GCP aim of sustainable economic growth and quality of life Long-term effect on business sustainability and growth in Waterbeach, Cambridge and Greater Cambridge area Benefit / impact on recruitment, retention, housing and quality of life Impact / opportunities customers/clients/service users Benefit / impact on distribution channels Opportunities for sponsorship / partnership Key GCP business contacts/conduits Project-specific detailed information as required	Joint Assembly participation Geographically targeted business briefings/events during consultation GCP briefing – direct or within exiting meeting cycle – at least annually Website, social media Local business and trade media Executive Board / Joint Assembly meetings	GCP Core Team; Project Manager, Communications Manager
Environmental Groups	Awareness and understanding of wider GCP programme Engagement, advice and support for planning and transport projects Engagement in consultations	Planned calls/meetings – at least biannual Shared documents Executive Board / Joint Assembly Meetings Consultation engagement information packs Project Manager meetings	Project Manager, Communications Manager

Audience	Communication Aims	Channels and Approach	Owner
MPs	Understanding and support for wider programme aims GCP narrative, key facts, figures and progress Advocates for sustainable economic growth in Greater Cambridge Awareness, understanding and support for discrete workstreams, benefits/impact on constituents Local/Government champions of discrete projects/innovations, alignment and interdependency with local, regional, national initiatives Policy requirements Key GCP contacts and narrative	Greater Cambridge MPs briefings In person/telephone briefings – Issue/project specific Conferences Community forums Site visits Research/policy publications Media events/releases Local, national, trade media Website/social media Executive Board /Joint Assembly meetings	Board members City Deal core team
Planning	Awareness of GCP programme Access to relevant information Advice and engagement on consultations	Executive Board / Joint Assembly meetings Project Board Project Team liaison GCP email updates	CEO, Transport Director, Strategic Communications Manager, Team Leader, Project Manager, Communications Manager
	Keep Informed		
Cambridge Medical Community	Awareness of wider GCP aim of sustainable economic growth and quality of life Awareness of GCP programme; access to relevant information; advice and engagement on consultations	Cambridge Biomedical Campus and Papworth Briefings as part of consultation Mention in the CBC weekly communications update	CEO, Transport Director, Project Manager, Community Engagement Manager Communications Manager
Cambridge North Businesses	Awareness of wider GCP aim of sustainable economic growth and quality of life Awareness of GCP programme; access to relevant information; advice and engagement on consultations	CEO, Transport Director, CNW Development Director, Head of Infrastructure based at WC site	CEO Transport Director, Team Leader Project Manager
Commuters	Awareness of wider GCP aim of sustainable economic growth and quality of life Detailed understanding of project Engagement in consultation	Media, social media, Parish Councils and Residents' Associations, consultation events, correspondence	Project Manager, Communications Manager

Audience	Communication Aims	Channels and Approach	Owner
Local Businesses	Awareness of wider GCP aim of sustainable economic growth and quality of life Long-term effect on bottom line/ business sustainability and growth Benefit/impact on employees – recruitment, retention, housing and quality of life Impact/opportunities for customers/clients/service users Benefit/impact on distribution channels How to get involved and influence decision-making for business benefits Key business contacts/conduits Project-specific detailed information as required Gain their views/input on growth/project plans	CEOs Business Networks Business consultation events Industry events Regular newsletter - LEP Joint Assembly participation Website, social media Local, business and trade media Executive Board /Joint Assembly meetings	Programme Board, Project Manager, Communications Manager
Local Campaign Groups	Awareness and understanding of GCP wider aims. Detailed understanding of project. Engagement in consultation	Project Manager and Communications Manger meetings 'Place based' Engagement event during consultation Engagement events GCP email updates	Transport Director, Project Manager, Communications Manager
Local Residents	Awareness, understanding and acceptance/support for sustainable economic growth in Greater Cambridge Awareness and understanding of the wider benefits of the GCP programme Feel positive to be part of a globally successful city region Knowledge of how to get involved and where to find information Scheme-specific information as it benefits/impacts on them	Residents'/community groups and Parish Forum and Councils Regular residents' newsletters Website and social media GCP e-bulletin (monthly) Community event or webchat (at least monthly) Board/Assembly meetings – at least 9 p/year Consultations/surveys – issue/project-specific Community workshops, Local Liaison Forum Focus groups – direct or via third party organisations and/or group – project specific E.g. SCDC Youth Council; Independent Advisory Groups Local, regional media Paid-for advertising NGOs/membership Collaborative community initiatives	Board/Assembly members GCP core team Communications managers Project managers/ Communications Officers

