



**CAMBRIDGESHIRE
& PETERBOROUGH**
COMBINED AUTHORITY

Cambridgeshire & Peterborough Combined Authority
Pathfinder House
St Marys Street, Huntingdon
PE29 3TN

23rd September 2025

[REDACTED]

[REDACTED]

Dear [REDACTED]

Re: Freedom of Information request ref CA462

Thank you for your request for information which was received on 15th September 2025.

Request

I am writing to make a Freedom of Information request for the Cambridge Area Metro Strategic Outline Business Case, as well as any other documents you have relating to the Cambridge Area Metro proposal. I know that an SOBC for this proposal was published in 2019 (it's discussed in many online sources, i.e. this one [Cambridge has 'compelling' business case for £4bn metro - The Transport Network](#)) but I can't find the document itself anywhere online.

Please could you send me a digital copy of the SOBC for the Cambridge Area Metro proposal as well as any other documents relating to it? Thanks.

Response

The following digital copies as requested are enclosed below:

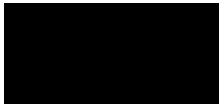
1. Combined Authority Board 27 March 2018 - Agenda Item No 4.2
2. Combined Authority Board 31 October 2018 - Agenda Item No 2.4
3. Combined Authority Board 29 January 2020 - Agenda Item No 4.3
4. Transport & Infrastructure Committee 4 November 2020 - Agenda Item No 2.2
5. Transport & Infrastructure Committee 20 October 2020 - Agenda Item No 2.2

I hope this information is helpful but if you are unhappy with the service you have received in relation to your request and wish to make a complaint or request a review, you should write to us via our contact us email address: democratic.services@cambridgeshirepeterborough-ca.gov.uk or write a letter to Complaints, Cambridgeshire and Peterborough Combined Authority, 2nd Floor, Pathfinder House, St Mary's Street, Huntingdon, Cambs PE29 3TN within 40 days of the date of this letter.

If you are not content with the outcome of the internal review, you have the right to apply directly to the Information Commissioner for a decision. The Information Commissioner can be contacted via their complaints portal [FOI and EIR complaints | ICO](#) or writing to the Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF

Generally, the ICO will not undertake a review or make a decision on a request until the internal review process has been completed.

Yours sincerely



Sophie Purvis
Data Protection and Information Governance Assistant



**CAMBRIDGESHIRE
& PETERBOROUGH**
COMBINED AUTHORITY

| | |
|---|--|
| CAMBRIDGESHIRE AND PETERBOROUGH COMBINED AUTHORITY BOARD | AGENDA ITEM No: 4.2 |
| 27 MARCH 2018 | PUBLIC REPORT <i>(Appendix 2 to this report is exempt from publication under Paragraph 3 of Part 1 of Schedule 12A of the Local Government Act 1972, as amended, in that it would not be in the public interest for this information to be disclosed: information relating to the financial or business affairs of any particular person (including the authority holding that information))</i> |

CAMBRIDGE AUTONOMOUS METRO UPDATE

1.0 PURPOSE

- 1.1. The Cambridgeshire and Peterborough Combined Authority Order 2017 transferred the local transport planning powers to the Combined Authority and created the Cambridgeshire and Peterborough Combined Authority as the local transport authority for the area.
- 1.2. The Cambridgeshire Autonomous Metro (CAM) is one of twelve priority projects identified by the Combined Authority, most recently through the Growth Ambition Statement (adopted November 2018) and Business Plan (adopted January 2019) which describes our overall approach to making Cambridgeshire and Peterborough the leading place in the world to live, learn and work.
- 1.3. The Combined Authority at its meeting in January 2018 approved £600,000 to develop a Strategic Outline Business Case (SOBC) and an Options Appraisal Report for the CAM.
- 1.4. This report provides the very positive findings from the SOBC and recommends to the Board that approval is given to move into the next stage of the project that will require concurrent work covering four areas:
 - (a) production of the Outline Business Case
 - (b) development of a funding solution
 - (c) integration and coordination with the strategic spatial strategy
 - (d) stakeholder engagement and communication

| <u>DECISION REQUIRED</u> | |
|--|---|
| Lead Member: | James Palmer, Mayor |
| Lead Officer: | Chris Twigg, Transport Director |
| Forward Plan Ref: 2019/002 | Key Decision: Yes |
| <p>The Combined Authority Board is recommended to:</p> <ol style="list-style-type: none"> 1. Note that the CAM SOBC has been founded upon CPIER growth scenarios as set out in section 2.6 to 2.9. 2. Note the strong strategic and economic case made in the SOBC for the CAM and that this case has been made drawing upon only 50% of the total potential economic growth in the CPIER report. 3. Note the links between the timeline of the CAM outline business case and the Non-Statutory Spatial Plan. 4. Agree that the funding solution for the CAM will be drawn from blend of sources as set out in section 3.9. 5. Agree to release £1m of funding from the 2019/20 budget for the procurement and development of the Outline Business Case, the accompanying technical packages (including funding) and programme of stakeholder engagement. 6. Agree to delegate authority to the Chief Executive, in consultation with the Chair of the Transport and Infrastructure Committee, to enter into the contractual relationships following the procurement of the external consultants required to undertake the Outline Business Case and accompanying technical packages | <p>Voting arrangements</p> <p>All members are required to be present for this item.</p> <p>Two thirds of the constituent council members must vote in favour to include Cambridgeshire County Council and Peterborough City Council.</p> |

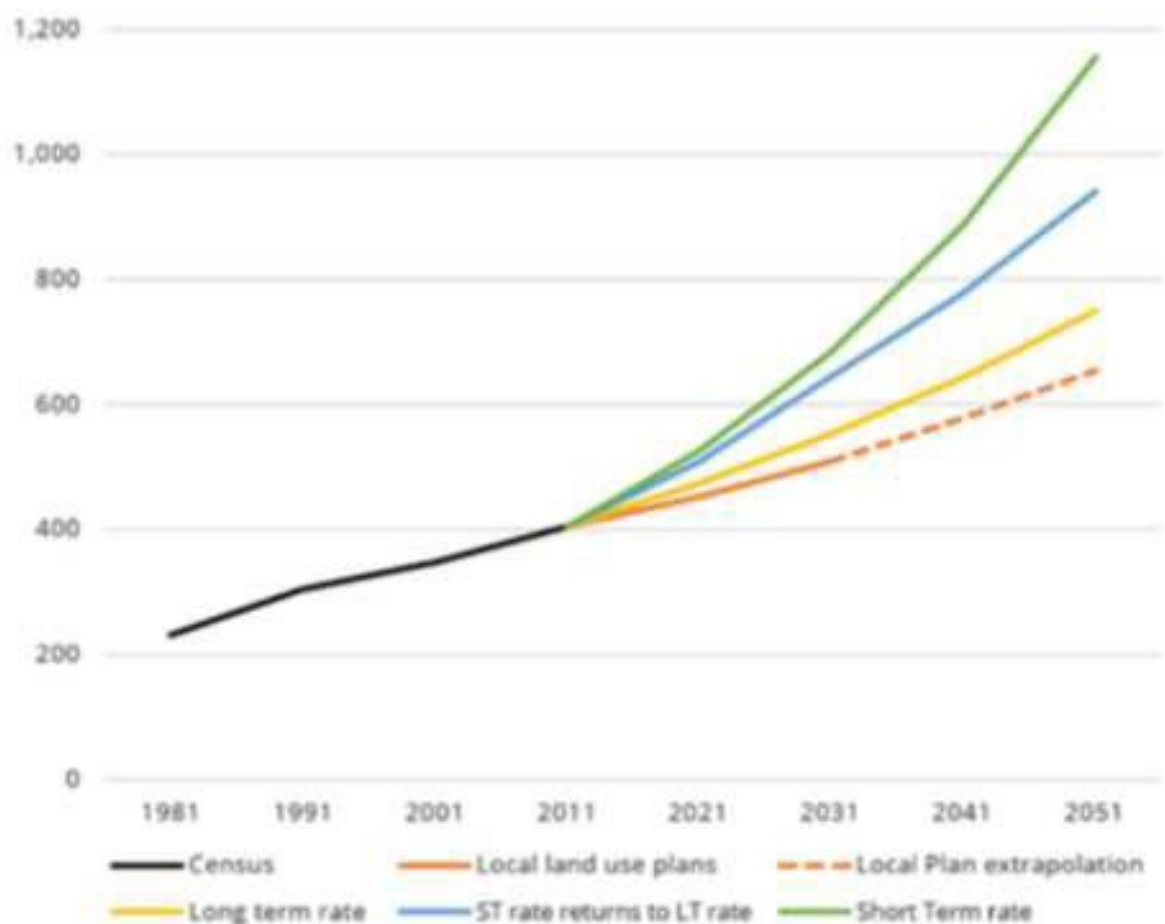
2.0 BACKGROUND AND CONTEXT

- 2.1 At the October 2018 meeting of the Combined Authority Board it agreed unanimously to adopt the Cambridgeshire and Peterborough Independent Economic Review (CPIER) main recommendations and the Growth Ambition Statement.
- 2.2 Recommendation seven of the CPIER states that a package of transport & other infrastructure projects to alleviate the growing pains of Greater Cambridge should be considered the single most important infrastructure priority facing the Cambridgeshire and Peterborough Combined Authority (CPCA) in the short-medium term.
- 2.3 The growth ambition statement goes on to emphasise the importance of the Cambridgeshire Autonomous Metro in contributing to this recommendation (items 18-22) through joining transport and spatial planning to ensure that jobs and homes are linked.
- 2.4 At the January meeting of the Combined Authority Board, the CA further reinforced its commitment to the CAM by identifying it as a priority project within the Medium-Term Financial Plan and Business Plan and allocated £1m of revenue funding for 2019/20.
- 2.5 At the February meeting of the Combined Authority Board, the CA agreed a programme and approach for the production of phase 2 of the strategic spatial framework. The strategic spatial framework is due to be finalised by October 2019 and will underpin the growth assumptions of the next stage of work on the CAM.

Cambridgeshire and Peterborough Independent Economic Review (CPIER)

- 2.6 The CPIER identified Cambridgeshire and Peterborough's housing crisis as a major constraint on the region's ability to fulfil its economic potential. Since 2012, employment has grown by over 15%, whilst housing stock has grown by under 5%, reflected in ever-increasing house prices and housing unaffordability. House prices are now more than 13 times average earnings in Cambridge and over 11 times in South Cambridgeshire, compared to the UK average of 7.
- 2.7 The 'Cambridge Futures' study, widely cited in the CPIER report, modelled the economic impact that this increase in prices will have should current trends continue. This study found that the increased cost of living, driven through higher housing costs, could cause employment growth to slow beyond 2021 and decline beyond 2031.
- 2.8 Accelerating the supply of housing that is affordable to people on average and lower incomes is therefore critical to supporting the level of employment growth consistent with the 'Devolution Deal' ambition and the CPIER 'central case' projection (shown as the blue line in **figure 1** overleaf).

- 2.9 Alongside the ‘central’ employment projection, CPIER also set out an employment growth scenario based on ‘Local Plan extrapolation’, where constraints on growth prevent the region’s potential from being realised, shown as the orange dashed line in **figure 1** below. This ‘business as usual’ scenario indicates employment increasing to around 650,000 by 2051, compared to over 900,000 in the ‘central’ scenario – a difference of over 250,000 jobs by 2051 at the Combined Authority level.
- 2.10 CPIER asserts that many firms take a ‘Cambridge or Overseas’ approach when considering where to locate. If Cambridge became a less attractive location, then businesses are more likely to locate abroad than to other locations within the UK. Survey evidence from the CPIER report indicates that significantly more businesses indicated that they would move abroad (44.2%) than elsewhere in the UK (25.0%).
- 2.11 This highlights the ‘net additionality’ of Greater Cambridge to national economic output. Many jobs of the additional jobs would be ‘net additional’ to the UK economy, rather than simply displaced from elsewhere. This underlines the importance of Cambridge as a national asset – where Cambridge succeeds, the UK succeeds. The potential of CAM to deliver the additional jobs and homes is central to the Strategic and Economic Cases for the project.



Source: Dr Ying Jin, University of Cambridge, reproduced from CPIER page 20

Figure 1 - CPIER growth projections

- 2.12 Transport infrastructure is a fundamental ‘enabler’ to supporting the additional housing and jobs growth required to tackle the challenges set out in the CPIER.
- 2.13 Current and emerging transport policies set out in the current Cambridgeshire and emerging Cambridgeshire and Peterborough Local Transport Plan firmly establish the role of high-quality public transport corridors in providing the required sustainable transport capacity and connectivity to support growth. This policy has underpinned the development of existing (Cambridgeshire Guided Busway) and planned (Cambridge to Cambourne, Granta Park and Waterbeach New Town) segregated corridors, which will form integral elements of the full CAM network.
- 2.14 Despite the significant investment planned across Greater Cambridge, including public transport corridors and ‘City Access’, significant constraints will remain part of the transport network if CAM is not constructed. Fundamentally, the historic, highly constrained nature of the city centre streetscape will always limit the public transport connectivity and capacity that can be achieved for trips to, across and within the city.
- 2.15 Moreover, these constraints mean that public transport accessibility to the city ‘fringe’ is limited for any cross-city movements. This limits public transport mode share to major ‘fringe’ employment sites, but also limits their full potential by constraining firms’ effective labour market catchments and limiting development density by the need to accommodate significant volumes of parking.
- 2.16 These city centre constraints cannot be overcome with an at-grade transit solution that will deliver the capacity, connectivity and reliability that is necessary to deliver the transformation public transport provision envisaged by the CAM network, and in turn to support the growth ambition of Greater Cambridge. This suggests a more radical rethink of how transport capacity is expanded will be required. Tunnelling is the only option which will allow future transport capacity to be adequately accommodated.

3.0 THE CASE FOR THE CAM

Developing a business case for the CAM

- 3.1. Consultant Steer was appointed in May 2018 to produce a Strategic Outline Business Case in accordance with the CA assurance framework and Department for Transport guidance for business cases.
- 3.2. The CA assurance framework and Department for Transport (DfT) guidance requires that the business case for the CAM will be developed across three principle stages:
- (a) Strategic Outline Business Case (SOBC)
 - (b) Outline Business Case (OBC)
 - (c) Full Business Case (FBC)

3.3. The SOBC is formed of five cases, as set out below and in line with published guidance. The SOBC is primarily focussed on establishing the strategic and economic cases for the CAM.

- (a) Strategic – to demonstrate a robust case for change that fits with wider public policy objectives
- (b) Economic – to demonstrate value for money
- (c) Financial – to demonstrate that it is financially affordable
- (d) Commercial – to demonstrate that it is commercially viable
- (e) Management – to demonstrate that it is achievable

Key points from the SOBC

A copy of the Strategic Outline Business Case is appended to this report at **Appendix 1** and the key points have been extracted below.

Strategic case – why is CAM required?

3.4. The strategic case for the CAM is founded upon the following key points:

- (a) Without a transformational transport intervention, to accelerate the delivery of more housing that is affordable, the Cambridge economy will go into decline from 2031
- (b) Current and emerging transport policies point to the requirement for high-quality transport corridors to provide the required transport capacity and connectivity to support growth
- (c) The historic, highly constrained nature of the city centre landscape mean that an at-grade solution will not deliver the capacity, connectivity or reliability required to support growth
- (d) That the CAM supports the concept of the 30-minute city; the Combined Authority's commitment to connecting homes to jobs

3.5. In summary, there is not another transport solution that can achieve the connectivity and overcome the constraints.

Economic case – Will CAM deliver value for money

3.6. The economic case for the CAM is founded upon the following key points:

- (a) The SOBC conservatively assesses that 50,000 new jobs and 30,000 new homes could be attributed to the CAM. The upper range of these figures is 100,000 jobs and 60,000 homes
- (b) That, based upon total scheme costs in the range £3,690m - £4,500m, the benefit cost ratio (BCR) ranges from 2 to 4; meaning that the economic benefits are 2-4 times higher than the scheme costs. A BCR of above 2 is classified as high value for money by the Department for Transport.

3.7. The economic case also includes the following information on the type of service the CAM would offer:

- (a) Metro levels services: CAM will provide for a high frequency 'metro-style' level of service. Passengers will benefit from 'turn up and go' services whereby they can arrive at stops in the expectation that there will be a service within a few minutes, without the need to check a timetable.
- (b) High-quality vehicles and stops: CAM will operate with high-quality, zero-emission 'trackless metro' vehicles, powered by electric batteries recharged overnight and at route termini throughout the day, without the need for overhead wires. Vehicles would offer a high level of ride comfort, comparable to tram operation, with a maximum speed of approximately 55mph (88kph). There are several low-floor, 'tram style', fully battery-powered electric vehicles on the market which could be used to support CAM services.
- (c) Direct Accessibility and Easy Interchange: CAM will provide direct services from all corridors to the City Centre and Cambridge Station, together with several direct cross-city connections (such as between the Cambridge Biomedical Campus and the St Ives corridor). Where passengers are required to interchange for a small proportion of journeys, this will be achieved via a 'same-platform' interchange in the City Centre without the need to use stairs, lifts or escalators.
- (d) Capacity to accommodate future growth – the very nature of the system means that it can progressively respond to changes in demand from housing and employment growth. The capacity of the CAM system can be significantly increased through increasing service frequencies, operating longer vehicles and / or 'platooning' of vehicles, whereby vehicles operate in 'convoy' travelling a short distance apart from one another. These approaches enable the capacity of the CAM network to be increased incrementally
- (e) Autonomous-Capable: CAM presents the opportunity to adopt rapidly emerging autonomous vehicle technology, as and when it becomes sufficiently mature for mainstream use. CAM has been developed to maximise segregation, which in addition to creating a faster, more reliable network, will increase the ease at which autonomous operation can be introduced. The initial piloting and then running of driverless vehicles will be significantly easier to implement within a more controlled (i.e. segregated from general traffic) environment. Autonomous, driverless operation of CAM could deliver significant operational savings, as well as help Cambridge become a 'city of firsts' in creating a high-quality, high-capacity and automated mass transit system.

3.8. In summary, the SOBC demonstrates that the CAM has a strong economic case and that the DfT would assess the BCR for CAM as very high.

Financial case – how could CAM be funded?

3.9. The financial case for the CAM is founded upon the following key points:

- (a) The capital cost of the project is estimated at around £4 billion (2018 real prices) for the entire network
- (b) There is now a clear expectation that a large proportion of funding for major transport investments such as the CAM should be secured from local sources, rather than Central Government, as seen with the funding packages that have supported the construction of Crossrail and the Northern Line Extension in London.
- (c) A robust funding strategy for large-scale transport infrastructure schemes should therefore consider finding ways of capturing the uplift in benefits enabled by the scheme as this can reduce reliance on the public purse
- (d) The funding strategy should be prepared on the concept of 'beneficiary pays'. This concept is based on the principle that those who benefit from the improvement in transport should contribute to its cost, where beneficiaries include both direct users of the development (such as passengers) and economic beneficiaries (such as those who obtain increased economic benefit either in capital or revenue terms from the improved transport provision). The SOBC provides evidence that central government would also benefit from the scheme because of the anticipated net addition that the CAM would contribute to the national economy.
- (e) It is therefore anticipated that the funding solution for the CAM will be developed from a blend of funding sources including central government and local contributions
- (f) More detail is contained within the technical report on funding and finance that was produced by consultant Arup and is attached as **Appendix 2** of this report.

3.10. In summary, the SOBC and accompanying technical report on funding and finance demonstrates, to an appropriate level of detail, that the CAM can be funded and that extensive engagement with local beneficiaries and national government will be required to develop a funding solution to accompany the OBC.

Commercial case – how will CAM be procured and operated?

3.11. The commercial case for the CAM is founded upon the following key points:

- (a) The delivery of a successful project is dependent on its commercial viability.
- (b) That the CAM should be delivered in a way that: allocates risk appropriately across contracts; incentivises the intended outcomes in terms of performance, efficiency and innovation; facilitates the delivery of the project to time and budget; and secures the targeted economic, social and environmental benefits of the project as discussed with stakeholders and agreed with decision makers.

3.12. In summary, the SOBC demonstrates that there are a range of delivery models that could be adopted for the CAM and that these will be explored in more detail during OBC stage.

Management case – how will CAM be delivered?

3.13. The management case for the CAM is founded upon the following key points:

- (a) That the management case has been developed to an initial outline level commensurate with the requirements of an SOBC.
- (b) That it is the intention of the CA and GCP to align resources to deliver the next stages of the CAM project, including the joint appointment of a CAM programme director.
- (c) That the CA will be the lead promoter of the central tunnelled section and outer corridors (to St Neots, Mildenhall, St Ives and Haverhill) and that the GCP will remain the promoter of the inner corridors (Cambridge to Cambourne, Granta Park, Waterbeach New Town and Newmarket Park and Ride)

3.14. In summary, the SOBC demonstrates, to an appropriate level of detail, that the CAM can be delivered and that this will be explored in more detail during OBC stage.

Overall summary of SOBC

3.15. This SOBC demonstrates that CAM has the potential to transform the connectivity and quality of Greater Cambridge's transport network, and support the long-term growth ambitions of the CPCA and GCP in a sustainable manner. CAM would deliver value-for-money and be operationally affordable. The Strategic and Economic Case for CAM is therefore compelling.

3.16. There are a range of potential funding and financing sources that could fund the delivery of the project, and developing the funding strategy further will be a key focus of the next stage of project development. Similarly, there are a number of different delivery models for the implementation of CAM, outlined in the SOBC, that would be developed as the scheme progresses.

4.0 NEXT STEPS - OUTLINE BUSINESS CASE

- 4.1. As set out in sections 3.1 to 3.3 the next stage in the development of the CAM project is the Outline Business Case. The Outline Business Case will include a detailed funding solution (as part of the financial case) and demonstrable links to the non-statutory spatial plan (as part of the updated economic case).
- 4.2. Concurrently with the development of the OBC, the CA, working in partnership with the GCP and district council partners, will design and implement a comprehensive programme engagement with key local and national stakeholders and the communities that are set to be positively affected by the CAM project.

- 4.3. The key activities for the next year and the associated timescales are set out below:

| Activity | Dates |
|---------------------------------------|----------------------------|
| Technical and engineering development | February 2019 onwards |
| Local stakeholder engagement | February 2019 onwards |
| Procurement of technical team | April to May 2019 |
| Outline business case production | June 2019 to February 2020 |
| National stakeholder engagement | April 2019 onwards |

- 4.4. The Combined Authority (CA) and Greater Cambridge Partnership (GCP) have agreed to jointly appoint a CAM programme director to ensure that the work across each of the CAM routes continues to be integrated and coordinated.

5.0 FINANCIAL IMPLICATIONS

- 5.1. This report is seeking approval for the release of the £1m allocated for 2019/2020 within the approved MTFP to fund the next stage of work for the CAM project.
- 5.2. The Combined Authority is also in discussions with partners and key stakeholders to raise additional funding contributions that would more components of the technical work to be advanced at the same time as preparing the Outline Business Case.

6.0 LEGAL IMPLICATIONS

- 6.1. Cambridgeshire and Peterborough Combined Authority was created by virtue of the Devolution deal reached between the local authorities of Cambridgeshire and Peterborough and authorised by the making of the Cambridgeshire and Peterborough Combined Authority Order SI 251/2017.
- 6.2. The Order confers powers on the Combined Authority making it the Transport Authority for the Key road network and for Public Transport in these areas.
- 6.3. The Greater Cambridge Partnership (GCP) has been set up as a sub-committee of three local authorities in Cambridgeshire to encourage economic growth and the provision of infrastructure across the area.
- 6.4. As a local transport authority the Combined Authority sets the transport strategy and develops a Local Transport Plan, the promotion of the CAM is a central part of this and seen as a key driver in economic growth across the Combined Authority Area.
- 6.5. Both the CA and GCP have agreed to enter into a Memorandum of Understanding in which they aspire to work together and to create a framework under which they can agree key objectives in the promotion of the CAM, how they will collaborate and how they will identify the respective roles and

responsibilities. The first outcome in the project was the production of the Strategic Outline Business case. This report is now asking approval for work to proceed collaboratively moving onto stakeholder engagement and technical development of the Outline Business case.

7.0 SIGNIFICANT IMPLICATIONS

7.1. There are no other statutory matters to bring to the Board's attention.

8.0 APPENDICES

- 8.1 Appendix A – CAM Strategic Outline Business Case – Steer
Appendix B – Technical report on funding and finance - Arup

| <u>Source Documents</u> | <u>Location</u> |
|---|---|
| Report and decisions of the Board dated ** January 2018 | http://cambridgeshirepeterborough-ca.gov.uk/meetings/combined-authority-board-31-january-2018/ |
| Report and decisions of the Board dated 25 July 2018 | http://cambridgeshirepeterborough-ca.gov.uk/meetings/cambridgeshire-and-peterborough-combined-authority-board-3/ |

Cambridgeshire Autonomous Metro Strategic Outline Business Case



Greater Cambridge Partnership

Cambridgeshire and Peterborough Combined Authority and the Greater
Cambridge Partnership

Our ref: 23288302

Cambridgeshire Autonomous Metro Strategic Outline Business Case

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Our ref: 23288302

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Executive Summary

Introduction

This report sets out the Strategic Outline Business Case (SOBC) for the Cambridgeshire Autonomous Metro (CAM). The purpose of the SOBC is to establish the case for investment in the CAM network, based on HM Treasury's Five Case Business Case model.