Audience	Communication Aims	Channels and Approach	Owner
Park and Ride	Awareness and understanding of GCP wider aims. Detailed understanding of project Engagement in consultation	Project manager meetings with Park and Ride Service Manager	Project Manager
Partner Communications Teams	Detailed understanding and shared support for programme aims; detailed understanding of programme, ensure co-ordinated approach Advocacy Detailed understanding of project Facilitation of consultation through channels	Community Engagement Manager/Communications Manager meetings, emails with South Cambridgeshire Communications Manager and City Communications Manager	Community Engagement Manager, Communications Manager
Transport User Groups	Awareness and understanding of GCP wider aims. Detailed understanding of project Facilitation of consultation through channels to user group members Engagement in consultation	Project Manager meetings Focus group during consultation Consultation public events GCP email updates	Project Manager, Communications Manager
	Monitor		
Emergency Services	Awareness and understanding of broader GCP programme Benefit/impact on services, staff and service users of GCP schemes Dissemination of GCP to staff Engagement and advice in consultations	Planned calls/meetings – at least annually Consultation events Executive Board /Joint Assembly meetings	GCP core team Transport Director
Nearby Councils	Awareness and understanding of broader GCP programme Benefit/impact on services, staff and service users of GCP schemes	Executive Board /Joint Assembly meetings Project Manager meetings	Transport Director
New development potential residents	Overall purpose and benefits of GCP investment for them Scheme information, timings, impacts How they can get involved/have their say on proposals and scheme development	Media Social media Via developer updates and promotions Consultation public events	Project Manager, Communications Manager

Audience	Communication Aims	Channels and Approach	Owner
Schools	Overall purpose and benefits of GCP investment for them Scheme information, timings, impacts How they can get involved/have their say on proposals and scheme development	Information via school/college email Parentmail Cambridge sixth form colleges leaflet distribution Media Focus group during consultation	Project Manager, Communications Manager
Youth Groups	Overall purpose and benefits of City Deal investment for them Scheme information, timings, impacts How they can get involved/have their say on proposals and scheme development	Focus group during consultation Information via group organisers	Project Manager, Community Engagement Manager, Communications Manager
City of Ely Council	Overall purpose and benefits of GCP investment for South Cambs/parishes Understanding/acceptance/ support for schemes impacting on local community Scheme information, timings, impacts How to get involved/have their say on proposals and scheme development	GCP e-bulletin – monthly 'Place based' Engagement event during consultation Stakeholder e-news – project specific Events – Consultations, site visits, media calls Local media Website, social media Geographically-targeted briefings, webchats – Quarterly Executive Board /Joint Assembly meetings	