This SOBC seeks to demonstrate that CAM:

- is supported by a robust case for change that aligns with wider objectives – the '**strategic case**';
- represents value for money – the '**economic case**';
- is commercially viable – the '**commercial case**';
- is financially affordable – the '**financial case**'; and
- is achievable – the '**management case**'.

The **Strategic Case** for CAM centres on its ability to enable and accelerate additional economic growth within Greater Cambridge, through supporting the sustainable delivery of additional jobs, housing, and GVA through investment to alleviate the region's transport constraints. The Strategic Case demonstrates that a combination of limited transport capacity and accessibility undermines future development, exacerbates housing unaffordability, and puts future growth at risk.

The **Economic Case** demonstrates how delivering this additional growth, alongside transforming the quality of public transport provision, delivers significant benefits at both the regional and national level that justify the expenditure of the scheme. It outlines how, when the benefits of this additional growth dependent of CAM are captured, the scheme represents good value-for-money.

At SOBC stage, the **Financial, Commercial and Management Cases** are developed to a more outline level of detail than the Strategic and Economic Cases, reflecting the early stage of scheme development. However, the **Financial Case** sets out the principles that will underpin the development of a funding strategy, and identifies a range of potential funding mechanisms. The SOBC sets out the overall case for investment, and more work on funding involving a range of stakeholders has recently commenced. The **Management and Commercial Cases** outline how (and by whom) the scheme is proposed to be planned, developed, procured and operated. This will be reviewed and developed further if the scheme is progressed to Outline Business Case (OBC).

Each case is clearly set out as a respective chapter within this SOBC.

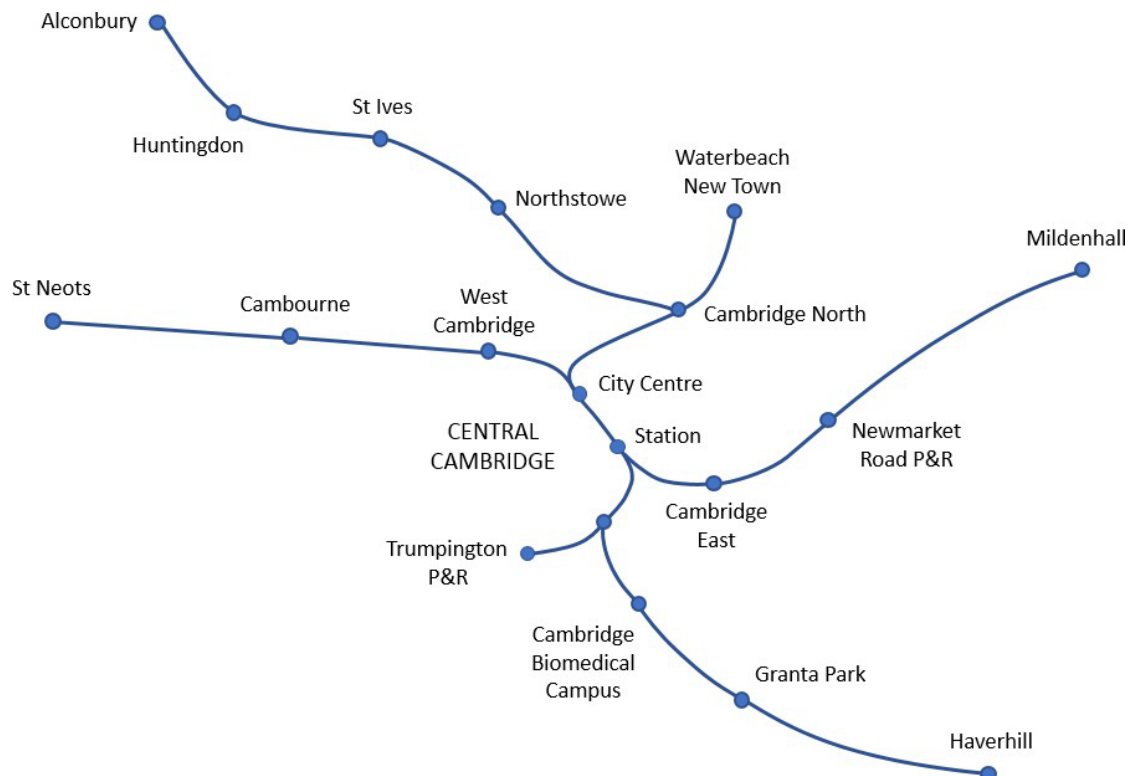
What is Cambridgeshire Autonomous Metro?

The Network Vision

The Cambridgeshire Autonomous Metro (CAM) will provide a high-quality, fast and reliable transport network that will transform transport connectivity across the Greater Cambridge region. The vision for the project is an expansive metro network that seamlessly connects Cambridge City Centre, key rail stations (Cambridge, Cambridge North and future Cambridge South), major city fringe employment sites and key 'satellite' growth areas, both within Cambridge and the wider region.

Figure 1 outlines the key corridors proposed to be served by the Cambridgeshire Autonomous Metro.

Figure 1: CAM Network Map



CAM will operate entirely segregated from traffic through Central Cambridge through an underground tunnel, ensuring fast and reliable services unaffected by traffic congestion. Services will be provided by electric, low-floor 'trackless metro' vehicles.

Many of the building blocks of the network are already in place or planned. These include the existing Cambridgeshire Guided Busway (CGB), and the proposed high-quality segregated public transport corridors to Cambourne, Waterbeach New Town and Granta Park currently being developed by the Greater Cambridge Partnership.

These corridors deliver segregated routes to the 'city fringe', but suffer from severe congestion within its bounds. This congestion slows journeys and makes them less reliable, limiting the effectiveness of the public transport network and discouraging its use. Journeys on the existing Guided Busway, for example, are timetabled to take the same time to travel from St Ives to the Science Park – a distance of 12 miles – as from the Science Park to Cambridge station – a distance of just 3.5 miles.

Furthermore, Cambridge City Centre is characterised by a network of historic, narrow streets which limit the routes, speeds and reliability at which buses (or any on-street system) operate, and, critically, cannot adequately cater for the significant growth planned in Greater Cambridge. While these constraints remain, the potential for public transport to cater for demand to and across the city centre (e.g. to major 'fringe' employment sites) will be severely limited, and car use and traffic congestion will worsen.

The critical 'enabler' of the overall network is therefore the provision of new segregated, tunnelled infrastructure within the city. Tunnelled sections are required to connect existing

and planned segregated corridors, at Cambridge North, West Cambridge, East Cambridge and north of the Biomedical Campus to each other, and to the City Centre and Cambridge Station. This infrastructure will transform the nature of public transport connectivity by providing complete segregation and reliability within Central Cambridge. The CAM network configuration means services from each of the six radial corridors shown in Figure 1 will have direct services to new, underground stations at both the City Centre and Cambridge Station.

The vision for the CAM network includes regional connections to St Neots, Haverhill, Alconbury and Mildenhall, serving locations with significant planned or potential growth. These regional connections will only be viable if they directly connect into new segregated infrastructure serving the city centre, and are fully or largely segregated on the 'regional' sections of route.

CAM Services and Operations

CAM will provide a modern, high-quality, high frequency and reliable metro system. Key features of CAM are summarised below.

Metro Level Services: CAM will provide for a high frequency 'metro-style' level of service. Passengers will benefit from 'turn up and go' services whereby they can arrive at stops in the expectation that there would be a service within a few minutes, without the need to check a timetable.

High-Quality Vehicles and Stops: CAM will operate with high-quality, zero-emission 'trackless metro' vehicles, powered by electric batteries recharged overnight and at route termini throughout the day, without the need for overhead wires. Vehicles would offer a high level of ride comfort, comparable to tram operation, with a maximum speed of approximately 55mph (88kph).

There are several low-floor, 'tram style', fully battery-powered electric vehicles on the market which could be used to support CAM services. The supplier market is developing rapidly as manufacturers and technology companies are responding to opportunities that 'trackless metro' offers, and the ambition that a number of public authorities have to develop and enhance their public transport networks based on an affordable, flexible and scalable technology. An example of a such a vehicle is shown in Figure 2 below.

Figure 2: Potential CAM Vehicle

Source: Irizar ie Tram

CAM stops will include waiting facilities, covered cycle parking, ticket vending machines, smartcard readers and real-time information provision. Stops would be high-quality, providing shelter from the elements, and present an attractive, iconic and recognisable impression of the CAM system.

Direct Accessibility and Easy Interchange: CAM will provide direct services from all corridors to the City Centre and Cambridge Station, together with several direct cross-city connections (such as between the Cambridge Biomedical Campus and the St Ives corridor). Where passengers are required to interchange for a small proportion of journeys, this will be achieved via a 'same-platform' interchange in the City Centre without the need to use stairs, lifts or escalators.

Guidance: It is envisaged that vehicles would be guided through tunnelled and other segregated sections by an optical guidance system of the CAM network. Such optical guidance systems are well-proven, and the technology has been in operation in several European cities since the early 2000s, including Rouen, Nimes, Bologna, Castellon and Essen. Optical guidance is currently proposed for the segregated Cambourne – Cambridge and Granta Park – Cambridge Biomedical Campus corridors, under development by the Greater Cambridge Partnership, which will form part of the CAM network at opening. Such guidance mechanisms can be readily migrated towards driverless operation.

Capacity to Accommodate Future Growth: It is essential that the CAM network provides both a level of service and coverage which is commensurate with the expected level of demand in the early years of operation, but also able to accommodate increased demand in future, including from both housing and employment growth and future expansion of the network.

Our demand analysis, presented in the Economic Case, shows that the assumed initial service levels are sufficient to accommodate forecast demand. In the medium and longer term, the capacity of the CAM system can be significantly increased through increasing service frequencies, operating longer vehicles and / or 'platooning' of vehicles, whereby vehicles

operate in 'convoy' travelling a short distance apart from one another. These approaches enable the capacity of the CAM network to be increased incrementally, to respond to increasing demand over time, and to accommodate areas of planned and future growth.

Autonomous-Capable: CAM presents the opportunity to adopt rapidly emerging autonomous vehicle technology, as and when it becomes sufficiently mature for mainstream use. CAM has been developed to maximise segregation, which in addition to creating a faster, more reliable network, will increase the ease at which autonomous operation can be introduced.

The initial piloting and then running of driverless vehicles will be significantly easier to implement within a more controlled (i.e. segregated from general traffic) environment. Autonomous, driverless operation of CAM could deliver significant operational savings, as well as help Cambridge become a 'city of firsts' in creating a high-quality, high-capacity and automated mass transit system.

It should be noted, however, that the CAM concept is not *dependent* or in any way predicated on autonomous operation. It is intended that CAM will operate with a driver initially, before transiting to driverless operation as and when the requisite technology matures.

The Strategic Case - Why is CAM Required?

A Unique and Thriving Economy

Greater Cambridge, defined as the area encompassing the City of Cambridge, South Cambridgeshire, and parts of Huntingdonshire and East Cambridgeshire, is a thriving region. It is home to more than 459,000 people, a world-leading university, and a highly productive and dynamic economy. Cambridge acts as the centre of “Silicon Fen”, a leading global cluster of biomedical, software, programming and life science firms, which sustain the regions’ high-tech economy and compete on a national and international stage.

Knowledge-intensive (KI) sectors drive the success of the economy. Greater Cambridge is home to over 1,000 technology and biotechnology companies (1,400 when providers of services and support organisations are included), including 61 bio-technology firms. Parts of the city act as ‘clusters’ for specific sectors: the Cambridge Science Park is home to more than 70 software and technology firms; the Cambridge Biomedical Campus a network of healthcare facilities, life sciences and pharmaceutical companies, and start-ups.

In total, over 60,000 people work in KI-sector companies in Greater Cambridge. Multi-national knowledge-intensive firms based in the region include ARM Holdings, Astra Zenica, Aveva Group, Dialight, Marshalls of Cambridge and PPD Laboratories – many of whom started as start-ups in the regions’ business and science parks.

Greater Cambridge’s economic success is characterised by significantly higher levels of Gross Value Added (GVA) per head than the national average: £39,000 in Cambridge, compared to £27,000 for the UK, together with a highly skilled workforce: 34% hold degree-level qualifications, compared to the national average of 17%, and UK-leading rates of innovation. Within Cambridge, there are 341 patent applications per 100,000 people: more patents per person than the next six cities combined.

Firms choose to locate in Greater Cambridge – despite the high cost of doing so – due to the availability of skilled, innovative staff, and the high concentration of other knowledge-intensive (KI) firms. Firms benefit from being located close to one another, either physically or through good transport connectivity, as it facilitates collaboration and competition. This allows firms to learn and benefit from each other’s best practices, reduce costs by sharing resources, and have access to an extensive pool of skilled labour.

The Opportunity for Growth

The opportunity for the continued growth of Greater Cambridge, driven by the desire of businesses to locate and expand in the area, is highly significant. The Combined Authority has set out clear ambition to deliver this growth, with the Cambridgeshire and Peterborough ‘Devolution Deal’ setting out the ambitious target of doubling the size of the local economy over the next 25 years, boosting regional GVA from £22bn to £40bn.

The Cambridge and Peterborough Independent Economic Review (CPIER), published in September 2018, provides an evidence-based, independent assessment of the Cambridgeshire and Peterborough economy and its growth potential. CPIER has developed scenarios for the scale of change in the number of jobs, homes and improvement in productivity that are required to meet the target of doubling the size of the regions’ economy. CPIER sets out a ‘central case’ employment projection, whereby employment at the Combined Authority level would need to increase from approximately 480,000 in 2018 to over 900,000 by 2051 for the regions’ potential to be maximised. This is shown as the ‘blue’ line in Figure 3.

Challenges to Realising Growth

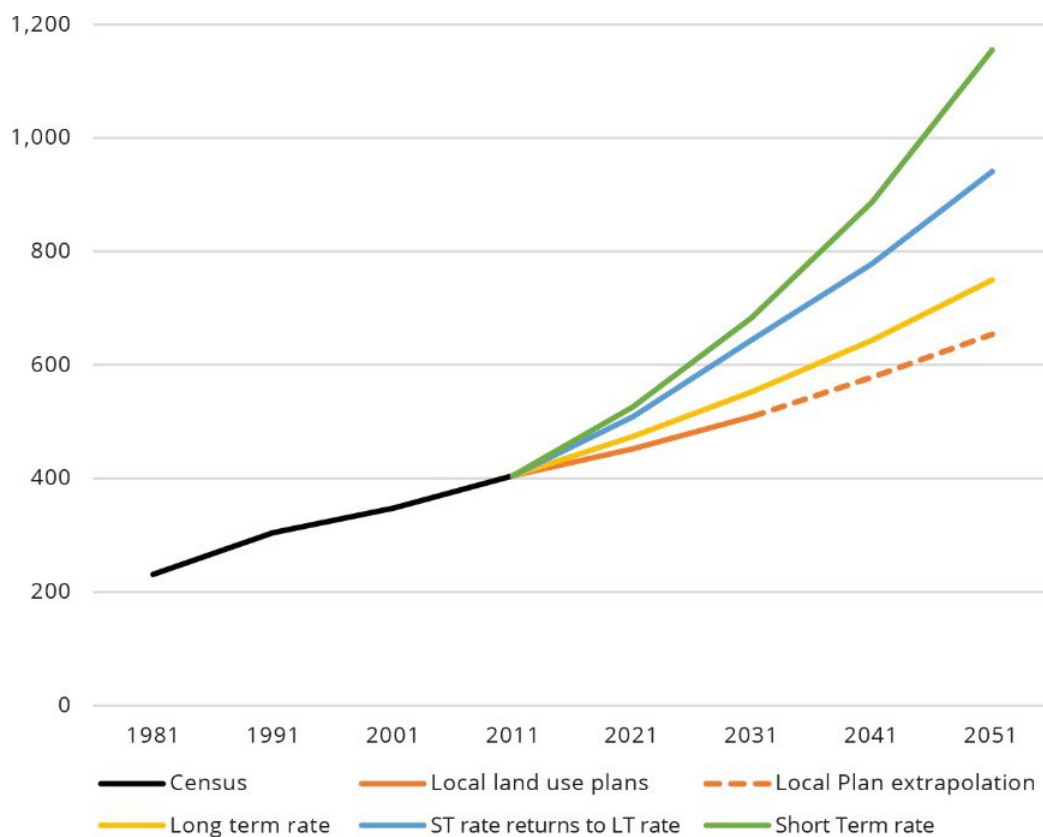
CPIER identified Cambridgeshire and Peterborough's housing crisis as a major constraint on the region's ability to fulfil its economic potential. Since 2012, employment has grown by over 15%, whilst housing stock has grown by under 5%, reflected in ever-increasing house prices and housing unaffordability. House prices are now more than 13 times average earnings in Cambridge and over 11 times in South Cambridgeshire, compared to the UK average of 7.

The 'Cambridge Futures' study, widely cited in the CPIER report, modelled the economic impact that this increase in prices will have should current trends continue. This study found that the increased cost of living, driven through higher housing costs, could cause employment growth to slow beyond 2021 and decline beyond 2031.

Accelerating the supply of housing affordable to people on average and lower incomes is therefore critical to supporting the level of employment growth consistent with the 'Devolution Deal' ambition and the CPIER 'central case' projection.

Alongside the 'central' employment projection, CPIER also set out an employment growth scenario based on 'Local Plan extrapolation', where constraints on growth prevent the region's potential from being realised, shown as the orange line in Figure 3. This 'business as usual' scenario indicates employment increasing to around 650,000 by 2051, compared to over 900,000 in the 'central' scenario – a difference of over 250,000 jobs by 2051 at the Combined Authority level.

Figure 3: Growth scenarios under different employment assumptions



Source: Dr Ying Jin, University of Cambridge, reproduced from CPIER page 20

Our assessment is that around 150,000 of the 250,000 additional jobs (CPIER ‘central case’ versus ‘Local Plan extrapolation’ or ‘business as usual’ scenario) would be accommodated within Greater Cambridge and that, taking account of the likely opening date for a CAM network, CAM has the potential to support the delivery of around 100,000 of these additional jobs. This number of additional jobs equates to a commensurate number of additional dwellings of up to 60,000, based on estimates from CPIER.

Why Growth in Greater Cambridge Matters to UK plc

CPIER asserts that many firms take a ‘*Cambridge or Overseas*’ approach when considering where to locate. If Cambridge became a less attractive location, then businesses are more likely to locate abroad than to other locations within the UK. Survey evidence from the CPIER report indicates that significantly more businesses indicated that they would move abroad (44.2%) than elsewhere in the UK (25.0%).

This highlights the ‘net additionality’ of Greater Cambridge to national economic output. Many jobs supported by CAM are likely to be ‘net additional’ to the UK economy, rather than simply displaced from elsewhere. This underlines the importance of Cambridge as a national asset – where Cambridge succeeds, the UK succeeds. The potential of CAM to deliver the additional jobs and homes is central to the Strategic and Economic Cases for the scheme.

“the UK government should adopt a ‘Cambridge or overseas’ mentality toward knowledge-intensive (KI) business in this area, recognising that in an era of international connectivity and footloose labour, many high-value companies will need to relocate abroad if this area no longer meets their needs. Ensuring that Cambridge continues to deliver for KI businesses should be considered a nationally strategic priority” *CPIER Recommendation #3*

The Case for Change

Transport infrastructure is a fundamental ‘enabler’ to supporting the additional housing and jobs growth required to deliver the wider growth ambitions of the Combined Authority and its partners.

Current and emerging transport policies set out in the current Cambridgeshire and emerging Cambridgeshire and Peterborough Local Transport Plan firmly establish the role of high-quality public transport corridors in providing the required sustainable transport capacity and connectivity to support growth. This policy has underpinned the development of existing (Cambridgeshire Guided Busway) and planned (Cambridge to Cambourne, Granta Park and Waterbeach New Town) segregated corridors, which will form integral elements of the full CAM network.

Despite the significant investment planned across Greater Cambridge, including public transport corridors and ‘City Access’, significant constraints will remain part of the transport network if CAM is not constructed. Fundamentally, the historic, highly constrained nature of the city centre streetscape will always limit the public transport connectivity and capacity that can be achieved for trips to, across and within the city.

Moreover, these constraints mean that public transport accessibility to the city ‘fringe’ is limited for any cross-city movements. This limits public transport mode share to major ‘fringe’

employment sites, but also limits their full potential by constraining firms' effective labour market catchments and limiting development density by the need to accommodate significant volumes of parking.

These city centre constraints cannot be overcome with an at-grade transit solution that will deliver the capacity, connectivity and reliability that is necessary to deliver the transformation public transport provision envisaged by the CAM network, and in turn to support the growth ambition of Greater Cambridge. This suggests a more radical rethink of how transport capacity is expanded will be required. Tunnelling is the only option which will allow future transport capacity to be adequately accommodated.

CAM Vision and Objectives

CAM has been designed to support the shared CPCA and GCP priorities and outcomes around economic growth, accelerating housing delivery, promoting equity and encouraging sustainable growth and development. These outcomes have directly informed the development of four overarching CAM scheme objectives. Under each of the four outcome-related objectives there are a number of sub-objectives. These are presented in Table 1.

Table 1: CAM Scheme Objectives

| Objective (outcome-related) | Sub-objectives |
|---|---|
| Promote economic growth and opportunity | <ul style="list-style-type: none"> • Improve transport connectivity • Improve journey time reliability • Promote agglomeration • Support new employment by enhancing access to and attractiveness of key designated employment areas • Increase labour market catchments |
| Support the acceleration of housing delivery | <ul style="list-style-type: none"> • Direct high-quality public transport access to key housing sites (existing designations) • Serve and support new areas for sustainable housing development • Provide overall transport capacity to enable and accommodate future growth |
| Promote Equity | <ul style="list-style-type: none"> • Promote better connecting other towns within Cambridgeshire and Peterborough to Cambridge • Improve opportunities for deprived residents |
| Promote sustainable growth and development | <ul style="list-style-type: none"> • Improve local air quality • Promote the low carbon economy • Support environmental sustainability |

Objectives and Measures of Success

The scale of contribution of CAM against the scheme objectives stems from the transport outputs delivered 'on the ground' in terms of the nature and scale of the improvements in overall public transport connectivity and accessibility that CAM delivers. This provides for clear 'measures of success' against which the scheme can be assessed throughout the scheme development and business case stages.

The Mayor's Interim Transport Strategy Statement outlined a number of key measures for CAM. These are:

- Delivering high quality, high frequency, reliable services, making it the mode of choice and taking away a reliance on cars;
- Delivering maximum connectivity, network coverage, and reliable journey times;
- Forming part of a more active and sustainable travel choice which encourages walking and cycling at the start and end of journeys;
- Providing sufficient capacity for growth and supporting transit-led development;
- Flexibly adapting to future needs; and,
- Using emerging technologies, including connected and autonomous vehicles.

The development of the CAM proposition as set out in this SOBC delivers against these key transport-related output measures and these, in turn, will support the achievement of the wider outcomes encapsulated in the CAM objectives.

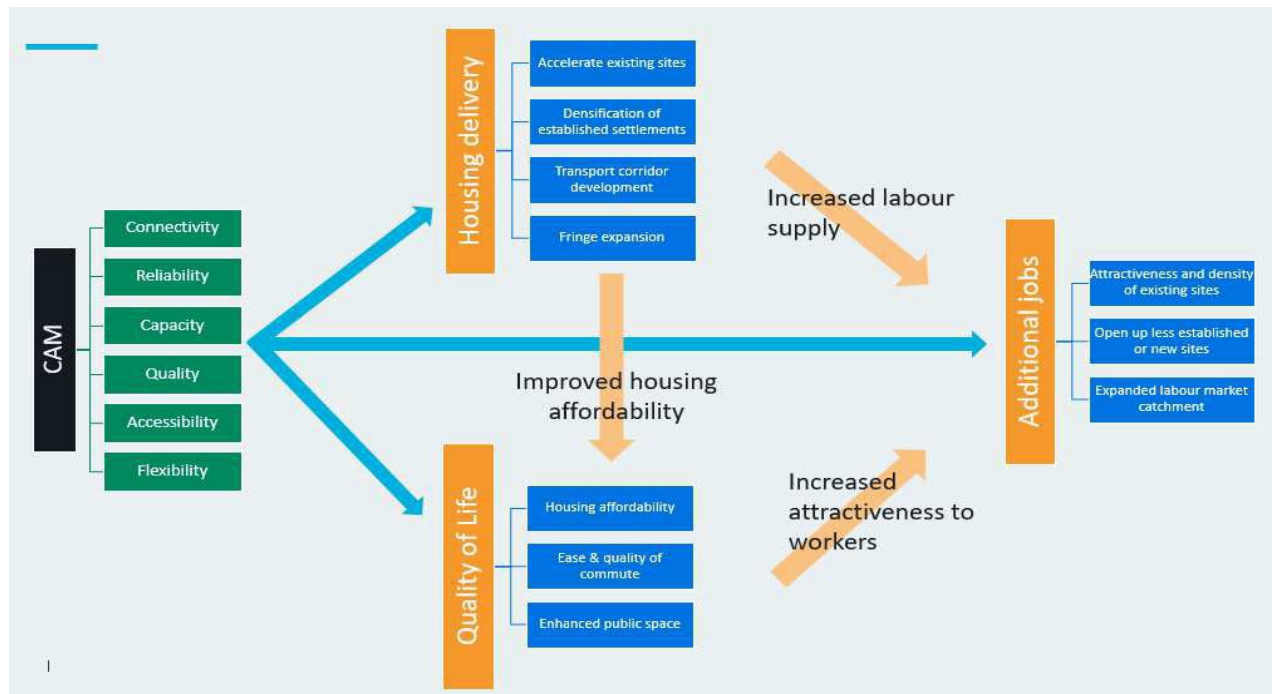
Strategic Assessment - How CAM will deliver additional jobs, housing and growth

CAM will transform the quality of public transport provision for the benefit of existing residents and businesses. However, the scale of investment required can only be justified if it will support additional growth in jobs and housing within Greater Cambridge, significantly increasing the overall size of the economy above which would not be possible without CAM.

We consider that CAM has the potential to deliver up to 100,000 additional jobs, together with up to 60,000 additional dwellings which be required to support this level of employment growth.

The mechanisms through which transport can support additional growth are summarised in Figure 4.

Figure 4: How CAM will Support Growth



CAM will support the delivery of additional jobs through a number of ways. These include:

- supporting the delivery of additional housing that is fundamental to providing the expanded labour market supply required to support employment growth;

- improving the quality of life through addressing the housing shortfall and delivering affordable homes;
- enabling better and more reliable commutes across the Greater Cambridge area;
- making existing employment sites more accessible to workers and other businesses and supporting a higher density of development;
- providing the potential to open up less established or wholly new employment sites; and
- enhancing the degree of ‘clustering’ and agglomeration of economic activity which make Greater Cambridge uniquely attractive to businesses and inward investors, a self-perpetuating process in which high-value knowledge-intensive businesses want to locate in larger and more successful clusters.

There are several ways in which CAM can support the delivery of additional housing. CPIER recommended the development of a ‘blended’ spatial strategy to support the level of growth required. CAM would support each of the spatial development options set out in CPIER:

- **Densification.** This applies to both jobs and housing, where there is significant scope for densification in and around the city ‘fringe’ (in contrast to central Cambridge where options within the historic core are very limited). Densification will support the development of an expanded cluster of high-value knowledge intensive sectors within a better connected urban area;
- **Fringe Growth.** There will be opportunities for additional housing development to be delivered sustainably within and beyond the current city ‘fringe’, whereby development can be developed at a high density within the catchment of CAM stops – and therefore connected to the city and locations across Greater Cambridge;
- **Transport Corridors.** CAM can support the development of expanded and new settlements on high-quality transport corridors. This offers the potential for significant new housing development in locations that have high public transport accessibility to all key employment areas in Greater Cambridge, and where the developments themselves can be developed to a higher-density and more sustainable manner.

Importantly, the land use scenarios presented above which CAM could support would also mean that growth and development pressures in other parts of Greater Cambridge, less well-suited to sustainable growth and potentially more sensitive, would be reduced. CAM can therefore ensure that additional growth can be accommodated in a manner that is likely to be more acceptable to stakeholders.

The Economic Case – Will CAM deliver Value for Money?

The Economic Case establishes whether CAM represents overall *value-for-money* (whether the benefits of the scheme outweigh the costs) and whether it is *affordable* on an ongoing basis (whether system revenues cover operating costs).

The economic assessment is underpinned by estimates of scheme capital and operating costs, forecasts and CAM demand, revenue and benefits, and the development of an economic appraisal prepared in line with DfT guidance which provides for an overall assessment of economic performance. Fundamentally, this appraisal assesses and values the benefits of the additional growth than CAM has the potential to deliver.

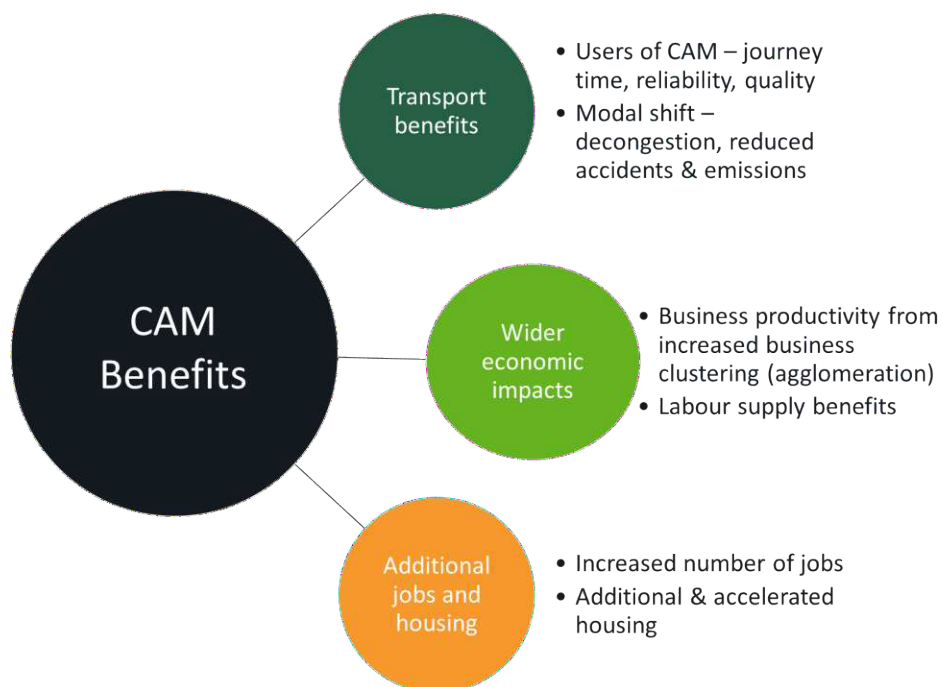
Benefits Considered

Under DfT WebTAG guidance, the benefits from transport interventions can be considered under three different ‘levels’ of analysis. These reflect the different economic impacts of

transport investment, and the level of confidence in the analytical methods used to appraise these impacts, as outlined in WebTAG Unit A2-1¹.

These benefits are summarised in Figure 5.

Figure 5: Overview of different types of benefits delivered by transport schemes.



Level 1 benefits include the direct impacts of transport investment on journeys. These primarily include the savings in generalised journey time – to both existing and new users – generated by a transport scheme. Level 2 benefits include the wider ‘connectivity’ benefits arising from transport investment. These include the ‘agglomeration’ or ‘clustering’ benefits that arise from firms and workers being located ‘closer’ to one another as a result of improvements in transport connectivity, together with labour supply effects and benefits from increased market competition.

Level 3 benefits refer to a range of benefits arising from the relocation of economic activity and a change in land use. These include *employment effects* – where transport investment results in additional local employment growth which would not otherwise be delivered, *dependent development* – where transport investment ‘unlocks’ additional development which would not otherwise have been delivered and *dynamic clustering* – where the increased concentration of economic activity from the above increases the productivity of firms within these areas.

Basis for Economic Appraisal

The vision for CAM is that it will comprise a comprehensive ‘regional’ network, extending to St Neots, Alconbury, Haverhill and Mildenhall, of approximately 142km in length.

¹

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/712878/tag-unit-a2-1-wider-impacts-overview-document.pdf

However, in estimating the patronage, together with the transport and wider economic benefits (Level 1 and 2) for CAM, the economic assessment is based on a smaller network that extends as far as the proposed GCP ‘inner corridors’ to Cambourne, Granta Park and Waterbeach New Town, together with Newmarket Road P&R and Trumpington and St Ives on the existing Cambridgeshire Guided Busway. The reason for focusing upon this network is that:

- There is a much greater level of scheme development that has taken place for these sections, and therefore greater certainty about their routes and scheme costs;
- The transport model only has sufficient geographic coverage to meaningfully forecast demand for the network above. The lack of geographic coverage, uncertainty about specific routings and the fact that the case for the development of these corridors will be based, to a large extent, on future housing growth that is not represented in current transport models, makes the forecasting of demand and benefits for the wider network using existing transport models inappropriate, and the use of any alternative approach would be too speculative to provide meaningful evidence;
- In economic terms, it is necessary to understand and delineate the benefits that accrue from the development of different elements of the network. It is essential that the economic assessment presented in this report helps to make the incremental case for delivering the ‘core’, central infrastructure (and associated costs) that are addition to the schemes coming forward as part of the ‘Reference Case’ scenario.
 - These refer to the GCP ‘inner corridor’ schemes to Cambourne, Granta Park and Waterbeach, which form an integral part of the CAM network, and are being developed by the GCP as ‘discrete’ projects subject to their own options, scheme development, business case and powers and consents processes.
 - The same principle also applies to the ‘outer corridors’, where it is also important that the economic case for the ‘core’, central infrastructure is not conflated with that of the ‘outer corridors’, as the development of these corridors will also need to be justified on a case by case basis.

We have also made a high-level assessment of the overall economic case for the full network. This is based on indicative capital costs for the ‘outer corridors’, and an assessment of the additional levels of housing and employment growth (Level 3 benefits) they could support.

Scheme Capital Costs

The overall costs of delivering the full CAM network would be in the order of £4,000m, as set out in Table 2.

Table 2: Summary of CAM Capital Costs

| Network / route sections | Cost (£m, 2018 prices) | Scope |
|---------------------------|------------------------|---|
| ‘Core’ CAM infrastructure | 2,360 | <p>Bespoke cost estimates have been developed for the SOBC based on the feasibility design. Costs include:</p> <ul style="list-style-type: none"> • approximately 12km of twin-bore tunnels • four tunnel portals • two underground stations, at the City Centre and Cambridge Station • Systems costs and charging infrastructure costs • New at-grade surface infrastructure • conversion of approximately 4km of the existing Cambridgeshire Guided Busway |

| | | |
|---|----------------------|--|
| | | <ul style="list-style-type: none"> • Vehicles • Depot costs • Scheme development costs • Inclusive of Optimism Bias at 66% |
| Greater Cambridge Partnership 'inner corridors' | 530 | <p>Cost estimates based on published cost estimates for all schemes except Waterbeach, where a unit rate has been applied.</p> <ul style="list-style-type: none"> • Cambourne – Cambridge; • Cambridge Biomedical Campus – Granta Park; • Cambridge Science Park – Waterbeach New Town; and • additional P&R capacity at Trumpington or a new P&R site at Hauxton <p><i>Note that CAM will also integrate with GCP proposals for the East Cambridge corridor, where a preferred scheme has yet to be identified.</i></p> |
| Combined Authority 'outer corridors' | 800 – 1,610 | <ul style="list-style-type: none"> • Cambourne to St Neots (13km) • Newmarket Road P&R to Mildenhall (30km) • Granta Park to Haverhill (16km) • St Ives to Alconbury (15 km) |
| Total | 3,690 – 4,500 | |

CAM Demand Forecasts

Our approach has used evidence from transport modelling, the Cambridgeshire and Peterborough Independent Economic Review (CPIER) and recent growth trends to inform our assessment of CAM patronage and the magnitude of benefits it could deliver.

The Cambridge Sub Regional Model 2 (CSRM2) forms the strategic multi-modal transport model for Cambridgeshire, maintained by CCC with the geographic coverage of the county. Based on a modelled transport network (both highway and public transport), and the locations of housing and jobs, it forecasts demand volumes and journey times across the transport network for a 2031 model year. We have used CSRM2 to estimate patronage and transport user benefits for CAM for a 2031 model year. This is supported by a spreadsheet-based forecasting model to understand how CAM demand could change in response to longer-term growth and development in line with the CPIER scenarios, which forecast a significant level of population and employment growth over and above that committed in the Local Plans.

Table 3 presents our annual demand forecasts for the CAM network, for 2031 and 2051 under Local Plan and CPIER 'central case' growth scenarios. These are informed by the CSRM2 2031 CAM model run, under Local Plan growth assumptions, combined with our spreadsheet-based forecasting tool.

These forecasts are with respect to a 'Greater Cambridge' CAM network stretching to St Ives, Cambourne, Trumpington P&R, Granta Park and Newmarket Road P&R. Demand from the 'outer corridors' would be additional to this, and would depend primarily on the level of development occurring along these corridors.

Table 3: CAM Annual Demand Forecasts

| Scenario | 2031 demand <i>million trips per year</i> | 2051 <i>million trips per year</i> |
|--------------------|--|---------------------------------------|
| Local Plan | 15 – 18 | 19 – 23 |
| CPIER Central Case | 18 – 22 | 27 – 33 |

Demand has been benchmarked against current public transport usage in Greater Cambridge (e.g. the guided busway and existing P&R), and against the demand on other UK metro systems. Our assessment is that the demand ranges reported for CAM are reasonable and plausible. However, the modelling and forecasting work to date has been relatively high-level, and further model development will be required to support updated demand forecasts as part of any future Outline Business Case (OBC).

The forecasts suggest that that approximately 44% of CAM demand will originate from users who would otherwise have travelled by car for the entirety of their journey. This demonstrates that CAM will offer an attractive and viable alternative to car users, reflective of the transformational nature of the scheme.

The analysis of demand on each CAM corridor suggests that the assumed SOBC service frequency provides sufficient capacity to accommodate forecast demand. Again, as part of any further scheme development there would be further assessment to validate this, and to refine and optimise the service pattern and frequency assumptions.

CAM Revenues and Operating Costs

Ongoing Affordability

Based on a 2031 'Local Plan' demand forecast of 15 – 18 million trips per year, we would expect CAM to generate annual revenues of approximately £30 – 35 million per annum, based on an assumed revenue yield per trip of £2.

Our estimate of CAM operating costs is £25 – 30 million per annum. This suggests that, at a more prudent end of the demand range estimate, CAM revenues would be sufficient to cover operating costs.

CAM Transport and Wider Impacts Benefits

The assessment of transport (Level 1) and wider (Level 2) benefits are underpinned by the transport modelling, and have been forecast and valued in accordance with DfT guidance. The benefits are shown for a 60-year appraisal period.

The assessment of transport and wider impacts benefits are based on:

- a 'Greater Cambridge' CAM network, including both the 'core', central infrastructure and the GCP 'inner corridors'; and
- the *incremental* benefits delivered by the 'core' infrastructure, over and above those of the GCP 'inner corridor' schemes which are assumed to be part of the Reference Case.

The benefits are shown in Table 4.

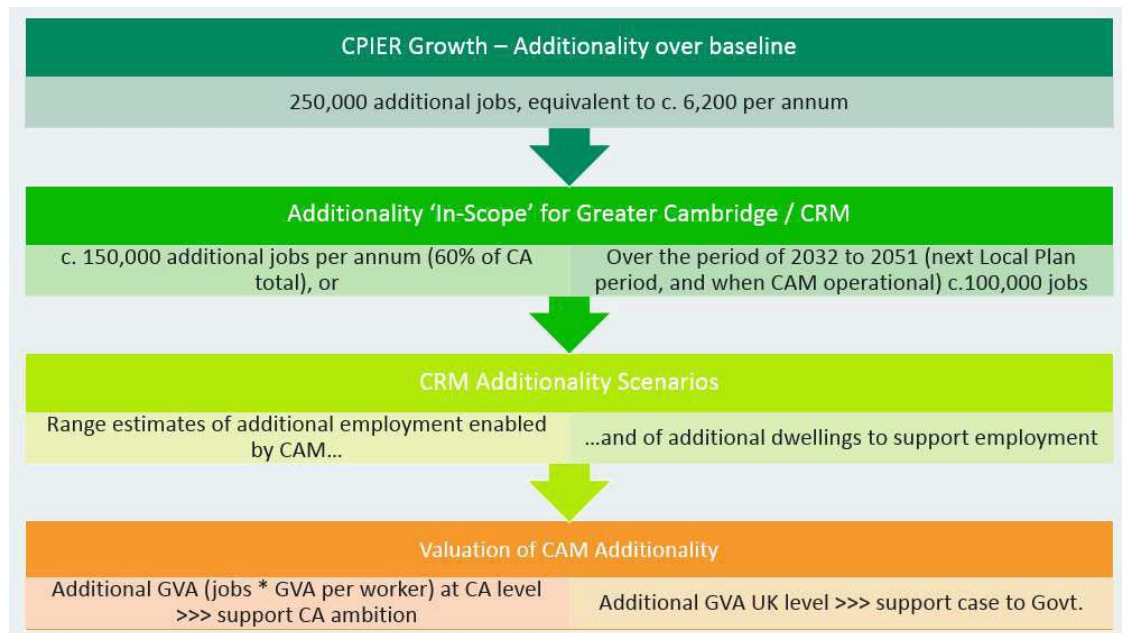
Table 4: Summary of CAM Transport Benefits

| Network | £mill, 2010 PV |
|------------------------------|--------------------|
| Transport benefits (Level 1) | 520 – 645 |
| Wider Impacts (Level 2) | 475 - 575 |
| Total | 995 – 1,220 |

CAM Additionality Benefits

For the estimation of ‘additionality’ benefits a more bespoke approach, grounded in the CPIER scenarios has been adopted, as summarised in Figure 6.

This approach is based on the c. 250,000 additional jobs that the CPIER report identifies would be delivered under its ‘central’ employment projection compared to a ‘business as usual’ scenario. The 250,000 figure is at the Combined Authority level, and covers the period from now to 2051. Taking account of the Greater Cambridge geography and the assumed opening date of CAM, our assessment is that approximately 100,000 of these 250,000 jobs (and up to 60,000 homes) can be considered ‘in-scope’ for the additionality assessment.

Figure 6: Summary of Additionality Approach

The valuation of additionality then rests on two key assumptions. Firstly, the quantum of additional jobs and housing that CAM has the potential to deliver, and hence the ‘attribution’ of related GVA uplift to the scheme. This provides for an assessment of additionality at the Greater Cambridge/ Combined Authority level. Secondly, an assessment of the proportion of the **local** additionality that can be considered **net additional** at the national level. It is the national level GVA that informs the economic appraisal and value for money assessment.

Greater Cambridge Additionality

Based on the approach outlined above, we estimate that CAM could support a significant number of additional homes and jobs which would not otherwise be delivered. Our range estimates for the additional housing, employment and GVA that CAM could support within Greater Cambridge is outlined in Table 5.

Table 5: Scenarios for additional housing, jobs and GVA in Greater Cambridge supported by CAM

| CAM-enabled development (% of 100,000 jobs by 2051) | Additional jobs by 2051 | Additional housing units by 2051 | Additional GVA per annum in 2051 (£m 2010 prices, undiscounted, single-year estimate) | Present Value of additional GVA (£m, 2010 PV, over 60 year appraisal period) |
|--|-------------------------|----------------------------------|--|---|
| 100% | c. 100,000 | Up to c.60,000 | 6,100 | 66,300 |
| 75% | c. 75,000 | Up to c. 45,000 | 4,600 | 49,800 |
| 50% | c. 50,000 | Up to c. 30,000 | 3,000 | 33,200 |
| 25% | c. 25,000 | Up to c. 15,000 | 1,500 | 16,600 |

It should be noted that, if only 50% of the c. 100,000 ‘in-scope’ jobs are deemed attributable to CAM, this would still imply that CAM would support up to 30,000 additional homes and £3.0 billion of additional GVA annually in Greater Cambridge – equivalent to £33bn in Present Value terms over 60 years.

In our view, this represents a realistic and prudent level of additional growth that could be supported by a CAM network stretching to St Ives, Waterbeach, Newmarket Road P&R, Granta Park, Trumpington P&R and Cambourne, subject to suitable sites being identified through the planning process and the Non-Statutory Spatial Plan.

Levels of housing and employment growth above this could be supported by an expanded network, with additional extensions to Alconbury, Mildenhall, Haverhill and / or St Neots. Our assessment is that the full network could support additional housing of 75% or more of the ‘in-scope’ additionality, which would deliver £4.6bn GVA per annum in 2051 and around £50bn over the 60-year appraisal period.

Additionality at the UK Level

Not all additional housing, employment and GVA presented in the scenarios above will be additional to the UK economy. In practice, a significant majority will be displaced from elsewhere in the country. Whilst this can generate productivity benefits – jobs in Greater Cambridge are typically more productivity than elsewhere, so if a job moves from elsewhere to Greater Cambridge, this will be associated with a productivity uplift at the national level² – this benefit is small compared to the GVA generated by a ‘new’ job displaced from abroad.

HM Treasury guidance therefore assumes (as the default starting position) that 100% of jobs are displaced at the national level, but in unique cases – such as Greater Cambridge – it can be argued that some jobs will be displaced from abroad, and genuinely ‘net additive’ to the UK economy. CPIER demonstrates that for many businesses in Greater Cambridge, particularly in

² This is referred to as the ‘Move to More Productive Jobs’ (M2MPJs) effect in WebTAG guidance

high-value, knowledge-intensive sectors such as scientific research and life sciences, Greater Cambridge is the only place in the UK that they would locate.

If Greater Cambridge is not sufficiently attractive, such as due to housing unaffordability or transport constraints, they would instead locate abroad – the ‘*Cambridge or overseas*’ argument – representing a significant loss to national economic output.

Experience from other transport business cases – notably Crossrail 2 and the Northern Line Extension to Battersea – indicates that employment displaced from abroad can represent 10% - 30% of that forecast to be generated by a transport scheme in a local area.

We have assumed, for the purposes of the SOBC, a 15% level of additionality at the national level that could be attributable to CAM. This has informed our Value for Money assessment.

Value for Money Assessment

Based on the appraisal results, we have developed an assessment of the overall value-for-money (VfM) performance of the CAM network. This is presented both for a ‘Greater Cambridge’ CAM network including the ‘core’ and ‘inner corridors’ only (as far as Cambourne, St Ives, Waterbeach, Newmarket Road P&R, Granta Park and Trumpington P&R), and the full ‘regional’ CAM network including the above plus the ‘outer corridors’ to Mildenhall, Haverhill, St Neots and Alconbury.

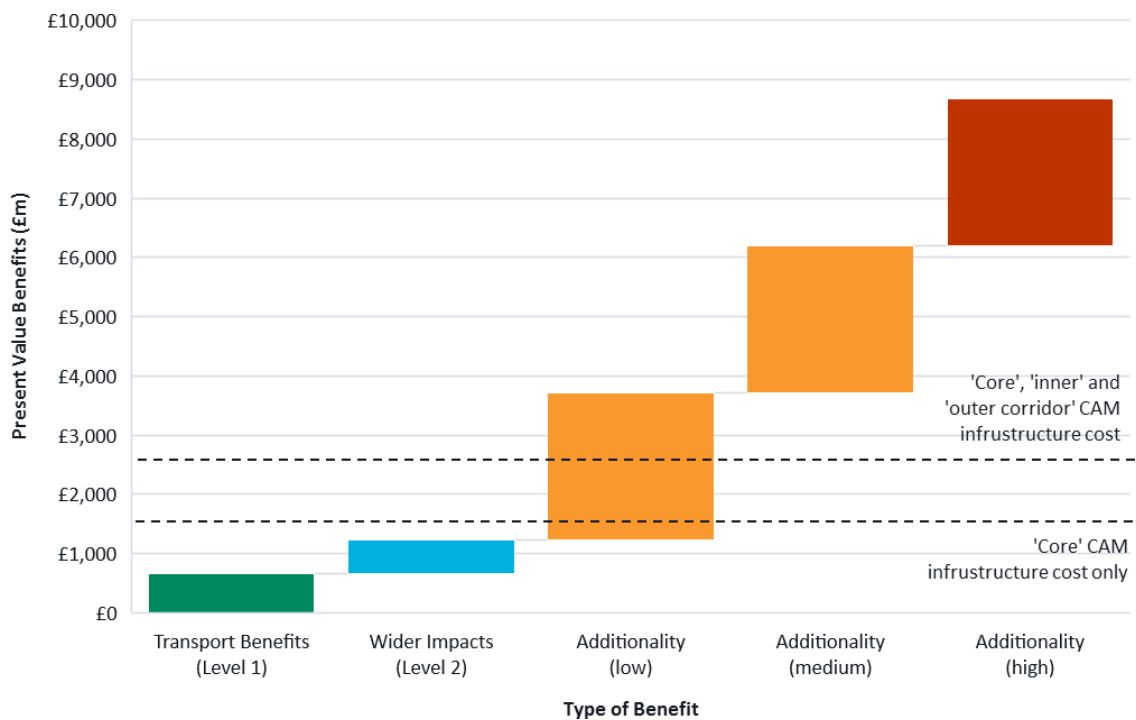
Costs Presented in VfM

The two dotted lines represent the capital costs of two network options:

- a ‘Greater Cambridge’ network extending to St Ives / Waterbeach / Newmarket Rd P&R / Granta Park / Trumpington P&R and Cambourne, with a capital cost of £2.36bn in 2018 real prices (which equates to £1.55 billion discounted to 2010 prices and values). The costs (and benefits) of the GCP infrastructure are included in the Reference Case, and are hence not represented in the diagram.
- a ‘regional’ network extending to Mildenhall / Haverhill / St Neots and Alconbury, with an assumed capital cost of £4.00 billion in 2018 real prices (which equates to £2.63 billion discounted to 2010 prices and values), inclusive of the GCP ‘inner corridor’ and CA ‘outer corridor’ scheme costs.