Appendix J. Risk register

Project Risk Ref No.	Project Risk Category	Project Stage	Project Risk Description	Risk Mitigation Measures	Residual Risk Rating			Risk Mitigation Owner
					Likelihood	Impact	Score	
1	City Deal Governance	KD 1-3	There is a risk that the shortlisted options will not be considered politically acceptable	Regular engagement will take place with Members and GCP Executive Board / Assembly	2	2	4	GCP PM
2	External Stakeholders	KD 1-3	There is a risk that the shortlisted options will not be supported by the public	Regular engagement will take place with local residents through both formal and informal consultation. Ensure that local residents receive detailed information about the scheme which covers the benefits and mitigation measures. Ensuring that early public engagement takes place to get buy-in from the public for the principle of enhanced public transport route. The first round of public engagement will give very broad outline for potential routes that new public transport links to give the public a broad steer regarding the proposed options. Consultation will take place to allow the public to submit their views on the scheme and public comments will	3	3	9	GCP PM
3	CCC Resources	KD 1-2	There are insuffient resources to deliver the work	Engagement by senior officers in programme and delivery	2	2	4	GCP PM
4	Statutory Process	KD 2-4	Opponents to the scheme challenge it on procedural grounds and secure a judicial review of the scheme	Ensure that all statutory processes and legal requirements are followed to ensure that there is no scope for judicial review	3	4	12	GCP PM
5	Consultation/Comms	KD 2-4	Local media adopt a negative stance towards the scheme and runs stories that challenge its credibility	The communications strategy aim to ensure that local media coverage is balanced or positive and key messages get out	4	2	8	GCP PM
6	Consultation/Comms	KD 2-4	Responses to the consultation are largely negative and the scheme lacks support among public and private sector organisations	The communications strategy aim to ensure that public and all stakeholders have access to information about the benefits of the scheme from an early stage. Ensure that consultation is effective in terms of scope and reach	3	3	9	GCP PM
7	Statutory Process	KD 2-4	Failure to appropriately consider obtain planning consent / appropriate consents	Follow best practice and observe all statutory procedures in preparing any planning consent applications, allocate adequate time and devote sufficient resources to preparation	2	4	8	GCP PM
8	Scheme Development	KD 2-4	Shortlisted and preferred options found to be unaffordable	The preferred and shortlisted options will be rigorously assessed and costed along with a robust business case.	3	3	9	Service Provider
9	Scheme Development	KD 2-4	Outturn costs are greater than expected	Cost estimates will be rigourously calculated along with a robust business case	3	3	9	Service Provider
11	CCC Resources	KD 2-4	The business case for the scheme will be found to be unviable	Follow best practice and observe all statutory procedures in preparing the business case and devote sufficient resources to preparing the case.	2	5	10	GCP PM
12	Scheme Development	KD 2-4	Environmental issues prevent the preferred scheme from proceeding	An environmental assessment will be undertaken to identify any environmental issues. Environmental mitigation measures will be programmed to limit or avoid environmental harm. Once basic preferred option has been established, further detailed assessments are conducted.	3	4	12	Supply Chain other
13	Project Funding	KD 2-4	The scheme fails to secure sufficient funding or that the funding available is unsufficient	Maintain good relationships with funding bodies and submit detailed and rigourous funding bids. Adequate resources will be devolted to maintaining funding bids. Continue to ensure that the City Deal funding is still available throughout project. Ensure S106 funds are available for this project.	2	4	8	GCP PM
14	Scheme Development	KD 2-4	Costs of utilities alterations or diversions exceeds the budget allocation	Scutinise the utility allowance and make sure they are sensible. Conduct a thorough survey of utilities on the route and consult with any utilities companies	2	4	8	Supply Chain other
15	Scheme Development	KD 2-4	Topographical or other surveys highlight significant issues	Conduct preliminary or desktop surveys to ensure that no major unforeseen issues emerge when the full survey is undertaken. Topographical surveys will be undertaken initially with other surveys as appropriate as the scheme progresses.	3	3	9	Service Provider