The operating costs and incremental revenues for the ‘Greater Cambridge’ network broadly balance in present value terms. We have not estimated the operating costs and revenues for the ‘regional’ network, but it is assumed for this assessment that the revenues delivered by the additional extensions meet their operating costs.

The costs and benefits are illustrated in Figure 7.

Figure 7: Assessment of Scheme Costs and Benefits (£m, Present Values, 2010 prices)

The analysis shows that:

- For the 'Greater Cambridge' network, the transport and wider impact benefits alone do not cover the 'core' infrastructure costs. They are, nevertheless, substantial and deliver benefits in excess of £1bn PV. However, the inclusion of 'medium' net additionality (50% attributable to CAM, of which 15% additional at the national level) would serve to increase the benefits above £6bn – almost four times higher than the costs. The implied BCR would be almost 4:1;
- For the full 'regional' network, the inclusion of additionality at an assumed 75% CAM attribution would deliver benefits of towards £9bn, compared to a full network cost (inclusive of all costs) of less than £3bn, which would deliver an implied BCR of above 3:1.

The Financial Case – How Could CAM be funded?

The Financial Case focuses on identifying potential sources of how CAM could be funded. There is now a clear expectation that a large proportion of funding for major transport investments should be secured from local sources, rather than Central Government, as seen with the funding packages that have supported the construction of Crossrail and the Northern Line Extension in London.

The focus of this Financial Case is to consider how a funding strategy could be developed utilising a range of potential funding sources to meet the capital cost of the CAM project, which is estimated at around £4,000m (2018 real prices) for the delivery of the full 'regional' network.

A robust funding strategy for large-scale transport infrastructure schemes should therefore consider finding ways of capturing the uplift in benefits enabled by the scheme as this can reduce reliance on the public purse. This approach to funding is particularly pertinent in

Cambridgeshire and Peterborough given the ambitious growth aspirations of the area, and the additional growth that can be enabled by CAM.

Policy Context

Public investment in the UK is more dependent than ever on finding sufficient funding and increasingly the ability to raise income locally is determining whether any scheme is taken forward or not. As central government funding has become increasingly constrained, the days when a public investment would be centrally funded largely on the economic, social or environmental benefits it generates have gone. In addition, devolution has focused decision making on seeking to find local sources for any particular investment.

Crossrail can be seen as setting the benchmark for establishing the case for public investment in transformative transport infrastructure and, in particular, identifying and securing an appropriate funding package. These include the following broad principles:

- A significant proportion of funding required to deliver a transport infrastructure project is from local sources;
- That the project should be able to cover its longer run operating, maintenance and ideally renewal costs;
- That a mix of local funding can be secured, supported by local businesses, developers and users; and
- That the wider economic benefits of the project are significant and that increased taxes can help recover any central government outlay (particularly through increased productivity, generating additional and higher paying jobs).

The Additionality of CAM

One of the most important aspects of any proposed investment is the question of the scale of change it can generate directly or unlock indirectly. Investment in CAM provides a step change in the capacity and capability of Greater Cambridge's transport network, supporting growth but more importantly unlocking the opportunity to transform the region's economy in a more sustainable manner.

The transformational impact of CAM and the additional scale and productivity of economic activity, in the form of additional jobs, homes and productivity, is set out in the Strategic and Economic Cases. There are a range of potential ways in which the value of additional housing, jobs and economic activity can be captured.

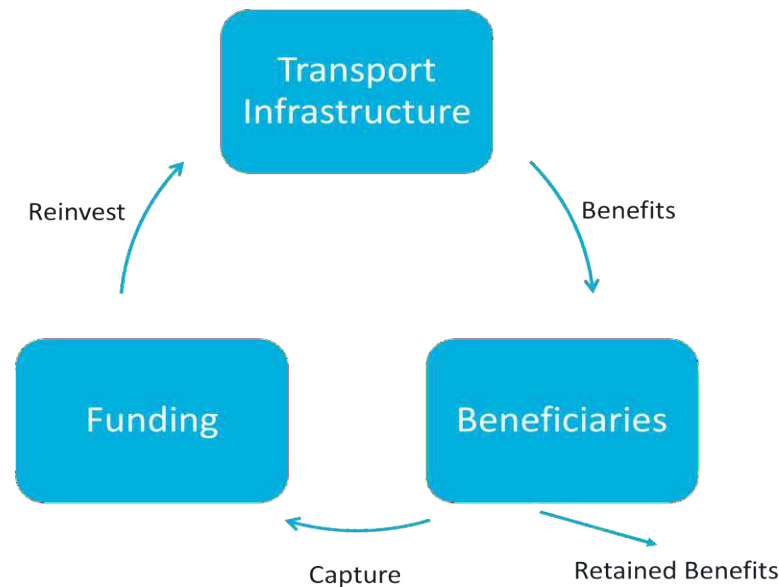
Beneficiary Pays Principle

A key concept in our assessment of funding sources is the concept of 'beneficiary pays'. This concept is based on the principle that those who benefit from the improvement in transport should contribute to its cost, where beneficiaries include both direct users of the development (such as passengers) and economic beneficiaries (such as those who obtain increased economic benefit either in capital or revenue terms from the improved transport provision). This approach creates an investment cycle where transport infrastructure generates benefits to a series of beneficiaries, with different funding mechanisms then capturing a proportion of these benefits to invest into transport infrastructure.

This process is typically led by the public sector, whereby an initial capital outlay in the form of a transport investment is subsequently repaid by additional income from the scheme beneficiaries, such as through a combination of increased fare receipts and/or Section 106 and

business rate contributions from additional housing and commercial development that would not have occurred without the scheme. Both the funding of Crossrail and the Northern Line Extension to Battersea Power Station are based, at least in part, upon this principle.

Figure 8: Beneficiary Pays Cycle



A step-change improvement in transport accessibility, connectivity and capacity enabled by CAM will result in a range of beneficiaries, whether passengers who benefit from the improvement in service or developers who benefit from increased land values near the stations. An overview of beneficiaries of the mass transit options in Cambridge is set out in Table 6, including how they may benefit from the project.

Table 6: Potential Beneficiaries of Transport Infrastructure

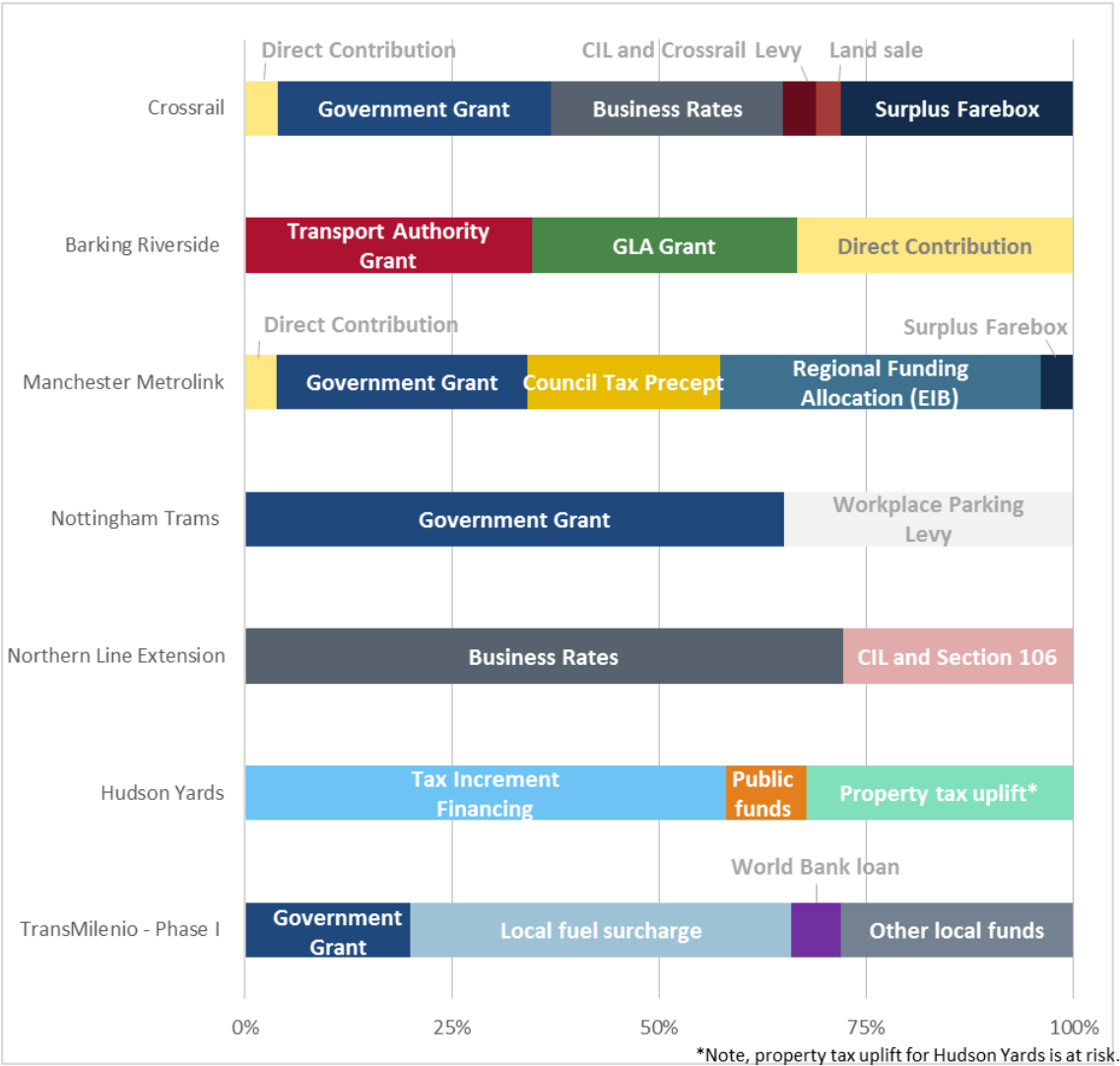
| Benefactor | How they benefit from transport | Potential capture mechanisms |
|----------------------------|---|--|
| Developers and land owners | Increased land value as more businesses and/or residents look to relocate to the area. This benefit translates into a financial benefit as higher land values can result in higher density developments and/or an increase to rental values and/or sale incomes. | <ul style="list-style-type: none"> Developer / Direct contributions CIL/MCIL/SIT Land Value Capture Stamp duty retention |
| Businesses/ Workers | Agglomeration as greater productivity and lower costs arising from the concentration of economic activity. The increased concentration has a productivity 'bonus' that is shared between businesses and workers that can lead to increased revenues and/or reduced costs. In addition, businesses can benefit from being able to draw from a wider pool of prospective employees who can more easily access their business. | <ul style="list-style-type: none"> Business rate uplift retention Business rate supplement Workplace parking levy |
| Residents | Better connectivity and increased mobility providing access to more jobs and amenities and (if they own their property) through an uplift in land values. | <ul style="list-style-type: none"> Council tax supplement Council Tax retention |

| Benefactor | How they benefit from transport | Potential capture mechanisms |
|---------------------|---|---|
| Transport Users | Reduced journey times, improved reliability and/or increased frequency. These benefits allow users to access a wider pool of jobs and can lead to productivity gains where both may result in financial benefits to the user. | <ul style="list-style-type: none"> • Intelligent charging/ • Parking levy • Operator access fee • Farebox surplus |
| The Road Maintainer | Reduced road usage as people increasingly travel by public transport, walking or cycling as opposed to by private car. In this instance, it may reduce the need to expand the road network around Cambridge to meet growing demand. | <ul style="list-style-type: none"> • Shadow Tolls |

Case Studies

The funding strategy developed for CAM will be bespoke, aligned to beneficiaries and cognisant of the specific opportunities and challenges within the Greater Cambridge context. The case studies shown in Figure 9 overleaf show that that promoters in different contexts have developed funding strategies based on a different blend of funding sources.

Figure 9: Funding strategies from Recent Transport Investments



Overview of Funding Sources

A number of funding sources with the potential to support CAM have been identified. These focus on funding that can be generated locally, and is informed by the case studies alongside the additionality driven by CAM and the concept of beneficiary pays.

Each funding mechanism is described in the main report, and an initial qualitative assessment of these funding mechanisms outlined above has been undertaken to highlight the advantages and challenges across the different potential sources. This qualitative assessment is set out in the main body of the SOBC.

Following the SOBC, it will be important to consult with the various local public and private bodies to gauge views on funding options in order to help filter the funding sources presented and identify the most feasible funding strategy. Preparing and presenting evidence that directly illustrates the benefits from CAM during this consultation will increase the chance of support for the scheme. For instance, when introducing a BRS in London, a wider economic benefits assessment of Crossrail was undertaken to demonstrate that the benefits received by

businesses in each borough was greater than the financial support they were being asked to provide.

Further developing the funding strategy will be a priority next steps in taking the CAM proposition. Next steps will include:

- Consulting with local stakeholders, local business groups and developers on the feasibility of the options outlined in the Financial Case;
- Continuing the ongoing dialogue with UK Government to set out the additionality benefits of CAM at the UK-level and discuss the potential for securing the ability and powers to leverage local funding sources and / or the ability to secure funding from Government.
- Further analysis of the practicality of introducing the funding options identified and the scale of funding that could be raised;
- To consider in more detail how to bridge any remaining funding gap, including further assessment of Land Value Capture mechanisms; and
- To assess financing issued, outline options and discuss with financing experts on requirements to establish a robust financing package (for example to mitigate risk).

The Commercial Case – How will CAM be procured and operated?

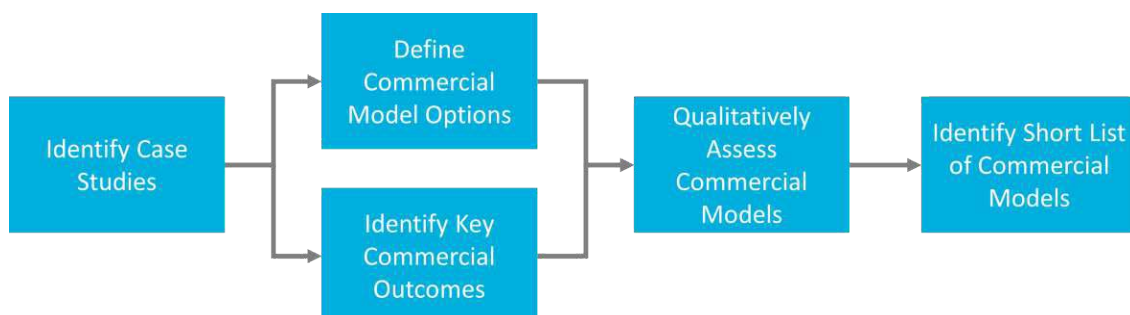
Approach

The Commercial Case should ensure that the Promoting Authority is able to oversee the delivery of the project and the output specification, in terms of quality, service level and performance, and hence ensure the scheme delivers the transport benefits and wider outcomes envisaged and meets its overall objectives.

The delivery of a successful project is dependent on its commercial viability. The delivery of CAM should be delivered in a way that: allocates risk appropriately across contracts; incentivises the intended outcomes in terms of performance, efficiency and innovation; facilitates the delivery of the project to time and budget; and secures the targeted economic, social and environmental benefits of the project as discussed with stakeholders and agreed with decision makers.

The approach undertaken as part of the Commercial Case is summarised in Figure 10.

Figure 10: Commercial Case Approach



Commercial Models

Based on case studies we have outlined four possible commercial models against the delivery responsibilities. Option 1 is a fully publicly led option, in which the CPCA or the contractors engaged by the CPCA deliver the project. Option 2 is similar to Option 1, with the exception that the 'operations and maintenance' responsibility is contracted to a private contractor. Option 3 is a 'design, build, operate and maintain' contract with the private sector, where there are several different variants in the structure of how the contracts are tendered. Option 4 is a 'design, build, finance, operate and maintain' contract to the private sector where, similarly to Option 4, there are several different variants in the structure of how the contracts are tendered.

Figure 11: Commercial models by Delivery Responsibilities

| | Option 1 Public Led | Option 2 Private O&M | Option 3 Private DBOM | Option 4 Private DBFOM |
|--------------------------|---|-------------------------|--------------------------|-------------------------------|
| Planning & Design | Public | Public | Private | Private |
| Construction | | | | |
| Vehicles | | | | |
| Operations & Maintenance | | Private | | |
| Ownership of Assets | | Public | Public | Public |
| Funding/Finance | Public | Public | Public | Public/Private |
| Case Study | Northern Line Extension and West Midlands Metro | Crossrail | Manchester Metrolink | Nottingham Express Transit |

Initial Assessment of Delivery Options

An initial qualitative assessment of these commercial models has been undertaken against the criteria below.

Table 7: Key Commercial Outcomes

| Key Commercial Outcome | Description |
|----------------------------|---|
| Public Balance Sheet | Limit the impact on the public balance sheet and maximise third party funding options |
| Risk and Responsibilities | Efficient allocation of roles, risks and responsibilities between delivery parties |
| Interfaces and Integration | Limit the number of interfaces in the commercial structure and facilitate integration with other services |
| Procurement Compliance | Ensure compliance with procurement rules |
| Competition | Maximise the opportunity for competition to drive the best Value for Money of the public sector |
| Timescales | Facilitate the delivery to optimal timescales |

Findings

CAM is a fundamental requirement for the CPCA to reach their growth ambitions over the next few decades. Each commercial delivery model has strengths and weaknesses, with trade-offs dependent on the extent to which project engineering, operational and financing risks are shared between the private and public sectors. Future work will therefore establish the preferred commercial model to deliver CAM at OBC stage.

The Management Case – The Delivery of the CAM Project

Overview

The purpose of the Management Case is to demonstrate that the preferred option can be delivered successfully. It provides details about the resources the Sponsor expects will be required to deliver the proposal and arrangements for managing budgets. It identifies the organisation responsible for implementation, sets out when agreed milestones will be achieved, and identifies a date when the proposal will be completed.

As the CAM project is only at the SOBC stage of development, the Management Case has been developed to an initial, outline level. It sets out the proposed sponsorship, governance and delivery agencies for CAM, alongside the processes required for stakeholder management and communications, change control and risk. The Management Case will be completed more fully as part of a future Outline Business Case. The implications of the Management Case should feed into the appraisal and must be reflected in the future versions of the economic, commercial and financial cases within the OBC.

Conclusions and Next Steps

This SOBC demonstrates that CAM has the potential to transform the connectivity and quality of Greater Cambridge's transport network, and support the long-term growth ambitions of the CPCA and GCP in a sustainable manner. CAM would deliver value-for-money and be operationally affordable. The Strategic and Economic Case for CAM is therefore compelling.

There are a range of potential funding and financing sources that could fund the delivery of the project, and developing the funding strategy further will be a key focus of the next stage of project development. Similarly, there are a number of different delivery models for the implementation of CAM, outlined in this report, that would be developed as the scheme progresses.

The next step, subject the necessary approvals, will be the development of an Outline Business Case (OBC) for the scheme where the design, technical work and analysis presented in this report would be progressed to the point of identifying a preferred scheme. The OBC process would also involve extensive stakeholder and public consultation, which would inform the development of the scheme and ensure it best meets local objectives.

1 Introduction

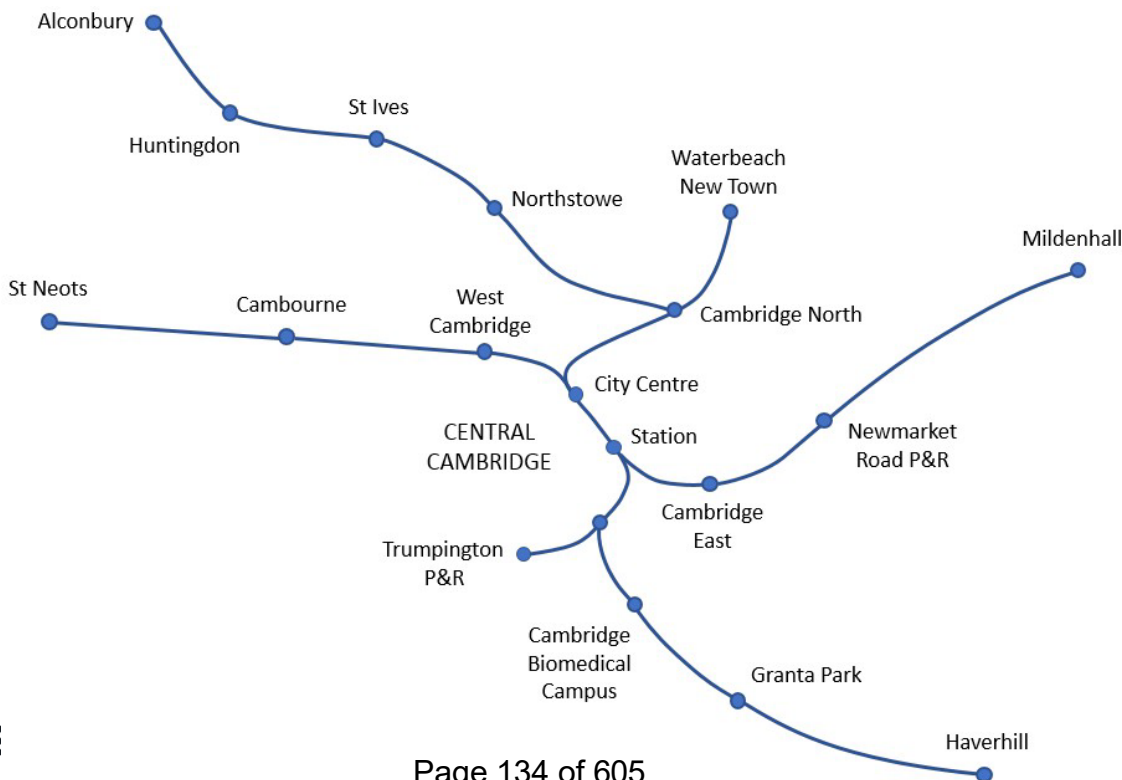
Background and Context

- 1.1 The Greater Cambridge Mass Transit Options Assessment Report, published in January 2018, identified a concept network for a metro system serving Greater Cambridge and connecting key locations across the region. The network was developed to address key transport constraints and support the ambitious growth ambitions of the region. The concept envisaged tunnelled sections, where required, to secure segregated running within and across the city.
- 1.2 This Strategic Outline Business Case, or SOBC, is intended to set out the case for investment, and provide decision-makers with the evidence on whether, and how, to take the scheme forward to Outline Business Case stage (OBC).

Cambridgeshire Autonomous Metro (CAM)

- 1.3 The Cambridgeshire Autonomous Metro (CAM) will provide a high-quality, fast and reliable transport network that will transform transport connectivity across the Greater Cambridge region. The vision for the project is an expansive metro network that seamlessly connects Cambridge City Centre, key rail stations (Cambridge, Cambridge North and future Cambridge South), major city fringe employment sites and key ‘satellite’ growth areas, both within Cambridge and the wider region. It would be operated by high-quality, electrically powered vehicles, segregated from traffic through a tunnel under Central Cambridge, to ensure frequent, reliable journeys.
- 1.4 Figure 1.1 outlines the key corridors proposed to be served by the Cambridgeshire Autonomous Metro.

Figure 1.1: CAM Network Map



Strategic Outline Business Case

- 1.5 This report sets out the Strategic Outline Business Case (SOBC) for the Cambridgeshire Autonomous Metro (CAM). The purpose of the SOBC is to establish the case for investment in the CAM network, based on HM Treasury's Five Case Business Case model.
- 1.6 This SOBC seeks to demonstrate that CAM:
- is supported by a robust case for change that aligns with wider objectives – the '**strategic case**';
 - represents value for money – the '**economic case**';
 - is commercially viable – the '**commercial case**';
 - is financially affordable – the '**financial case**'; and
 - is achievable – the '**management case**'.
- 1.7 As part of the scheme development undertaken for the Strategic Outline Business Case (SOBC) there has been substantive work to develop this concept to a 'feasibility' design level. Design and technical development work has been undertaken to demonstrate that the scheme is feasible and deliverable, focusing upon the core, tunnelled infrastructure, since this acts as both the critical 'enabler' of the wider CAM network, and is most complex in terms of identifying design solutions which are potentially feasible, suitable and acceptable.
- 1.8 The Strategic Case for CAM centres on its ability to enable and accelerate additional economic growth within Greater Cambridge, through supporting the sustainable delivery of additional jobs, housing, and GVA through investment to alleviate the region's transport constraints. The Strategic Case demonstrates that a combination of limited transport capacity and accessibility undermines future development, exacerbates housing unaffordability, and puts future growth at risk.
- 1.9 The Economic Case demonstrates how delivering this additional growth, alongside transforming the quality of public transport provision, delivers significant benefits at both the regional and national level that justify the expenditure of the scheme. It outlines how, when the benefits of this additional growth dependent of CAM are captured, the scheme represents good value-for-money.
- 1.10 At SOBC stage, the Financial, Commercial and Management Cases are developed to a more outline level of detail than the Strategic and Economic Cases, reflecting the early stage of scheme development. However, the Financial Case sets out the principles that will underpin the development of a funding strategy, and identifies a range of potential funding mechanisms. The SOBC sets out the overall case for investment, and more work on funding involving a range of stakeholders has recently commenced. The Management and Commercial Cases outline how (and by whom) the scheme is proposed to be planned, developed, procured and operated. This will be reviewed and developed further if the scheme is progressed to Outline Business Case (OBC).