16	External Stakeholders	KD 2-4	Failure to secure third party land for the project	If possible, align schemes within County land. Identify and begin negotiations with third party landowners at the earliest possible opportunity in order to agree a purchase. If necessary, and as a last resort, the promotors will remind third party land owners of their intention the use CPO powers to secure the land required.	3	3	9	Supply Chain other
17	External Stakeholders	KD 2-4	Interface issues with Third Parties (e.g. developers) cause programme delay and/or increased costs	The communications strategy will also include third parties with appropriate engagement stratgies developed. Appoint a property consultant to negotiate with developers	3	3	9	Supply Chain other
18	Project Management	KD 2-4	Interface issues with other GCP / CPCA schemes cause programme delay and/or increased costs	High level programme management will manage out conflicts	2	4	8	Programme Board
19	Scheme Development	KD 2-4	The options presented contradict the requirements of the Local Plans. Uncertainties in Local Plan cause difficulties in project planning.	Ensure that the schemes are consisent with the latest Local Plans as well as ensuring that appropriate development links are considered.	4	2	8	GCP PM
20	Scheme Development	KD 2-4	Modelling work undertaken through to outline business case is not appropriate	Develop modelling strategy for the project that sets out a specification required and methodology to be used. Regularly engage with CCC Modelling lead on CSRM and ensure that the consultants are maintaining agreed standards and controls on any modelling work.	2	4	8	Service Provider
21	Project Funding	KD 3-4	Delivery Options through to construction and operations are not properly considered	Develop an appropriate delivery programme aligning with a procurement strategy for the work. This will be consistent with other emerging GCP schemes whilst considering existing delivery frameworks.	2	2	4	GCP PM
22	External Stakeholders	KD 2-4	It proves not possible to reach an agreement with Cambridge Science Park / Urban + Civic / RLW over bus access	Maintain regular contact with stakeholders / land owners and reach a clarity of understanding in terms of what they need for their development, and what the project team need to provide a good transport link.	3	3	9	GCP PM
23	Scheme Development	KD 2-4	Cost and difficulty of providing a route under or over the A14 near Milton Interchange is prohibative or causes significant delay	Examine early to establish need for alternative options	3	4	12	Supply Chain other
24	Scheme Development	KD 3-5	Unable to secure agreement with bus operators to service new routes and / or park and ride	Early engagement with bus companies	2	3	6	GCP PM
25	Project Funding	KD 2-4	There is insufficient time in the programme to produce a robust business case	Ensure adequate time is allocated in the programme for preparation of the business case, and data requirements are flagged up early to ensure that all data required is available.	1	2	2	GCP PM
26	Statutory Process	KD 3-4	There is insufficient time in the programme to obtain planning consents	Early discussions with Planning Authority to understand key issues and evidence base required.	2	2	4	GCP PM
27	Statutory Process	KD 3-5	Statutory process stalls due to legal and issues with use of TWA/DCO	Continuous dialogue with DfT. Discussion with programme leads in relation with the earlier projects taking place.	3	3	9	GCP PM
28	Scheme Development	KD 3-5	Project is predicated on immature technology which takes time/cost to develop	Review state of the art technology areas, and establish maturity at early stage. Avoid relying on emerging technologies unless risk can be managed. Design transitway to accommodate 'traditional vehicles' as well as future technologies.	3	3	9	GCP PM
29	Supply Chain	KD 3-5	Supply chain is overstretched and fails to meet quality/time/costs targets	Effective management and a pro-active approach	2	2	4	GCP PM
30	Scheme Development	KD 2-5	Combined Authority does not support proposals and further options work is required	Work closely with the Combined Authority. Design project around supporting CAM sub-strategy. Assess project against CAM sub-strategy objectives.	3	3	9	Executive Board
31	Scheme Development	KD 2-5	Ongoing work on the dualling of the A10 within the Study area to improve access to Cambridge for vehciles erodes the likely benefits of any public transport scheme on the corridor	The Business Case needs to set out how Public Transport still needs to be improved even with the A10 dualling, therefore our proposed interventions are required.	3	3	9	Executive Board
32	Project Management	KD 2-3	Delay in defining the do-minimum	To be defined and agreed at AMR stage	2	4	8	GCP PM
33	Scheme Development	KD 4-5	Coronavirus changes the publics view on the usage of Public Transport and political aspirations.	To monitor the progress of the recovery post Covid-19 linking to work with GCP that will undertake on a programme wide basis.	2	3	6	GCP PM

Sam Appleton
Atkins Limited
5 Wellbrook Court
Girton Road
Cambridge
CB3 0NA

Tel: +44 (0)1223 276002