Each case is clearly set out as a respective chapter within this SOBC.

2 Strategic Case

Introduction

- 2.1 This Chapter outlines the ‘case for change’ for CAM. It discusses the strengths and opportunities for the Greater Cambridge economy, the key transport and housing constraints that act to limit the region’s potential, and the ability for CAM to provide the transport capacity and accessibility to support growth into the future.
- 2.2 It comprises four parts:
- **Part A: The Opportunity for Growth** explores the opportunity and ambition for growth in Greater Cambridge, and the identified challenges which, unless addressed, will act to constrain this economic potential;
 - **Part B: The Case for Change** outlines how the strategic case for the scheme is rooted in local and national policy, aligns with and can shape the region’s plans for future growth and development, and is effectively targeted at the region’s transport constraints;
 - **Part C: The CAM Vision, Objectives and Scope** outlines the network vision and scheme objectives for CAM, together with the scope of the scheme and options assessment process;
 - **Part D: The Benefits of CAM** summarises the benefits of CAM, and how it delivers against the scheme objectives.
- 2.3 Greater Cambridge is currently experiencing record levels of growth, delivering tens of thousands of new jobs to the region, reaffirming its position as one of the UK’s most productive and dynamic areas. However, without investment to improve transport capacity and connectivity, future growth is at risk.
- 2.4 The Cambridgeshire and Peterborough Independent Economic Review (CPIER) demonstrates that the *success of Cambridgeshire and Peterborough is of national importance*. This Chapter outlines how CAM can support the region’s sustainable growth, and therefore benefit the UK *as a whole*.

Part A: The Opportunity for Growth

Introduction

- 2.5 The “Greater Cambridge” economy is going from strength-to-strength. Over the past two decades, it has grown at an average of 2.5% annually – significantly greater than the national average – with employment growth helping to increase income per head by 11% in real terms between 2011 and 2016³. Much of this growth has occurred in knowledge-intensive sectors, often with close ties to the University of Cambridge.
- 2.6 Under the recent ‘Devolution Deal’ between the Cambridgeshire and Peterborough Combined Authority (CPCA) and the Government, ambitious new regional growth targets have been set, including doubling GVA over the next 25 years. Achieving this requires a marked acceleration in current growth rates, which will be challenging as the region’s housing, transport and digital infrastructure are rapidly becoming major constraints on future growth. Investment in strategic infrastructure will be vital to relieving these constraints and delivering the target level of growth.
- 2.7 This Section explores the Greater Cambridge economy in more depth, and outlines the region’s potential for growth. Helping to realise this growth potential underpins the Strategic Case for CAM.

Figure 2.1: Map of Greater Cambridge



³ Cambridgeshire and Peterborough Independent Economic Review, September 2018

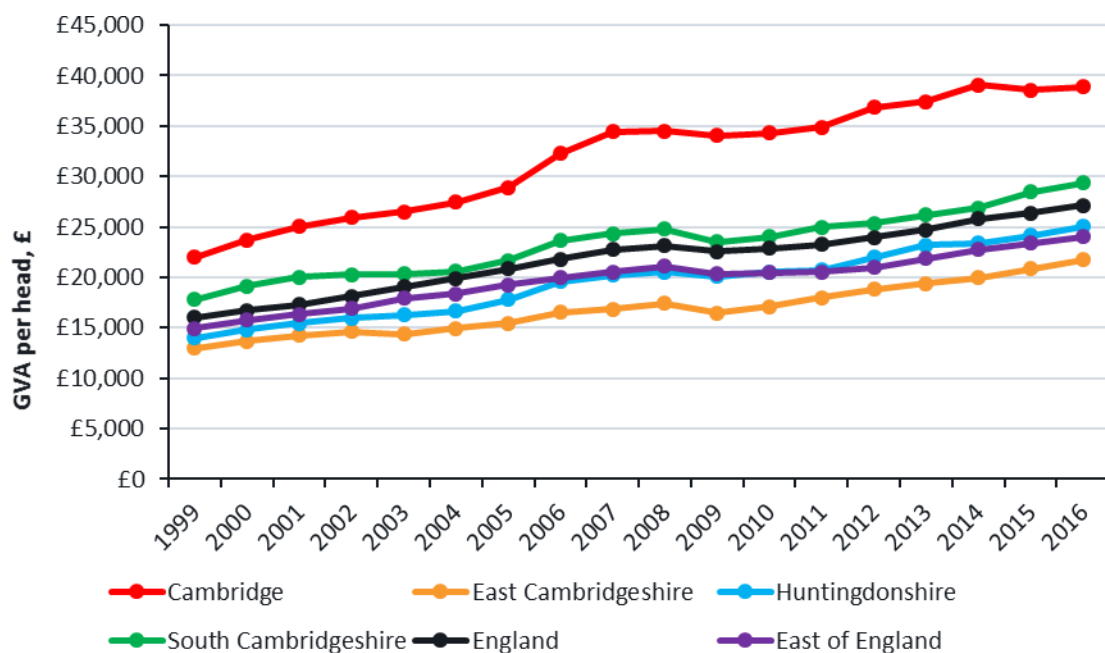
The Greater Cambridge Economy

- 2.8 Greater Cambridge, defined as the area encompassing the City of Cambridge, South Cambridgeshire, and parts of Huntingdonshire and East Cambridgeshire, is a thriving region⁴. It is home to more than 459,000 people, a world-leading university, and a highly productive and dynamic economy. Cambridge acts as the centre of “Silicon Fen”, a leading global cluster of biomedical, software, programming and life science firms, which sustain the region’s high-tech economy and compete on a national and international stage. Historic Cambridge, together with the towns and villages of surrounding South Cambridgeshire and Huntingdonshire, offer an outstanding quality of life which underpins the region’s success, and attracts talent from across the world.

High levels of productivity

- 2.9 These characteristics support an economy which is one of the most productive in the UK. This is particularly the case in Cambridge and South Cambridgeshire, as illustrated in Figure 2.2, where the GVA per head is £39,000 and £29,000 respectively, significantly higher than the England average. Over the past 20 years, Cambridge has shown particularly strong productivity growth, notably higher than the other ‘Greater Cambridge’ local authorities, largely because of its concentration of high-skill, high-value employment.

Figure 2.2: Regional, balanced, Gross Value Added (GVA), by Local Authority area



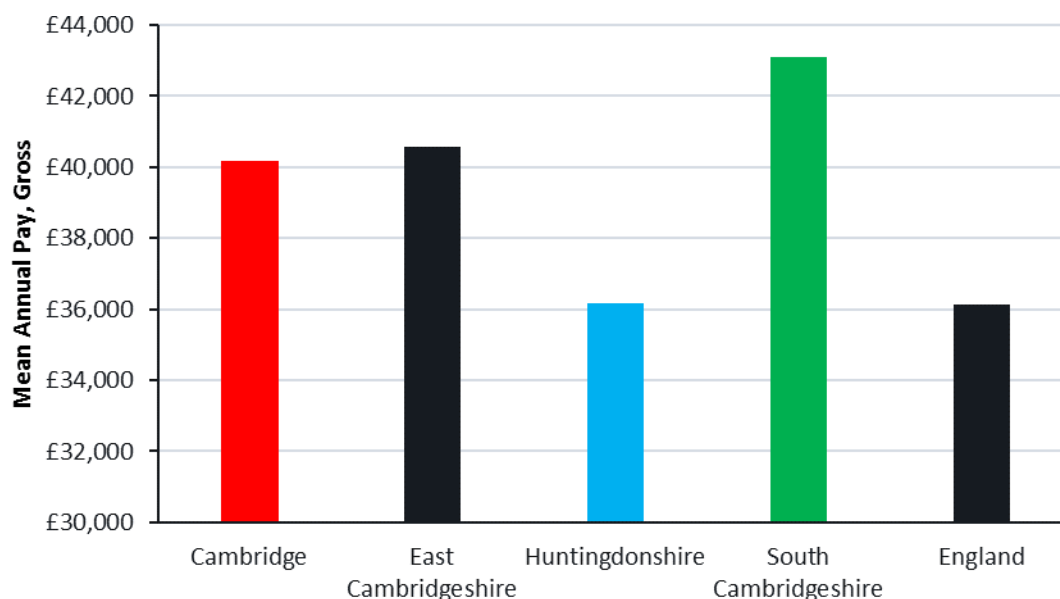
Source, Office for National Statistics, Regional gross value added (balanced) reference tables

- 2.10 High levels of productivity support a high-wage economy. Figure 2.3 indicates that all districts in Greater Cambridge have higher levels of pay than the England average. Notably, South

⁴ Area as defined by the CPIER report. Note, that the Greater Cambridge Partnership (GCP) defines ‘Greater Cambridge’ as including only the City of Cambridge and the surrounding South Cambridgeshire district. By this definition Greater Cambridge encompasses a population of approximately 280,000 people.

Cambridgeshire and East Cambridgeshire both have higher levels of mean annual pay per head than Cambridge, despite both having lower GVA levels. This is because of the high levels of ‘in-commuting’ from these areas to Cambridge city, where employment is concentrated.

Figure 2.3: Gross Mean Annual Pay per head, 2016



Source: Office for National Statistics, Annual survey of Hours and Earnings

- 2.11 Several key characteristics stand out in terms of explaining Greater Cambridge’s success: a skilled workforce, a culture of innovation and knowledge-sharing, and high levels of clustering and agglomeration.

Skilled, well-educated workers

- 2.12 Employment in professional, scientific and technical sectors in Greater Cambridge is more than double the national average. These sectors heavily rely on access to a well-educated, highly skilled workforce for their success. Within the City of Cambridge, 44% of the population hold an NVQ4 or above qualification, almost double the national average of 27%, while 34% hold degree-level qualifications (BA / BSc or higher), compared to the national average of 17%⁵.

- 2.13 The University of Cambridge, and associated academic start-ups, are key ‘attractors’ of skilled workers to the region. Connecting such firms with skilled labour is key to Greater Cambridge’s success: the Cambridge and Peterborough Independent Economic Review (CPIER) noted that the availability and quality of the workforce in Cambridge is critically or very important for 44.6% of businesses who have chosen to locate in the city. Many of these workers live outside the City of Cambridge, and depend on a well-functioning transport network to commute to the region’s business and science parks where employment is concentrated.

An innovative, collaborative culture

- 2.14 Greater Cambridge’s extensive networks of academic staff, skilled workers and postgraduate students fosters a culture of co-operation, knowledge sharing and innovation, known as the “Cambridge Phenomenon”. Collaboration and innovation, driven by the clustering of high-tech firms, skilled workers and academics is key to generating the products and ideas that the region so successfully exports elsewhere. This innovation is evidenced by the fact that within

⁵ Office for National Statistics, 2011 Census

Cambridge there are 341 patent applications per 100,000 people⁶, more patents per person than the next six cities combined⁷.

- 2.15 Firms choose to locate in Greater Cambridge – despite the high cost of doing so – due to the availability of skilled, innovative staff, and the high concentration of other knowledge-intensive (KI) firms. Firms benefit from being located close to one another, either physically or through good transport connectivity, as it facilitates collaboration and competition. This allows firms to learn and benefit from each other's best practices, reduce costs by sharing resources, and have access to an extensive pool of skilled labour. One respondent to the CPIER summarised the advantages of locating in Cambridge as:

“Lots of diverse and interesting companies. Plenty of growth and opportunities. A number of strong clusters for people to build careers. A pleasant local environment with good facilities” CPIER, page 52

- 2.16 In Cambridge, the concentration of professional, scientific and technical activities is approximately two and a half times higher than the English average, and the city is home to over 1,000 technology and biotechnology companies (1,400 when providers of services and support organisations are included), including 61 bio-technology firms⁸. Certain pockets of the city act as 'clusters' for specific sectors: the Cambridge Science Park is home to more than 70 software and technology firms⁹; the Cambridge Biomedical Campus a network of healthcare facilities and life sciences and pharmaceutical companies and start-ups.
- 2.17 In total, over 60,000 people work in KI sector companies in the Greater Cambridge Region. The largest knowledge-intensive firms in this region include¹⁰:
- *ARM Holdings*, a multinational semiconductor and software design company with over 1,600 employees in Cambridge;
 - *Aveva Group*, a global information technology and software design company that employs just under 1,700 people in Cambridge;
 - *AstraZeneca*, a multinational pharmaceutical and biopharmaceutical company with over 2,500 staff employed in Cambridge, and expected to open its new global HQ at the Cambridge Biomedical Campus in 2020;
 - *Dialight plc*, an electronics business specialising in light-emitting diode lighting, which employs over 2,100 people in nearby Newmarket;
 - *Marshall of Cambridge*, an aircraft maintenance, modification and design company located at Cambridge Airport, which employs 2,100 people on this site; and
 - *PDD Laboratories*, a biotechnology company which employs just under 1,500 in Cambridge.
- 2.18 Figure 2.4 highlights the recent clustering of the life sciences industry surrounding Cambridge. It clearly highlights the dense – and growing – patterns of clustering surrounding the city, and the key role of agglomeration in guiding the region's development.

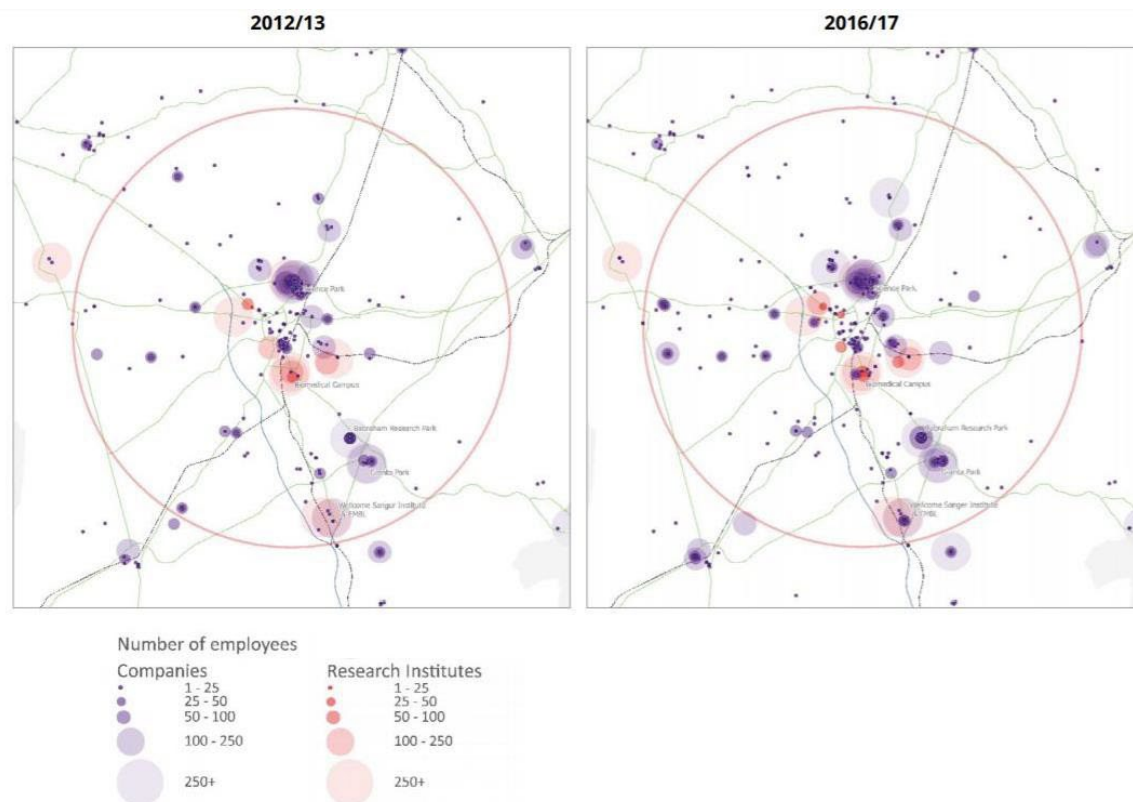
⁶ Cambridgeshire and Peterborough Independent Economic Review (CPIER)

⁷ Centre for Cities, Cities Outlook 2014

⁸ Cambridgeshire and Peterborough Independent Economic Review (CPIER)

⁹ [Cambridge Science Park](#), November 2018

¹⁰ University of Cambridge, [Link](#)

Figure 2.4: Life sciences companies and research institutes within 10 miles of Cambridge

Source: Dr Andy Cosh, University of Cambridge

Source: reproduced from CPIER

Cambridgeshire and Peterborough's Ambitions for Growth

- 2.19 The Cambridgeshire and Peterborough Combined Authority and the Greater Cambridge Partnership share a strong commitment to supporting growth and unlocking the region's potential. Under the 2017 'Devolution Deal', the region's newly-elected mayor, James Palmer, committed to doubling regional GVA by 2040. This will require accelerating current growth rates, from 2.5% to 2.8% per annum, but more fundamentally will require a significantly greater rate of growth of housing delivery compared to current Local Plan targets.

The Cambridgeshire and Peterborough Combined Authority

- 2.20 The Cambridgeshire and Peterborough Combined Authority (CPCA) was created in 2017, following the publication of a "Devolution Deal" with Government in March 2017. Led by a directly-elected Mayor, James Palmer, the CPCA is responsible for newly-devolved powers from Government regarding strategic issues that cross council boundaries, including transport, planning, housing, education and capital investment. Since April 2018, it has also taken on the functions of the former Greater Cambridge, Greater Peterborough Local Enterprise Partnership.

Aspirations of the Combined Authority

- 2.21 The Cambridgeshire and Peterborough "Devolution Deal" was developed to better support and realise the region's economic growth potential. Granting the region greater powers from Central Government will allow it to build upon recent successes by targeting economic and transport investment at a local level. The Cambridge and Peterborough Combined Authority has set several clear, ambitious targets for the region, including:

- Doubling the size of the local economy over the next 25 years, boosting regional GVA from £22bn to £40bn;
- Accelerating house building rates to meet local and UK need, delivering 72,000 new homes over the next 15 years, including several major new settlements;
- Delivering much needed transport and digital links;
- Creating an area that is internationally renowned for its low-carbon, knowledge-based economy;
- Transforming public service delivery to be much more seamless and responsive to local need;
- Enhancing the region's position as a global leader in knowledge and innovation, further developing its key sectors including life sciences, information and communication technologies, creative and digital industries, clean tech, high-value engineering and agri-business; and
- Improving the quality of life for all by tackling areas suffering from deprivation.

2.22 The new powers given to the Combined Authority to help achieve these goals include a 30-year, £600 million investment fund to grow the local economy, £170 million for new homes, responsibility for chairing a review of 16+ skills provision, joint responsibility with the government and the Employment and Skills board to co-design the new National Work and Health programme, and more effective joint working with the Department of International Trade (formerly UK Trade and Investment) to develop a Joint Export Plan.

2.23 Additionally, the Mayor, as the Chair of the Combined Authority, will have responsibility for a new transport budget, a key route network of local authority roads and powers over strategic planning (including control over a £100 million housing and infrastructure fund and the responsibility to create a non-statutory spatial framework).

2.24 Fundamentally, the Combined Authority recognises the essential need to invest in housing and transport infrastructure to achieve sustainable growth while improving the quality of life for people who live and work in Cambridgeshire and Peterborough.

“Cambridgeshire and Peterborough recognise that for the Combined Authority to meet and exceed its ambitious targets for growth and wealth creation it needs to connect people and places” Cambridgeshire and Peterborough, Devolution Deal, HM Government

The Greater Cambridge City Deal and the Greater Cambridge Partnership

2.25 The Greater Cambridge City Deal, established in June 2014, is an agreement between the region of Greater Cambridge and Central government to provide up to £500m of central government funding to “enable a new wave of innovation-led growth, by investing in the infrastructure, housing and skills that will facilitate the continued growth of the Cambridge Phenomenon”¹¹. To deliver this package, the Greater Cambridge Partnership (GCP) was established to coordinate and deliver the City Deal programme.

¹¹ Greater Cambridge City Deal, available at: <https://www.gov.uk/government/publications/city-deals-greater-cambridge>

Aspirations of the Greater Cambridge Partnership

2.26 Covering the area defined by the Cambridge and South Cambridgeshire local authorities, the GCP's key aims include:

- Accelerate delivery of 33,500 new homes;
- Creation of 45,000 new jobs;
Provision of £1bn of local and national public-sector investment, enabling an estimated £4bn of private sector investment in the Greater Cambridge area; and,
- Delivery of a new governance arrangement, joint decision making and the framework, funding and assurance to enable growth to take place.

2.27 Overall, the City Deal – and the GCP – both recognise that whilst growth to date has been widely celebrated, it has contributed towards a shortage of housing and worsening traffic congestion that threatens future economic growth. It identifies that Greater Cambridge must grow physically – with new housing and employment on fringe sites – whilst maintaining connectivity between key economic hubs to continue to offer the high quality of life that contributes so significantly to the area's attractiveness and success.

The Shared Growth Agenda

2.28 Both the Mayoral 'growth agenda', and the Greater Cambridge Partnership and City Deal, share a joint agenda around supporting sustainable growth while maintaining quality-of-life through investing in transport, housing and skills. These shared priorities are summarised in Table 2.1.

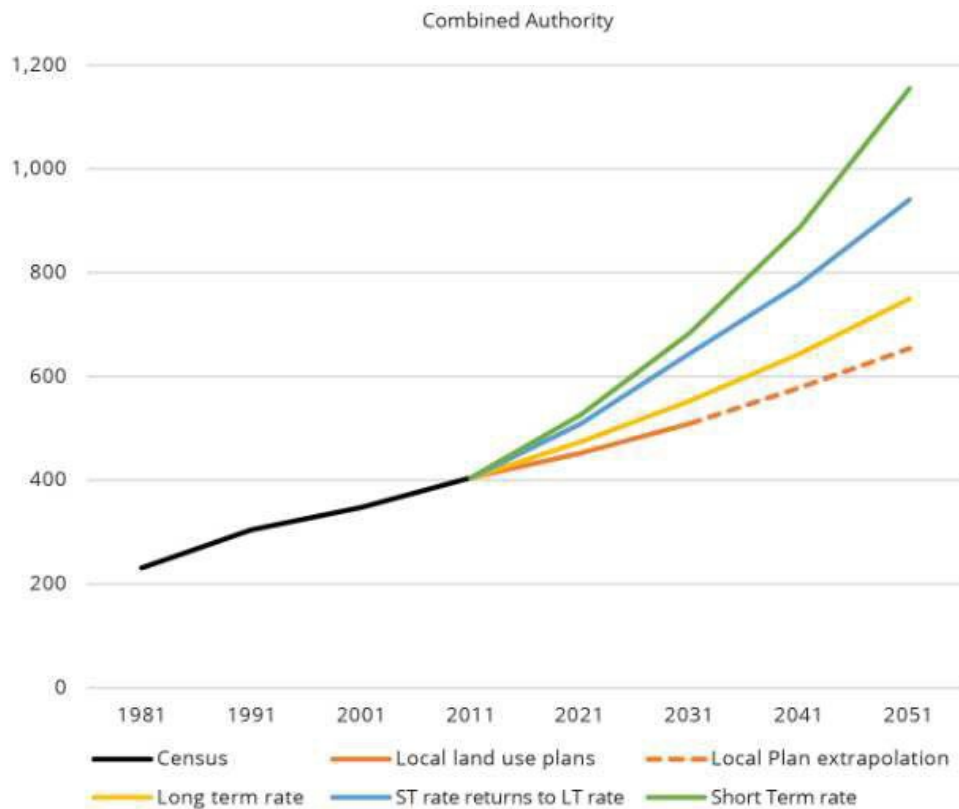
Table 2.1: Shared Mayoral and GCP / City Deal Priorities

| Theme | Mayoral Priority | GCP and City Deal priority | Outcomes |
|------------------------|--|--|---|
| Transport | <ul style="list-style-type: none"> • Encourage mode shift away from the private car • Improve the quality of the highway network • Develop a large-scale public transport network • Improve movement throughout the city | <ul style="list-style-type: none"> • Encourage sustainable travel, removing cars and traditional busses from local Cambridge roads • Deliver better, greener transport | <ul style="list-style-type: none"> • Reduce congestion, and minimise the damaging impacts of air pollution • Safer and more comfortable car journeys • Wider usage of the public transport system • Continue to increase productivity |
| Jobs and skills | <ul style="list-style-type: none"> • Encourage growth and economic agglomeration • Encourage international investment • Improve access to jobs and education | <ul style="list-style-type: none"> • Connect markets and jobs to the 'talent' they need • Support job and apprenticeship growth in the region | <ul style="list-style-type: none"> • Provides world class jobs for residents • Encourages economic growth and prosperity • Allows a more productive economy and spreads access to opportunities • Provides good future opportunities for young people |

| | | | |
|----------------|--|--|---|
| Housing | <ul style="list-style-type: none"> • Build new affordable homes • Accelerate delivery of homes • Link new settlements • Improve air quality and the quality of public realm spaces | <ul style="list-style-type: none"> • Plan for additional new homes on rural exception sites • Accelerate the delivery of homes in local plans by 2031 • Connect rural sites to the city centre • Improve sustainability of, and interconnectivity between, communities | <ul style="list-style-type: none"> • Unlocks future development sites • Promptly unlock future development sites • Connect new settlements to the core and improve the development viability of rural sites • Create strong and healthy communities and an overall better quality of life for residents |
|----------------|--|--|---|

Realising the Ambition: The Cambridge and Peterborough Independent Economic Review (CPIER)

- 2.29 The Cambridge and Peterborough Independent Economic Review (CPIER) was published in September 2018. It provides an evidence-based, independent assessment of the Cambridgeshire and Peterborough economy and its potential for growth, together with important support for several strands of this SOBC.
- 2.30 Critically, CPIER developed a number of scenarios for the volume of housing, employment and productivity growth required to double the size of the Cambridgeshire and Peterborough economy. Figure 2.5 outlines the employment growth scenarios presented in CPIER; the 'central case' scenario is represented by the blue line, and envisages growth from approximately 400,000 jobs in 2011 to 930,000 in 2051, compared to a 'business as usual' scenario of 640,000 jobs, based on Local Plan extrapolation, represented by the orange line. Combined with an 'ambitious but achievable' productivity increase of 0.8% per year, the 'central case' employment forecast will allow the region's GVA target to be met.
- 2.31 Investment in infrastructure, including transport, will be critical to facilitating this growth, as recognised by the Combined Authority and the GCP. CAM has therefore been developed first and foremost to provide the transport capacity and accessibility required to support the region's ambitions for growth, and overcome the factors that act to constrain it.

Figure 2.5: CPIER Employment Projections under different growth scenarios

Source: Dr Ying Jin, University of Cambridge, reproduced from CPIER, page 20

- 2.32 CPIER therefore provides a valuable evidence base which we have used to support the development of the SOBC. Key themes in CPIER, and how they relate to CAM, are summarised in Table 2.2.

Table 2.2: CPIER Themes and their Relevance to this SOBC

| CPIER Theme | Relevance to SOBC |
|---|---|
| <ul style="list-style-type: none"> Identifies the baseline position of the Combined Authority, and the unique strengths of the Greater Cambridge economy | <ul style="list-style-type: none"> Evidence informs Strategic Case |
| <ul style="list-style-type: none"> Identifies that the future success and growth of the CA and Greater Cambridge economy is of both regional and national importance Argues that the growth potential of the region is considerable, in particular of knowledge-intensive (KI) sectors – and that since much of this growth should be considered ‘net additional’ at the national level – a ‘Cambridge or Overseas’ approach should be taken | <ul style="list-style-type: none"> Provides the underlying rationale for the development of CAM within the wider sub-regional policy context Informs CAM objectives Provides the evidence that, where CAM can overcome constraints on growth, a proportion of the GVA uplift can be considered additional at the ‘national’, and simply ‘local’, level |
| <ul style="list-style-type: none"> Sets out how the Devolution Deal target of doubling GVA can be achieved – including a ‘central projection’ for jobs whereby the regions jobs would increase from 400,000 in 2011 to 930,000 by 2051. This compares against a ‘business as usual’ (Local Plan extrapolation) increase in jobs to approximately 640,000 Establishes that achieving this level of employment growth will need to be supported by the delivery of 6,000 – 8,000 homes per year | <ul style="list-style-type: none"> Provides an evidence-based starting point for the ‘growth and additionality’ scenarios within the SOBC Economic Case Informs the indicative level of additional housing (above ‘business as usual’) that is required to support the employment additionality |

| | |
|---|--|
| <ul style="list-style-type: none"> Identifies the key challenges faced if the target of jobs (and hence the related target of doubling GVA) is to be achieved, including: <ul style="list-style-type: none"> – accelerating housing delivery – improving transport accessibility – maintaining and enhancing quality-of-life | <ul style="list-style-type: none"> Challenges are set out and described in the Strategic Case, and help frame the CAM objectives. The role of CAM in addressing these challenges, and hence supporting the region's growth, is outlined later in the Strategic Case |
| <ul style="list-style-type: none"> Identifies several 'spatial strategy' options that can best deliver sustainable housing and employment growth. Recommends a 'blended spatial strategy' which would increase the total size of the economy while ensuring an equitable balance of growth across the CA region | <ul style="list-style-type: none"> Description of how CAM can support additional growth in jobs and housing, and how these relate to the spatial planning options identified in CPIER, as set out in Part D of the Strategic Case. Assessment of how CAM can support greater equity across the Combined Authority (also Part D). |

Challenges to Growth

- 2.33 Both the Combined Authority and GCP recognise that if Greater Cambridge's potential for growth is to be realised, several key challenges must be tackled. Failure to efficiently tackle these challenges will act to constrain growth and undermining the region's success, whilst threatening the region's outstanding quality-of-life which is key to attracting skilled firms and workers.

Transport capacity and accessibility

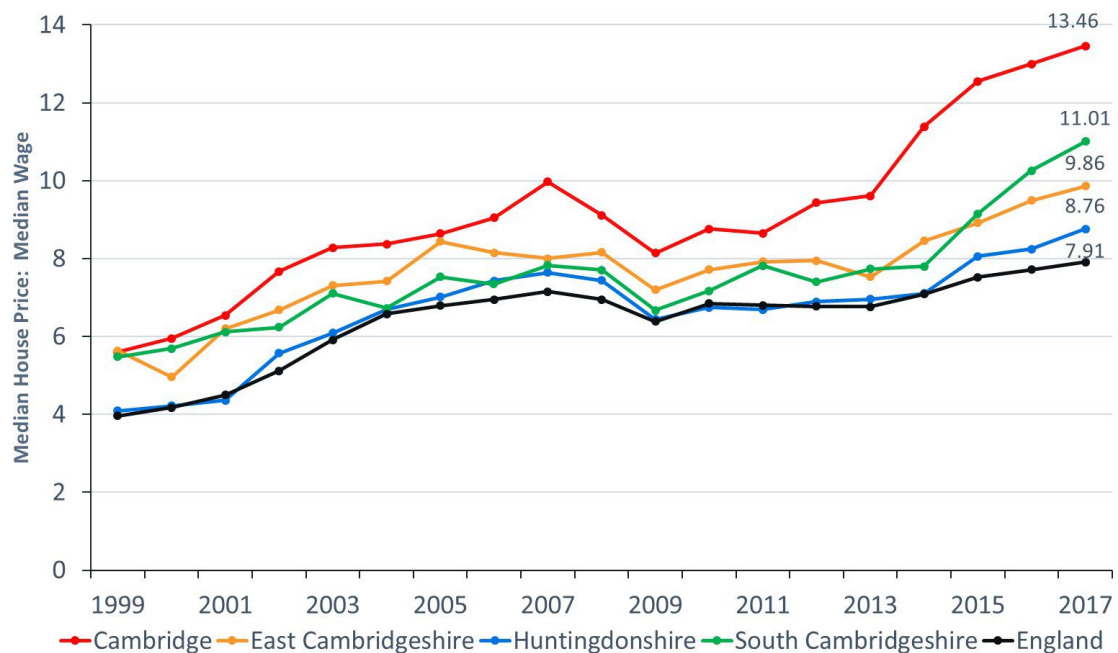
- 2.34 Transport infrastructure acts as a key *enabler* of economic growth and housing and commercial development. Individuals and firms choose to locate in areas well-connected by road and/or public transport links, enabling them to travel to work and for leisure, and access their markets and workers. Poor transport capacity and connectivity therefore acts as a barrier to growth, contributes to traffic congestion, and therefore undermines new development, particularly in 'peripheral' areas, from taking place.
- 2.35 While Cambridge benefits from an extensive transport network, including connections to the strategic highway network and local and regional rail and bus services, many key routes within the city suffer from severe traffic congestion. Committed transport schemes, as discussed in Part B, do not efficiently tackle this 'last mile' problem, in part due the constraints of Cambridge's historic streetscape in securing segregated routes for public transport. This results in slow, unreliable journey times, resulting in longer commutes and wasted time for businesses, which are expected to further deteriorate as the region's population increases.
- 2.36 Good bus accessibility is also limited for employment hubs outside the City Centre, such as the Cambridge Biomedical Campus, which lack good 'orbital' connectivity to wider Greater Cambridge. Since much of city's future growth is expected to occur at such sites, as discussed on page 48, this places increasing pressure on the highway network and undermines the attractiveness of the region as a place to locate a business.
- 2.37 These transport constraints matter, and ultimately constraint growth, for two key reasons:
- they undermine future development from taking place, which worsens the region's housing affordability crisis;
 - they exacerbate spatial inequalities, as people cannot travel effectively to work elsewhere; and
 - they undermine the region's quality-of-life and 'offer', and therefore deter firms and workers from locating here.

- 2.38 These factors are discussed in turn below. Detail on the exact nature of the region's transport constraints is discussed in Part B: The Case for Change.

Greater Cambridge's housing crisis

- 2.39 Cambridge's recent economic success has been accompanied by rapid population growth, which has not been matched by housing stock availability. Since 2012, employment has grown by over 15%, whilst housing stock has grown by under 5%¹². This has led to a pronounced housing shortage, high house prices and low levels of housing affordability.
- 2.40 Currently Greater Cambridge is one of the least affordable places to live in the UK. As shown in Figure 2.6, all areas within Greater Cambridge have higher house price to wage ratios than the England average. This is particularly the case in Cambridge and South Cambridgeshire, where there has been a rapid rise in house prices over the past five years. At the time of writing, the average house price in Cambridge City was £397,000. This is nearly double the UK average of £223,000 and is approximately 13 times local earnings (as opposed to the UK average of 7 times).

Figure 2.6: Median house price: median wage ratio in Cambridge, South Cambridgeshire and England



Source: Office for National Statistics, Ratio of house price to workplace-based earnings (lower quartile and median), 1997 to 2017 (annual data for year ending Q3)

- 2.41 The 'Cambridge Futures' study, which is widely cited in the CPIER report, has modelled the impact that this increase in prices will have should current trends continue. This study found that the increased cost of living, driven through higher housing costs, could cause employment growth to slow beyond 2021 and decline beyond 2031. This phenomenon is described as "overheating" and "burn out".
- 2.42 To prevent "burn out", the CPIER recommends significant investment into housing and the requisite infrastructure required to connect new homes with employment and leisure facilities. CPIER is clear on the need to develop housing that is genuinely affordable for those

¹² CPIER, page 56

at the lower end of the income scale: as growth pushes prices up, it is these people who are being increasingly forced away from Cambridge.

- 2.43 Knowledge-intensive firms typically require specialised skillsets to drive innovation, requiring workers with a range of skills, across the income spectrum. Should businesses in Cambridge be unable to access a wide labour pool, such as if workers are forced to commute increasing distances from the city, then overall economic growth will be severely constrained. The University of Cambridge, for example, frequently reports difficulties in housing support staff, post-graduates and academics, who can be forced to spend more than half their salaries on rent.

Inequality and poor opportunity

- 2.44 Although Greater Cambridge has enjoyed relative prosperity over the past two decades, significant pockets of deprivation remain. Cambridge has been described as the “UK’s least equal city”¹³, with several neighbourhoods in East Cambridge, together with in Huntingdon and the Fens, among the 20% most deprived areas in the country. Much of this inequality is spatial in nature, with clearly defined areas of high deprivation ‘cut off’ from opportunities elsewhere. The Mayor is keen to address this issue, providing the required transport connectivity to better connect people to jobs.
- 2.45 Spreading the benefits of Cambridge’s growth to the wider region can also help tackle deprivation and inequality elsewhere. CPIER notes that only 11% of the value of supplies for KI firms in Cambridgeshire and Peterborough comes from within 30 miles, while more than 27% comes from overseas. Ensuring that more supplies for these firms are sources from the local area is a good opportunity to spread the benefits of Cambridge’s success across the wider area, creating better opportunities elsewhere in the Combined Authority while also helping to prevent ‘overheating’ of the Cambridge economy.
- 2.46 Alleviating inequality should also have significant positive implications for wider region, through improving quality-of-life for all. For example, the Police and Crime Commissioner, in his submission to CPIER, noted “*increasing inequalities worsen crime and disorder, increasing economic burden and potentially impacting growth*”¹⁴. Addressing inequality by better connecting areas of economic opportunity with deprived regions elsewhere – both within Cambridge and the wider Combined Authority area – can therefore help support growth and improve quality-of-life for all.

Maintaining the region’s outstanding quality-of-life

- 2.47 Research shows that, as individuals incomes rise, “quality of life” becomes increasingly important for determining the ‘attractiveness’ of a city¹⁵. As incomes rise, factors such as the quality and efficiency of the transport network, the quality of the built environment, a ‘sense of place’, and the accessibility of consumer goods and services become more important when individuals choose where to live.
- 2.48 Greater Cambridge is competing for talent on both a lifestyle and economic offer, and there are many towns and cities, both in the UK and abroad, that provide this ‘offer’. It is therefore critically important that Cambridge’s future growth maintains the region’s excellent quality-of-

¹³ Centre for Cities, Outlook 2017, <https://www.centreforcities.org/blog/focusing-inequality-best-way-tackle-poverty-uk-cities/>

¹⁴ CPIER, page 37

¹⁵ Glaeser, Kolko and Saiz (2000) Consumer City, Harvard Institute of Economic Research, Discussion Paper 1901

life to continue to attract and retain the skilled workers required to support the region's growth.

“Cambridge or Overseas”: the additionality of Cambridge employment

- 2.49 The CPIER report asserts that many firms take a “Cambridge or Overseas” attitude when considering where to locate. If Cambridge became a less attractive location, then businesses are more likely to locate abroad than to other locations within the UK. Survey evidence from the CPIER report indicates that, of those respondents who said they would likely or certainly move activity outside of Cambridge and Peterborough, significantly more indicated that they would move abroad (44.2%) than elsewhere in the UK (25.0%). One respondent commented: *“Our reliance on a highly skilled work force, which could not easily be found elsewhere, would make relocation from the C&P area [to other areas in the UK] very difficult”*¹⁶.

“Many high-value companies will need to relocate abroad if this area no longer meets their needs. Ensuring that Cambridge continues to deliver for KI businesses should be considered a nationally strategic priority” CPIER, Recommendation #3

- 2.50 This highlights the *net additionality* of Greater Cambridge to national economic output. Many jobs supported by CAM are likely to be net additional to the UK economy, rather than simply displaced from elsewhere. This underlines the importance of Cambridge as a national asset – where Cambridge succeeds, the UK succeeds.

The National Imperative: The Oxford to Cambridge Corridor

National Infrastructure Commission

- 2.51 The National Infrastructure Commission (NIC) was established in 2015 to provide the UK government with expert, impartial advice on the country's long-term economic infrastructure needs. It released its first National Infrastructure Assessment in 2018, detailing key infrastructure areas that the UK must prioritise to ensure future growth. The assessment notes the importance of digital infrastructure, sustainable development, better resilience, and stable long-term investment in transport as particular areas of focus. Notably, the report proposes that £43 billion of stable long-term transport funding is provided for regional cities¹⁷.
- 2.52 In November 2017, the NIC published its final report *‘Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc’*¹⁸. In it, the NIC highlighted the potential for the Oxford-Cambridge corridor to become a world-renowned centre for science and innovation. It further highlighted Cambridge's unique strengths, including a concentration of highly-skilled workers, globally competitive business clusters and world-leading universities and research institutes. However, it also stressed that a chronic undersupply of housing and poor connectivity is putting growth – and future success – at risk.

¹⁶ CPIER, page 54

¹⁷ https://www.nic.org.uk/wp-content/uploads/CCS001_CCS0618917350-001_NIC-NIA_Accessible.pdf

¹⁸ <https://www.nic.org.uk/publications/partnering-prosperity-new-deal-cambridge-milton-keynes-oxford-arc/>

“The Cambridge – Milton Keynes – Oxford arc must be a national priority. Its world-class research, innovation and technology can help the UK prosper in a changing global economy. But success cannot be taken for granted. Without urgent action, a chronic undersupply of homes could jeopardise growth, limit access to labour and put prosperity at risk”

National Infrastructure Commission

- 2.53 The Commission’s central finding was that rates of house building within the corridor need to double – delivering up to one million new homes by 2050 – if the arc is to achieve its economic potential. The NIC recommended a range of incentives to help planning authorities deliver this housing growth, but acknowledged that urban extensions and regeneration will not be enough. The NIC therefore recommended that the government establishes New Town Development Corporations to work with local authorities to deliver new and expanded settlements. It suggests that this could include a new or expanded settlement to the west of Cambridge, which would be served by East-West Rail.
- 2.54 The NIC proposed a framework for future planning and decision making that would enable the arc to achieve its economic potential. This would include:
- A 2050 “Spatial Vision” for the whole arc, which would be developed by a Strategic Partnership Board. This would be underpinned by an Industrial Strategy, developed by Local Enterprise Partnerships, and a Strategic Infrastructure Plan for the arc, developed by a Strategic Infrastructure Board. The NIC expects the centrepieces of the Infrastructure Plan would be the delivery of an Oxford-Cambridge Expressway and the East-West Rail project, which would serve new communities as well as existing towns and cities.
 - Three Strategic Statutory Plans for the three sub-regions in the arc (West, Central and East), which would be developed by Combined Authorities or similar bodies. The NIC highlights the Cambridgeshire and Peterborough Combined Authority as the best vehicle for delivering a spatial plan for the Eastern sub-region of the arc.
 - Local plans and development policies, which would continue to be delivered by local authorities, but should align with the Spatial Vision and sub-regional plans.
- 2.55 The NIC also called on government and local policymakers to work *in partnership*, to implement measures which will increase certainty on the delivery of growth. This will enable infrastructure development, including:
- Establishing long-term pipelines of strategic national and local infrastructure investments, conditional upon housing delivery and supported by firm financial commitments
 - Developing robust and credible transport plans to enable the development of the corridors’ key towns and cities. This will provide a firm basis for long-term growth and investment, including plans for a significantly upgraded public transport, integrated transport hubs and the provision of safe cycling infrastructure.
- 2.56 The NIC stressed that cities – particularly those in the Cambridge-Milton Keynes-Oxford Arc – are important drivers for national economic growth. However, they also noted that as these cities become increasingly popular places to live and work, and attract workers from a wider catchment, significant strain is placed on the infrastructure capacity that these cities possess.
- 2.57 In particular, the NIC noted that the layout and design of cities such as Oxford and Cambridge is poorly suited to the car. Despite this, 53% and 55% of daily commuting trips in Oxford and Cambridge are by car, resulting in chronic congestion, which is will likely worsen with future

growth. Congestion and overcrowding was argued to have the potential to undermine quality of life, inhibit growth and undermine the success of cities within the ‘arc’. To combat this, the NIC suggested that walking, cycling, and forms of rapid public “mass transit” should be used to make existing transport systems, generally constrained by pre-existing urban infrastructure, more efficient. The NIC is explicitly supportive of mass rapid transit plans being developed by local authorities across the ‘arc’, to help improve city-scale transport.

“Although cars are a convenient, flexible and relatively low-cost form of transport, they use up a lot more road space per person than other forms of transport. If Cambridge, Milton Keynes, Northampton and Oxford are to continue to grow, there will not be enough space on their city-level transport networks to support current levels of car use.” National Infrastructure Commission, *Partnering for Prosperity*.

- 2.58 Overall, the NIC recommend that local areas are given the *certainty, freedom and resources* to create well-designed, well-connected new communities, integrated into the surrounding transport network. Doing so will allow them to fully realise their potential, enhancing the prosperity of the region and the country.

The Government’s Response

- 2.59 Within their response to *Partnering for Prosperity*, published in October 2018¹⁹, the Government welcomed the report and its recommendations, and recognised the significant, transformational growth opportunity that the arc presents for the UK economy. It supported the NIC’s ambition to deliver up to one million new, high-quality homes by 2050 in order to maximise the arc’s economic growth, and:
- supported the Commission’s finding that, in order to deliver the full economic potential of the arc, there needed to be an integrated approach to the planning and delivery of infrastructure, homes and business growth;
 - committed more than £4.5 billion in funding for new transport infrastructure within the arc, including for the Oxford to Cambridge Expressway, East-West Rail and Cambridgeshire and Peterborough’s Transforming Cities fund;
 - committed to working in collaboration with local partners to make the arc the world leading place for high value growth, innovation, sustainability and productivity; and
 - invited local authorities from across the arc to bring forward and commit to ambitious proposals for transformational housing and economic growth, including for new settlements.
- 2.60 With the right interventions and investment, the Government argued that there is a transformational opportunity to amplify the arc’s position as a world-leading economy and support the aims of the Industrial Strategy to boost the productivity and earning power of people across the United Kingdom. The Government hence designated the arc as a key national economic priority and committed to further consider the best mechanisms to maximise future growth.

¹⁹ <https://www.gov.uk/government/publications/cambridge-milton-keynes-oxford-arc-study-government-response>

Part B: The Case for Change

Introduction

- 2.61 Greater Cambridge needs better transport infrastructure to enhance connectivity, alleviate chronic congestion, and to unlock future economic growth. Improved transport infrastructure will support the region's growth, delivering benefits at the local, national and regional level, while creating a better, more efficient transport network for Cambridgeshire and Peterborough.
- 2.62 This Section outlines the transport, economic and planning context within Greater Cambridge, together with the specific transport constraints facing the region.

Transport Policy Context

- 2.63 CAM has been carefully developed to meet a range of economic, social and environmental objectives. These objectives have been developed to closely align with national and regional policy priorities, including the UK Government's Transport Investment Strategy, the Mayors Interim Transport Strategy Statement (MITSS), and the Local Plans for Greater Cambridge. This close fit means that CAM will complement schemes and projects already outlined by these key stakeholders across Greater Cambridge.

UK Government Transport Investment Strategy

- 2.64 The transport priorities at a local level are fully reflected by national transport objectives. These national objectives are set out in UK Government's statutory Transport Investment Strategy²⁰ (TIS) which was published in July 2017. The current TIS comes in response to a new National Industrial Strategy, which recognises the importance of transport as part of a package of policies and schemes for achieving greater economic growth and prosperity across the country.
- 2.65 The TIS sets out four key objectives:
- To create a **more reliable, less congested, and better-connected transport network** that works for the users who rely on it. The TIS notes UK transport systems are ageing and are facing increasing demands. In many places, the current transport network does not provide the right levels of connectivity for people and business.
 - To build a **stronger, more balanced economy** by enhancing productivity and responding to local growth priorities. The TIS notes the UK's national productivity lags other G7 countries (e.g. 36% behind Germany), and sees transport as one way of boosting productivity. It is also acknowledged that prosperity hasn't been shared evenly between different places, leaving some communities feeling left behind.
 - To **enhance the UK's global competitiveness** by making Britain a more attractive place to trade and invest. Britain is globally renowned as a leader in Research and Innovation, and Scientific fields. Foreign investment in these areas is significant, and relies upon good national and international transport links. Retaining the UK's pre-eminence in these areas

20

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/624990/transport-investment-strategy-web.pdf

will require continued investment in the transport network, enhancing “city clusters” and “international connectivity”. The TIS therefore views transport as a means of attracting job-creating investment, leveraging the UK’s industrial strengths and enabling it to trade with partners with a few frictions as possible.

- To support the **creation of new housing**. The TIS acknowledges parts of the UK face a significant challenge to provide the houses that people need in the places they wish to live. Furthermore, the Government’s Housing White Paper recognises that investing in transport infrastructure is one of best ways of unlocking development in places that are currently poorly served by our transport system.

The Vision for Transport: The Mayor’s Interim Transport Strategy Statement (MITSS) (May 2018)

- 2.66 As part of the Cambridgeshire and Peterborough Devolution Deal, strategic transport planning powers were transferred to the Combined Authority from Cambridge County Council and Peterborough City Council. Prior the adoption of a Local Transport Plan (LTP), due in Spring 2019, the Mayor has released a transport strategy statement which clarifies the Combined Authority’s transport priorities. The document recognises the CAM as a key priority, sketching a vision for how it will fit into the future transport network.
- 2.67 The document also outlines several ‘Guiding Principles’, which set out the broad goals for the region’s transport network:
- **Economic Growth & Opportunity** – Cambridgeshire and Peterborough will seek to connect its workforce with well-paying and lasting jobs, particularly those in key KI sectors.
 - **Equity** – Transport systems will actively address transport and infrastructure gaps across the region, especially those in badly served rural communities, helping all areas to become prosperous.
 - **Environmental Responsiveness & Sustainability** – A network will be developed that encourages active and sustainable travel choices, such as walking, cycling and public transport. The public transport system will be based on green energy and be of high enough quality to encourage users away from the private car.

The Cambridgeshire and Peterborough Local Transport Plan

- 2.68 Currently under development, the LTP will set out the Combined Authority’s transport policies and delivery plans, describing how developments in the transport network will feed into the wider development agenda for the region.
- 2.69 The Primary Goals of the new LTP will be;
- **Transforming public transport** – This is a multi-faceted goal, which will involve optimising the rail network, creating modern reliable and responsive mobility and bus services, and the development of the new metro system. The new metro system will help to link many elements of the public transport network.
 - **Designing integrated walking and cycling solutions** – The aim is to increase the number of, and average distance travelled by, these modes in line with best practice examples from countries such as The Netherlands. To do so, new pedestrian and cycle friendly infrastructure will need to be created, along with better public realm spaces and incentives for change.
 - **Creating and upgrading our major road network** – This will cater for longer distance car and freight journeys, providing vital connectivity with the strategic road network and key origins and destinations outside of the region.

- **Expanding access** – By connecting people with jobs and services businesses will be able to grow, helping to address social exclusion in tandem with the development of new housing and development sites.
- **Travel choice** – The plan aims to ensure that every home and business in Cambridgeshire and Peterborough has easy access to either a metro stop, rail station, on-demand bus or mobility service, or car share. Through technology, real-time information about these services will be provided, encouraging people and businesses to make use of the public transport system instead of currently popular private transport methods.
- **Ensuring reliability** – By prioritising the predictability of Cambridgeshire and Peterborough’s public transport system and road networks users should be encouraged to make consistent use of the services available.
- **Improving safety** – The new plan aims to eradicate traffic fatalities and severe injuries in Cambridgeshire and Peterborough through education, enforcement, and designs that prioritise moving people safely rather than faster.
- **Creating a network fit for the future** – To meet the long-term needs of businesses and residents, a network must be built that is progressive and flexible, able to effectively adapt to future growth and changes in journeys across the network.

2.70 Both the MITTS, and the emerging LTP, are highly supportive of the delivery of the CAM network. Both identify CAM as an integral part of the Combined Authority’s aspirations for the region’s public transport network, and critical to providing the transport capacity and connectivity required to meet their ambitions for growth across the region.

“The Cambridgeshire Metro, in particular, will transform public transport in the region and underpins the Combined Authority’s bold vision for our major cities and market towns. It is vitally important that ongoing transport schemes and associate strategies align with and support this policy commitment to create a metro solution that:

- Delivers high quality, high frequency, reliable services, making it the mode of choice and taking away a reliance on cars;
- Delivers maximum connectivity, network coverage, and reliable journey times
- Forms part of a more active and sustainable travel choice which encourages walking and cycling at the start and end of journeys
- Provides sufficient capacity for growth and supports transit-led development
- Flexibly adapts to future needs
- Uses emerging technologies, including connected and autonomous vehicles”

Mayoral Interim Transport Statement

Economic and Planning Context

- 2.71 Recent growth has seen the historic development pattern of Greater Cambridge change significantly in recent years, with Cambridge emerging as the heart of a rapidly growing, polycentric city region.

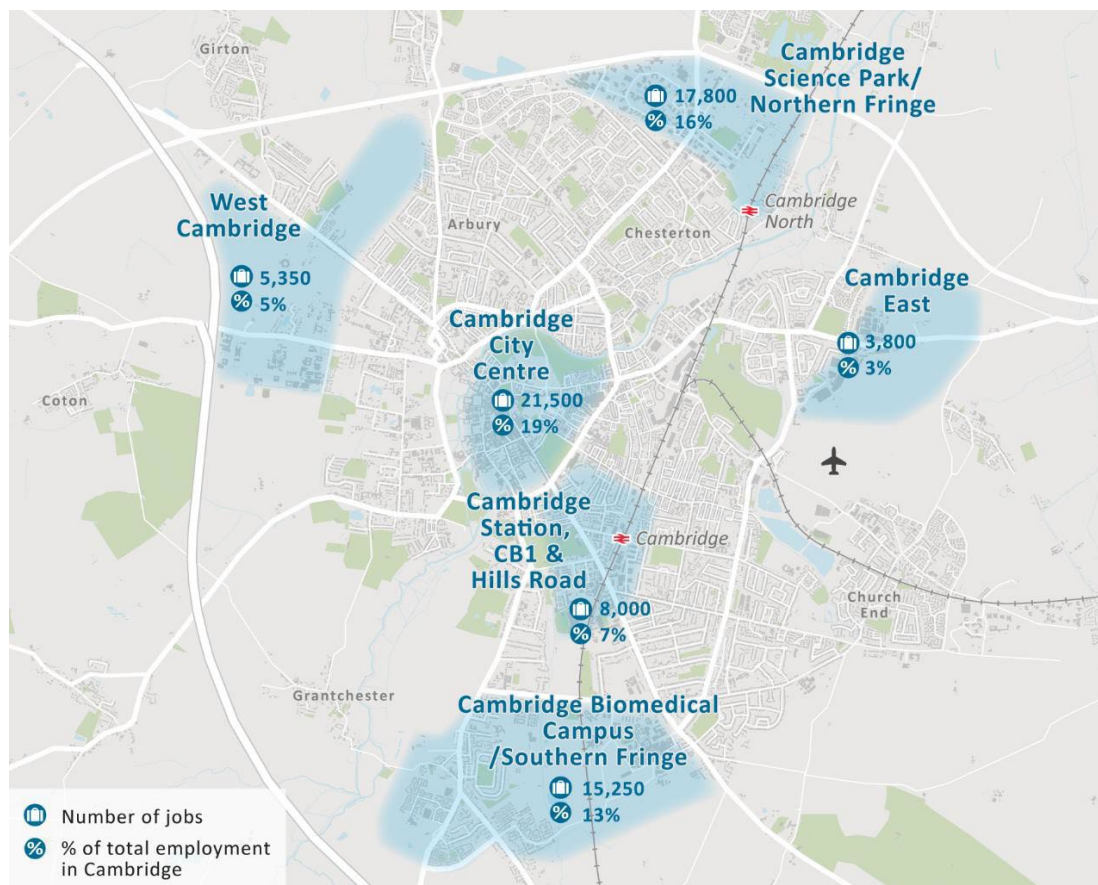
Cambridge

- 2.72 Historically, employment and economic activity in the city of Cambridge was centred around the city centre, but beginning with the construction of the Cambridge Science Park in 1971, development has increasingly occurred on the city 'fringe'. Partly reflecting the lack of available land for development in the city centre, Cambridge's development and employment has become increasingly decentralised, with employment and leisure activity focused within six districts, each of which will be served by CAM:

- Cambridge City Centre;
- Cambridge Station, CB1 and Hills Road;
- Cambridge Biomedical Campus and 'Southern Fringe';
- Cambridge Science Park and 'Northern Fringe';
- Cambridge West; and
- Cambridge East.

- 2.73 Collectively, these sites – outlined in Figure 2.7 – account for 63% of all jobs within the Cambridge urban area, and 40% of all jobs within Greater Cambridge. Growth is expected to be disproportionately located in these areas, which benefit from agglomeration and good labour market accessibility.

Figure 2.7: Key employment sites within Cambridge



City Centre

- 2.74 Cambridge City Centre is the heart of the city, forming the economic and cultural core of Greater Cambridge. It is home to the historic university, a large retail core and a range of tourist destinations (such as Kings College Chapel). A significant proportion of the university's research and office space is located here. However, much of the City Centre remains highly constrained, with limited opportunities for redevelopment or significant employment growth.
- 2.75 There is very limited scope to expand on-street capacity for public transport, including additional bus services, with access to the current bus station at Drummer / St Andrews Street highly constrained.
- 2.76 CAM addresses these constraints by expanding public transport significantly capacity underground. When completed, CAM will offer the potential to reconfigure the bus network by replacing existing bus services with new metro services underground, delivering much needed additional capacity while relieving pressure on space at street level for the benefit of pedestrians, cyclists and businesses.

Station, CB1 and Hills Road

- 2.77 The corridor radiating from the City Centre to Cambridge Station includes Cambridge Station, CB1 and Hills Road. It retains elements of a High Street offer, together with significant office space. The district (especially surrounding the station) is undergoing a mixed-use redevelopment, known as CB1, with more than 1,500 new dwellings and student units and 60,000 m² of new office and retail floor space.
- 2.78 Completion of the CB1 development will limit the potential for future large-scale development of the station. Along the Hills Road corridor there are proposals for continued incremental development, including mixed-use redevelopment of the Clifton Road Industrial Estate, with approximately 550 new homes.
- 2.79 The CAM network will directly support future development in the CB1 area by providing a fast, frequent, high-quality link between this area, Cambridge City Centre, and other key employment areas (such as the Biomedical Campus and Science Park).

Cambridge 'fringe' sites

- 2.80 Recent years have seen Cambridge's growth occur increasingly at development sites on the city 'fringe', and future growth is expected to increasingly be concentrated at such sites in the future. These include:
- the **Cambridge Biomedical Campus**, home to Addenbrookes' Hospital, Cambridge University Hospital, Medical Research, Council Laboratory of Molecular Biology, the current global HQ of AstraZeneca, and one of the world's leading clusters of life sciences, medical research and health innovation firms. It is expected to gain another 14,000 jobs by the mid-2020s;
 - the **Cambridge Science Park and Northern Fringe**, home to a large cluster of IT, programming and software development firms, and forming one of Europe's longest-serving and largest centres for commercial research and development. There are proposals for development surrounding Cambridge North station, and longer-term proposals for redevelopment of the 'Waterworks' site are currently subject to an application for Government Housing Infrastructure Fund (HIF) funding;
 - the **West Cambridge Site and North West Cambridge**, the former a large concentration of academic and laboratory space for the University of Cambridge, and the latter a large mixed-use, predominately residential development with a focus on affordable housing for university post-graduates and key workers; and

- **Cambridge East**, where the site currently occupied by Cambridge Airport is safeguarded under the Cambridge Local Plan for future (post-2031) development of up to 12,000 new homes and 25,000 new jobs.

2.81 These future development sites, and proposed growth, is outlined in Figure 2.9 overleaf.

Greater Cambridge

2.82 Several large-scale ‘satellite’ developments are also planned within Greater Cambridge and will be served by the CAM network. These include ‘new towns’ at **Northstowe** and **Waterbeach**, together with urban extensions at **Cambourne West** and **Bourn Airfield**, and continued expansion of ‘campus’ sites at **Babraham**, **Granta Park** and the **Wellcome Genome Campus**.

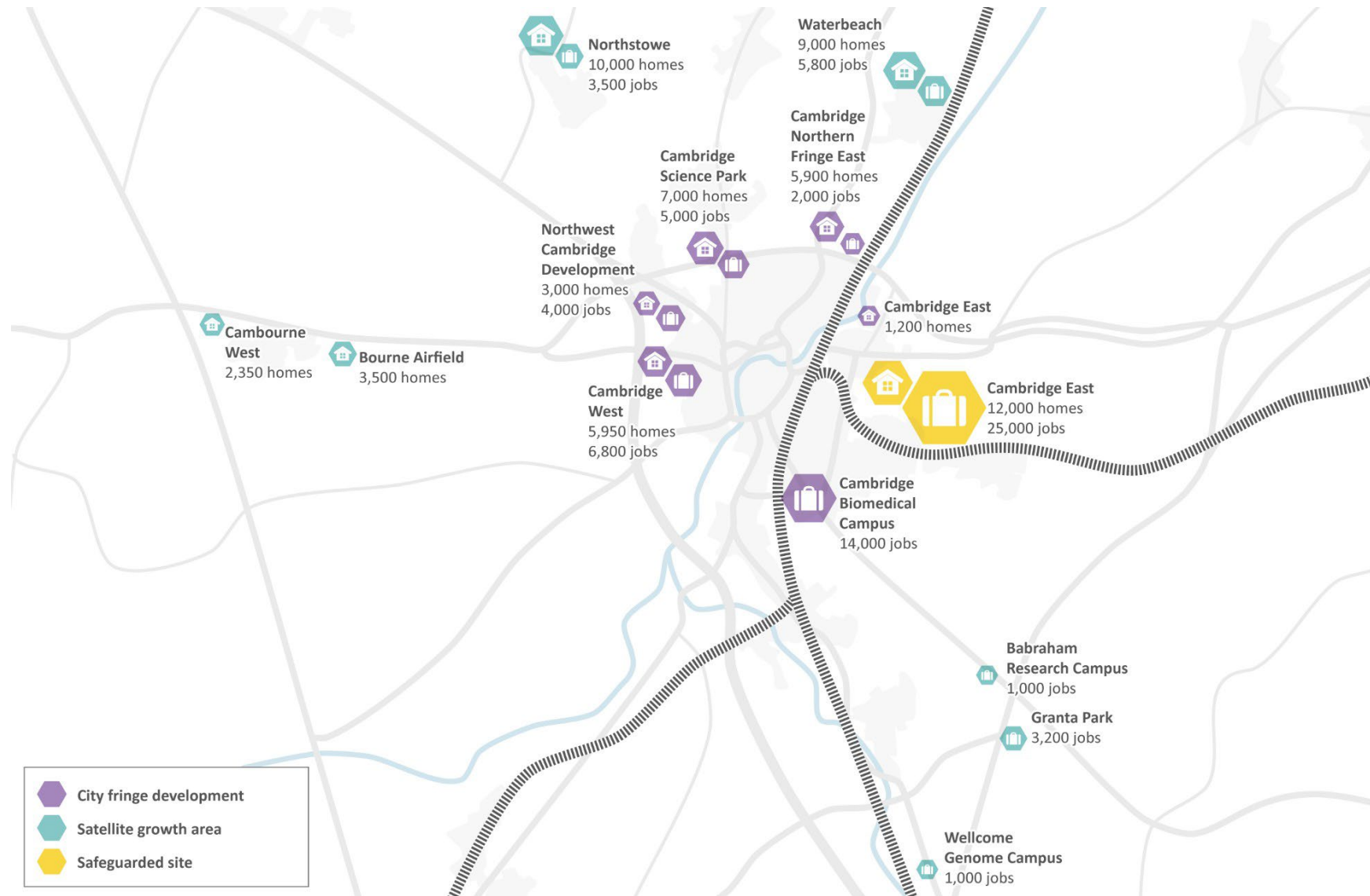
2.83 These developments will support the aims and aspirations of the Combined Authority, providing much-needed additional housing to support the region’s growth and tackle housing unaffordability, together with additional jobs, particularly in supporting sectors to Cambridge’s knowledge-intensive economy.

2.84 CAM will support the development of such sites by significantly enhancing their accessibility with Cambridge and the wider region. Such sites are critical to tackling the housing shortage in Cambridge, yet many currently lack good public transport to opportunities within Cambridge, undermining development and contributing towards worsening highway congestion. CAM will help provide the transport capacity and accessibility to allow these sites to be brought forward for development and maximise the overall quality and density of development.

Figure 2.8: Waterbeach Barracks development



Figure 2.9: Future Development within Greater Cambridge



Growth Elsewhere

- 2.85 Large-scale growth is also proposed elsewhere, both within Cambridgeshire and Peterborough, in Central Bedfordshire, and on the Suffolk and Essex borders. The National Infrastructure Commission aspiration, as outlined in Para 2.53 and supported by Government, is for the delivery of one million new homes across the Oxford to Cambridge arc by 2050, a significant proportion of which are expected to be delivered within Cambridgeshire and Peterborough together with surrounding districts.
- 2.86 Several major development sites have been identified, and expected to deliver tens of thousands of new homes over the coming decades. Whilst CAM is not currently proposed to serve each site directly, it will provide a significant improvement in the accessibility of Cambridge – and its key employment markets – to such sites, therefore supporting the viability and density of development.
- 2.87 These sites include:
- **Alconbury Weald**, located to the north of Huntingdon on the A14 corridor, is expected to deliver 5,000 new homes on a former RAF site, together with significant employment growth within the Alconbury Enterprise Campus, supported by Enterprise Zone status. This will include flexible research and development, office and production space and substantial business rate reductions from Government to encourage development;
 - **North Uttlesford Garden Community**, located on the M11 corridor near Whittlesford, is at an early planning stage and not currently part of the Local Plan, but has the potential to deliver up to 5,000 new homes as part of a new ‘garden community’;
 - **RAF Mildenhall**, currently occupied by a US Air Force base, is expected to be vacated by 2024, with future development expected to create a new community of up to 4,000 new homes within close access to the A11 and A14 corridors;
 - **St Neots East**, located on the A428 corridor, will include 3,700 new homes in an urban extension of the town near St Neots railway station and a future dualled A428;
 - **Ely North**, located on the A10 corridor approximately 17 miles north of Cambridge, is expected to include 3,000 additional homes as part of an urban extension of the town;
 - **Haverhill**, located 17 miles to the South East of Cambridge, is home to a multi-use development, with up to 1,200 new homes allocated in the Local Plan.

Planned Transport Investment

- 2.88 Reflecting Greater Cambridge’s growth, several major transport schemes have been committed to or recently delivered across the region. These schemes are outlined below.

Strategic Transport Investment

- 2.89 Several large, strategic transport schemes are currently either under development or under construction, and will deliver a significant improvement in long-distance connectivity. These include:
- The under-construction £1.5bn upgrade to motorway standard of the **A14** between **Cambridge and Huntingdon**, which will provide extra capacity and relieve congestion on a key strategic corridor;
 - Proposals for the **dualling of the A428** between Black Cat and Caxton Gibbet, with a preferred route announcement expected in 2018 and a construction start in 2021/22. In the longer-term, this would form part of a new Expressway between Oxford, Milton Keynes and Cambridge;

- Proposals for **East-West Rail**, including a new railway link between Bedford and Cambridge, with a route currently subject to consultation²¹;

2.90 While the latter two projects described above are at a relatively early stage of development, they have the capability to radically transform travel across the wider region and the Oxford – Cambridge corridor, supporting housing growth, reliving congestion on strategic routes and expanding labour market catchments. However, they will do little to improve local connectivity, relieve ‘local’ congestion or enhance ‘last mile’ accessibility to Cambridge’s key employment sites.

Regional Transport Infrastructure

2.91 Under the Greater Cambridge City Deal, several new mass transit links (the “GCP schemes”) are currently under development by the Greater Cambridge Partnership:

- **A428 Cambourne to Cambridge:** a new, segregated public transport route between Cambourne and Grange Road in Cambridge, expected to open as ‘first phase’ of CAM in 2024;
- **A1307 Three Campuses to Cambridge:** improvements to the bus, walking and cycling network between the Cambridge Biomedical Campus, the Babraham Research Campus and Haverhill, including a new, segregated public transport link between the Biomedical Campus (forming part of the future CAM network) and a new Park-and-Ride site at the A11 / A505 junction at Granta Park;
- **A10 Ely to Cambridge improvements:** upgrades to the A10 between Milton Interchange, Waterbeach and Ely, including dualling, together with a new Park-and-Ride site at Waterbeach linked to Cambridge by a new, segregated public transport link (forming part of the future CAM network);
- **Cambridge East:** improvements to the broad Newmarket Road corridor from Central Cambridge, expected to integrate into the CAM network once a preferred option is identified;
- **Milton Road:** introduction of new bus lanes and segregated cycleways along Milton Road;
- **Histon Road:** bus priority measures such as bus lanes, smart signals and side road closures to reduce delays caused by signals and improve reliability;
- **Rural Travel Hubs:** these are bespoke rural transport interchanges to connect residents with public transport and cycling/walking routes. Piloted in South Cambridgeshire, these aim to reduce the levels of private car journeys into Cambridge from rural villages.
- **Cambridge South Station:** a new railway station serving the Cambridge Biomedical Campus, catering for employees at the Campus and providing improved links to London.
- **“Greenways”:** commuter cycle routes from surrounding towns and villages within a ten-mile radius; and
- **Improved cycle infrastructure** within the city, including the Chisholm Trail linking Cambridge North to Cambridge Station and the Biomedical Campus, including a new bridge over the River Cam; and
- **Cambridge South Station:** a planned new rail station serving Addenbrookes and the Biomedical Campus, which is expected to open in 2025.

2.92 The Greater Cambridge Partnership is also pursuing a package of eight measures as part of the **City Access Strategy**, as shown in Figure 2.10, to tackle congestion in Cambridge. These will help to prioritise sustainable and active travel over the use of the private car, making it easier for people to travel by bus, rail, cycle or on foot. The Strategy aims to achieve a reduction in

²¹ <https://eastwestrail.co.uk/haveyoursay>

peak-time traffic levels in Cambridge by 10-15% by 2031, helping to boost economic growth and quality of life.

- 2.93 While these schemes will markedly improve journey times across Greater Cambridge, particularly on radial routes expected to be served by guided busway and Park-and-Ride services, they only represent part of the solution to alleviating transport constraints and supporting Cambridge's growth. Notably, by **failing to deliver segregated, reliable transport corridors through the City Centre**, they cannot provide the required transport capacity and accessibility required to fully support the region's growth.

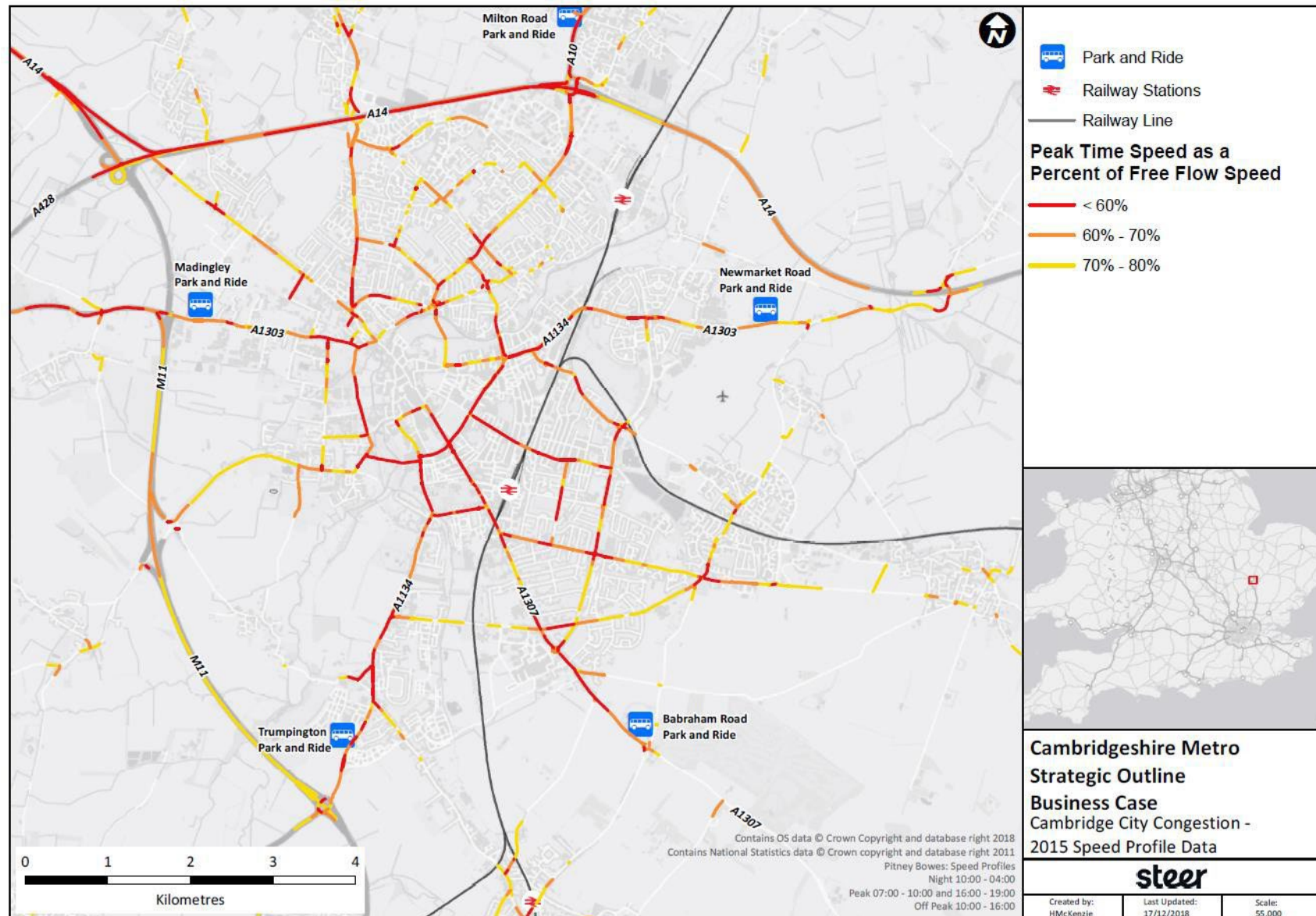
Figure 2.10: Greater Cambridge Partnership City Access Strategy



Key Transport Constraints

- 2.94 Despite the significant transport investment planned across Greater Cambridge, there will remain significant constraints on the region's transport network without CAM. Failure to invest will undermine the region's growth, result in worsening traffic congestion, and undermine the region's quality-of-life.
- 2.95 These constraints include:
- Severe traffic congestion on key radial corridors, resulting in slow journey times and poor reliability;
 - Limited accessibility to major employment sites located on Cambridge's urban fringe; and
 - Constraints on movement for vehicular modes (including public transport), due to the historic streetscape within the City Centre.
- 2.96 CAM will effectively tackle these constraints, improving the transport network to support the region's growth through the provision of tunnelling to provide reliable, segregated public transport links across Cambridge. This section explores these constraints in more depth, before explaining why CAM is well placed to tackle them.
- Severe traffic congestion on radial corridors**
- 2.97 Many of Cambridge's key road corridors suffer from chronic congestion, impacting journey times and reliability both by private car and by bus. Figure 2.11 outlines current levels of congestion within the city.

Figure 2.11: Congestion within Cambridge city



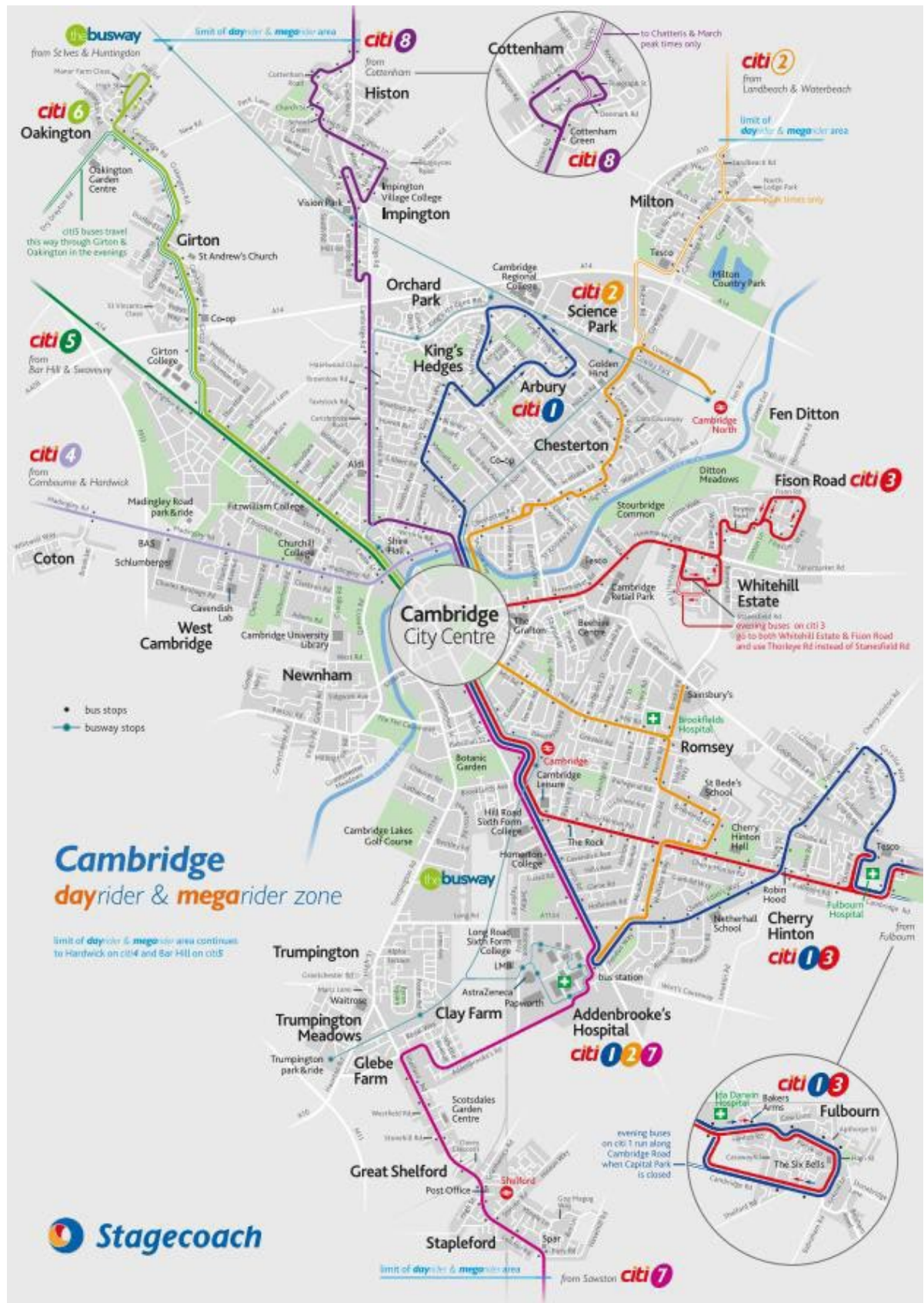
- 2.98 Many journeys, including those along key routes such as between the City Centre and Cambridge Station, are already faster and more reliable on foot than by car or public transport. Average journey times between market towns and new settlements outside the city, such as St Ives and Cambourne, are often slow and unreliable, particularly in the peak – deterring people from making the journey and commuting to productive jobs within the city and its environs.
- 2.99 Future growth, in the absence of investment, will place further pressure on the region’s highway network. The Greater Cambridge Partnership estimate that, if current trends continue, by 2031 traffic levels within the city will increase by over 30% in the morning peak and time spent in congestion will more than double. This will have a marked impact on the attractiveness of Greater Cambridge as a place to live and work – undermining the region’s growth aspirations – and resulting in worsening air quality.
- 2.100 Many of the Greater Cambridge Partnership schemes, such as Cambourne to Cambridge, will deliver segregated public transport corridors from market towns and new settlements in Greater Cambridge. Whilst these will help to improve journey times and provide viable alternatives to congested radial corridors, they do not provide a wholly segregated link within the *City Centre*. Such cross-city links are key to providing accessibility to ‘fringe’ sites, as discussed below.

Limited accessibility to ‘fringe’ sites

- 2.101 Cambridge is a polycentric city, with only 19% of employment located within the City Centre. Future employment growth is also expected to be disproportionately concentrated on the city’s “fringes”, either at large employment hubs such as the Cambridge Biomedical Campus, or in new communities at North West Cambridge, Cambourne or Waterbeach.
- 2.102 The city’s existing public transport network is poorly configured for such future trips and commuting patterns, which are likely to be more “orbital” than “radial” in nature. As Figure 2.12 shows, Cambridge’s bus network is overwhelmingly focused on the City Centre, with every high-frequency route passing through it, but offering limited connectivity to ‘fringe’ sites. Similarly, rail services are focused at Cambridge station, a twenty-minute walk south of the City Centre.
- 2.103 Commuting over longer distances by public transport to such “fringe” sites is hence often slow and challenging. Such journeys usually require entering the city centre, where congestion is at its worst, changing route, and exiting from the city centre again. Consequently, many commuters are forced to rely on their car: currently 60% of trips to the Cambridge Biomedical Campus and 63% of trips to Cambridge Science Park are made by private car, compared to just 12% and 33% for the City Centre and Cambridge station / CB1 area respectively²².
- 2.104 Public transport accessibility must therefore significantly improve at such sites for sustainable growth to be achieved. Without improved accessibility, traffic congestion will continue to worsen, and growth put at risk as such ‘fringe’ sites become increasingly difficult to access from the rest of Greater Cambridge.

²²Greater Cambridge Mass Transit Options Assessment Report, page 26.

Figure 2.12: Cambridge 'city' bus network



Source: Stagecoach East. Note other operators' services are not shown. Busway services and rail services are shown with a thin blue and grey line respectively.

Physical constraints within Cambridge

City Centre Constraints

- 2.105 One of the key causes of congestion in Cambridge is the limited capacity of its highway network, both for general traffic, bus services, and pedestrians and cyclists. This is particularly the case in the City Centre, where an historic street network, pre-dating the car, cannot accommodate modern traffic flows or provide sufficient space to fully segregate public transport services. Even if traffic volumes were to be significantly reduced, such as through adoption of an ambitious demand management or City Access user charging programme, many of these physical constraints would still remain.
- 2.106 Some of these constraints are outlined in Figure 2.13. Magdalene Street, which bisects the Grade I listed buildings of Magdalene College, is only wide enough for one vehicle at a time, but provides the only access point into the city centre from the north-west. This route is shared by local bus services and traffic accessing the City Centre, is frequently congested, and unable to support additional bus services.
- 2.107 This issue is emblematic of a wider capacity problem. East-West connectivity to the city centre is limited by three University Colleges that back onto the River Cam, an area known as 'The Backs' famous for its historic vistas. There is approximately 850m separating the only two vehicular access points to the west of the city, Magdalene Bridge and the Silver Street bridge, which forms a barrier for movement for public transport services accessing the City Centre.

Figure 2.13: Connectivity challenges within the City Centre



- 2.108 Similarly, the historic shopping streets surrounding Market Square, such as Sidney and Trinity Street, are part-pedestrianised, have a high density of pedestrians and cyclists, and insufficiently wide to support bus services. Instead, bus services are forced to operate via a longer route Hobson Street / Manor Street or Emmanuel Street, lengthening journey times and resulting in buses stopping further from Market Square.
- 2.109 This particularly results in slow journey times for passengers traversing the City Centre, such as from the Cambridge Science Park or West Cambridge to the Cambridge Biomedical Campus. Additionally, the nature of the stopping arrangements on Emmanuel Street and St Andrews Street – with extremely limited provision for bus stands and stops – leaves limited capacity to support additional buses.

Constraints on current Guided Busway services

- 2.110 The Cambridgeshire Guided Busway, which opened in 2011, demonstrates some of these constraints. Carrying approximately four million passengers per year²³, this 25km long guideway connects Cambridge North to St Ives, and Cambridge Station to Trumpington and the Cambridge Biomedical Campus, using a concrete ‘track’ separated from the local highway network. This ensures that buses can travel from the outskirts of Cambridge to St Ives without suffering from traffic congestion, offering a significant journey time saving over general traffic on this ‘leg’ of the journey.
- 2.111 However, busway services rely on largely unsegregated running between northern Cambridge, the City Centre, and Cambridge station. All buses travelling into the City Centre are required to leave the guided busway and join the congested local highway network, resulting in extended journey times and adversely impacting reliability.
- 2.112 For example, services are currently timetabled to take 25 minutes to travel between St Ives Bus Station and the Science Park stop, a distance of 12 miles and average speed of 29mph, on a largely segregated alignment. In comparison, they are timetabled to take an identical period of time in the peak to travel from the Science Park to Cambridge station, a distance of 3.5 miles and average speed of just 8mph, with recent performance data indicating that 27% of services run more than 5 minutes late. Insufficient segregation for such public transport services within Cambridge therefore presents a real barrier to efficient movement through and across the city.

The need for CAM

- 2.113 These constraints of severe traffic congestion, poor accessibility and physical constraints within the City Centre, are unique, and cannot be effectively tackled by more ‘traditional’ transport interventions such as improved bus and rail services or demand management techniques in the form of City Access.
- 2.114 Several rail improvements are already proposed in and around Cambridge, including frequency and capacity enhancements, a new station at Cambridge South serving the Cambridge Biomedical Campus, and in the longer-term the East-West Rail link to Bedford, Milton Keynes and Oxford. However, these do not provide a significant enhancement in ‘last mile’ connectivity to key destinations within Central Cambridge, or adequately provide connectivity to ‘fringe’ employment sites. For example, despite proposed interventions:

²³ Data provided by Stagecoach, current operator of Cambridgeshire

Guided Busway.

- Cambridge's rail station will remain more than 20 minutes' walk from the City Centre, or a bus journey along a congested corridor with little further potential to enhance journey times or reliability (Hills Road);
- the rail network does not directly serve major employment sites at West Cambridge or Cambridge East, and there are no feasible options for it to do so;
- many large market towns and new settlements (such as Northstowe) are not directly connected to the rail network, and there are unlikely to be feasible options to connect them to it.

2.115 Cambridge's historic streetscape, and the physical constraints it creates, will also undermine the ability for the city to be served effectively by improvements to bus services. Even under an 'ambitious' demand management or City Access programme, where user charging is implemented to significantly reduce peak highway demand and congestion, significant constraints which prevent adoption of a more comprehensive, efficient bus network. Narrow, constrained streets in the City Centre, as outlined in Figure 2.11, would still act to limit the opportunities to enhance bus and guided bus services, since:

- many streets are pedestrianised or part-pedestrianised, and unsuitable for enhanced bus services, forcing services to take indirect, suboptimum routes;
- a significant majority of traffic is 'essential' delivery and servicing traffic, which could not easily be displaced elsewhere, and where extensive filtered permeability has already been implemented;

2.116 These constraints mean that there are few opportunities to optimise or enhance bus operations through Central Cambridge, or facilitate additional services required to meet forecast peak demand. While the development of the GCP corridor schemes to Cambourne, Granta Park and Waterbeach will facilitate improved journey times and reliability on radial routes to the edge of Cambridge, they will do little to secure segregated, reliable operations within the City, and hence provide the comprehensive, reliable transport network required to fully support the regions' growth.

2.117 Bus priority measures, including bus lanes and junction priority such as that being delivered along Histon and Milton Road, will also lead to improvements in bus journey times and reliability, but fail to provide the transformational improvement required to capacity and connectivity required to support the region's growth. Competing demands for road space, including for dedicated cycling infrastructure as well as general traffic, and physical junction constraints, inevitably limit the extent to which reliable, seamless public transport services can be provided on surface streets.

2.118 It is these specific constraints, combined with the significant growth of Greater Cambridge, that build the case for CAM and for tunnelling under the City Centre.

Developing the case for tunnelling

Future housing and employment growth is largely focused on developments on the Cambridge 'fringe' and in new and expanded settlements in Greater Cambridge, which are key to the region's continued growth.

These developments rely on efficient connections to the City Centre and each other for their success, but the unique constraints of the city centre streetscape mean it is extremely challenging to provide a network to efficiently support these requirements.

Targeted mode shift and demand management could result in a more than doubling of current bus demand through the City Centre, which would be extremely difficult to support through additional services.

Furthermore, it would be impossible to deliver a significant improvement in the journey times or reliability of services crossing the City Centre, and hence improve the accessibility of 'fringe' sites from elsewhere in the region, with incremental improvements to bus priority or further demand management.

These unique constraints imposed by the urban geography of the city mean that it will be extremely difficult to adapt to future transport requirements on an incremental basis. This suggests a more radical rethink of how transport capacity is provided will be required.

Tunnelling is likely the only option which will allow for transport capacity to be efficiently increased while delivering significant improvements to journey time reliability and connectivity.

Part C: Vision, Objectives and Scope of CAM

- 2.119 The Vision for CAM is to develop a comprehensive transport network to help enable growth and development that is fundamental to Greater Cambridge being able to realise its full economic potential and, by extension, deliver additional growth at the UK level.
- 2.120 CAM has been developed to overcome the key constraints within the Greater Cambridge transport network that limit transport connectivity now, and to provide a step-change in network coverage capacity and connectivity to accommodate and shape future growth.

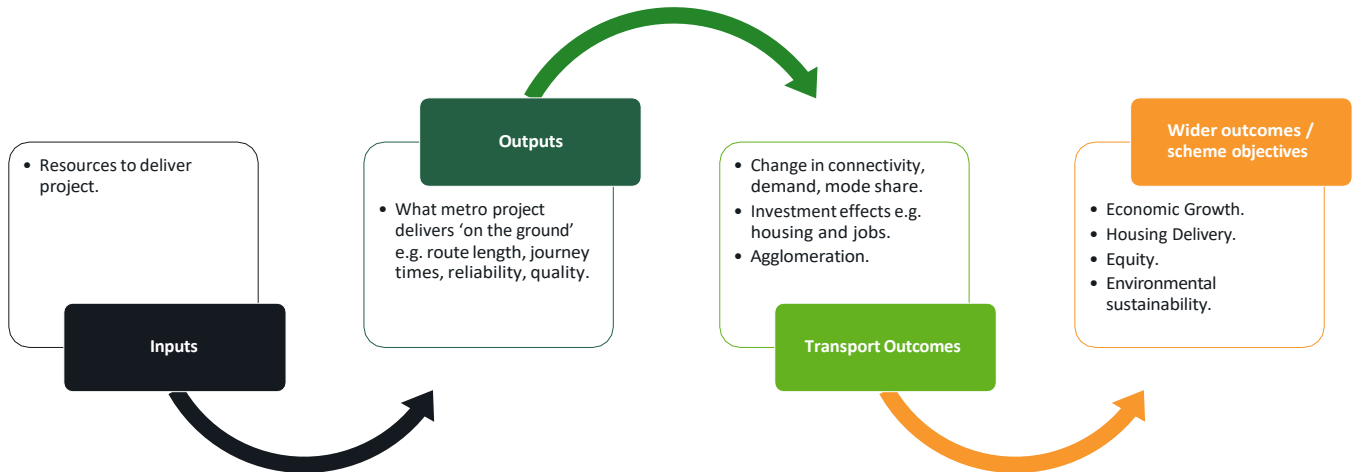
CAM Scheme Objectives

- 2.121 CAM has been designed to support the shared CPCA and GCP priorities and outcomes around economic growth, accelerating housing delivery, promoting equity and encouraging sustainable growth and development. These outcomes have directly informed the development of four overarching CAM scheme objectives. Under each of the four outcome-related objectives there are a number of sub-objectives. These are presented in Table 2.3.

Table 2.3: CAM Scheme Objectives

| Objective (outcome-related) | Sub-objectives |
|---|--|
| Promote economic growth and opportunity | <ul style="list-style-type: none"> • Improve transport connectivity • Improve journey time reliability • Promote agglomeration • Support new employment by enhancing access to and attractiveness of key designated employment areas • Increase labour market catchment |
| Support the acceleration of housing delivery | <ul style="list-style-type: none"> • Direct high-quality public transport access to key housing sites (existing designations) • Serve and support new areas for sustainable housing development • Provide overall transport capacity to enable and accommodate future growth |
| Promote Equity | <ul style="list-style-type: none"> • Promote better connecting other towns within Cambridgeshire and Peterborough to Cambridge • Improve opportunities for deprived residents |
| Promote sustainable growth and development | <ul style="list-style-type: none"> • Improve local air quality • Promote the low carbon economy • Support environmental sustainability |

- 2.122 The purpose of the sub-objectives is to establish meaningful criteria that allow the measurement and assessment of how CAM contributes to the achievement of individual sub-objectives and, by extension, contributes to the overall outcomes.
- 2.123 The process by which CAM can contribute to the achievement of wider outcomes is set out in a 'logic map', shown in Figure 2.14 below. Logic mapping is used to identify the broad mechanisms by which, in this case, a transformational transport improvement can contribute the outcomes such as GVA, jobs and housing delivery, given that these outcomes cannot be measured and attributed directly to CAM.

Figure 2.14: Logic map of the CAM assessment framework

2.124 The logic mapping sets out the relationship between:

- **Inputs** - These are the resources and costs required to deliver the project.
- **Outputs** - These are the transport outputs that are delivered 'on the ground', such as enhanced frequency, reliability, capacity, journey times, network coverage and quality that together transform the overall connectivity and accessibility of public transport in Greater Cambridge. The change in connectivity and accessibility can be measured and quantified through transport modelling and analysis.
- **Transport Outcomes** - These relate to the behavioural responses of a range of economic actors to the change in public transport connectivity. This includes the response transport users (demand and modal shift outcomes), developers (of housing and employment land), existing businesses (reduced business costs, agglomeration benefits, access to expanded labour markets), and inward investment effects (decisions on whether to locate or expand in Greater Cambridge rather than competing locations). Many of these impacts can be measured through established approaches (demand responses and expanded labour market catchment through transport forecasting, and agglomeration through a wider impacts assessment). Other impacts can be assessed through an understanding of the importance of transport accessibility for the viability and attractiveness of housing development, or of the range of factors that play a part in inward investment decisions. respond
- **Wider Outcomes** – These are the outcomes such as additional housing, jobs and GVA that CAM has been developed to support. These are intrinsically harder to directly measure, and hence the logic-mapping process sets out the process by which CAM can support these outcomes, and the contribution of CAM inferred and assessed.

2.125 A summary of the performance of CAM against scheme objectives is presented in Part D of the Strategic Case. The objectives have also informed the development of the CAM specification, and the assessment of CAM against modal alternatives.

Objectives and Measures of Success

2.126 It follows from the logic mapping process that the scale of contribution of CAM against the scheme objectives (economic growth, housing delivery, etc.) flows from its contribution to the 'transport outputs' in terms of the nature and scale of the improvements in overall public transport connectivity and accessibility that the scheme delivers. This therefore provides the measures of success against which the scheme can be assessed throughout the scheme development and business case stages.

- 2.127 The Mayor's Interim Transport Strategy Statement outlined a number of key measures for success for the future metro. These are:
- Delivering high quality, high frequency, reliable services, making it the mode of choice and taking away a reliance on cars;
 - Delivering maximum connectivity, network coverage, and reliable journey times;
 - Forming part of a more active and sustainable travel choice which encourages walking and cycling at the start and end of journeys;
 - Providing sufficient capacity for growth and supporting transit-led development;
 - Flexibly adapting to future needs; and,
 - Using emerging technologies, including connected and autonomous vehicles.
- 2.128 An assessment of how CAM delivers against these outputs is presented in Part D.

CAM Network and Infrastructure Requirements

Overview

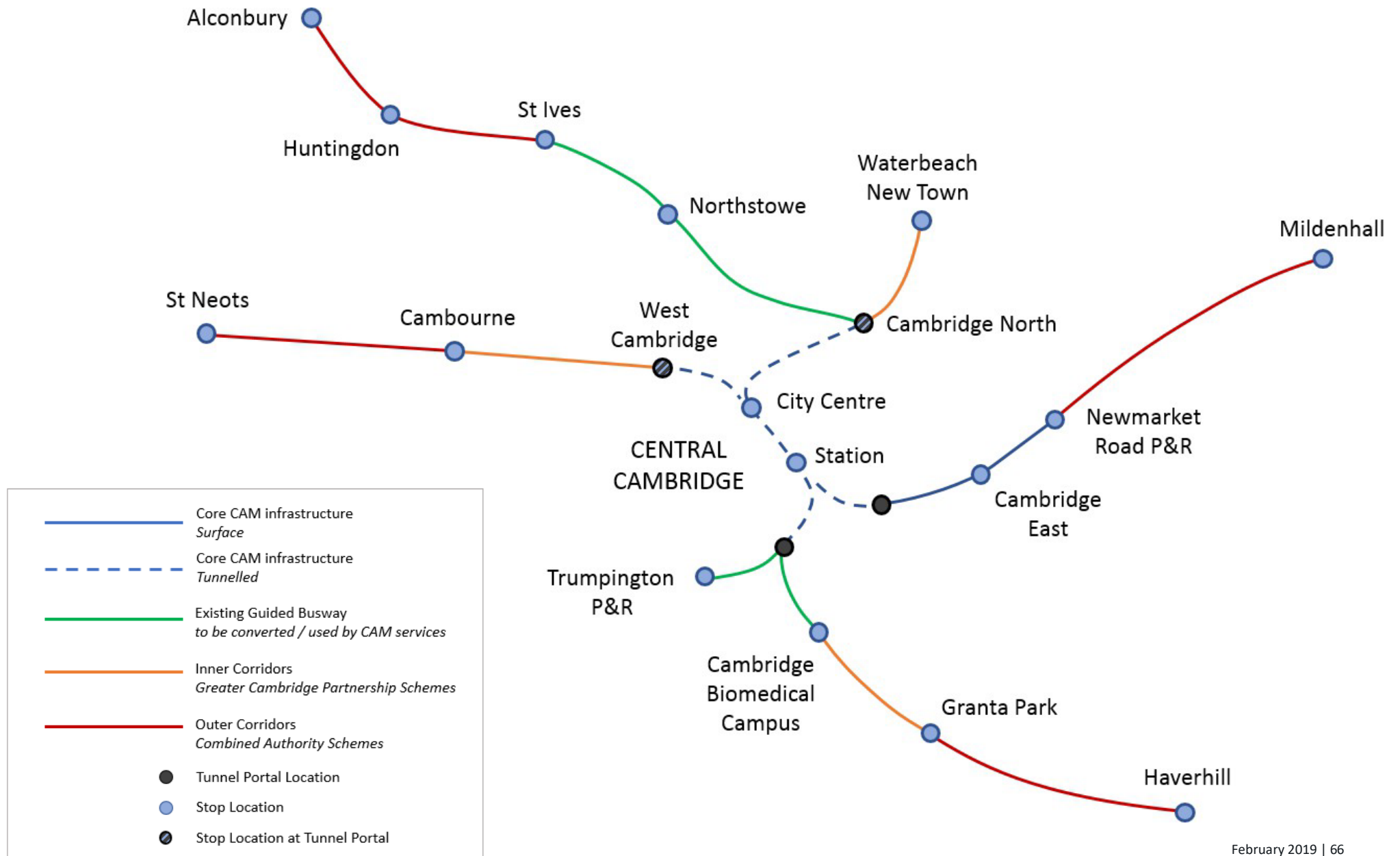
- 2.129 The CAM network is comprised of a number of segregated, public transport routes, which collectively deliver a comprehensive, largely segregated mass transit for Greater Cambridge.
- 2.130 The overall network vision envisages a network of up to 142 km, of which would comprise a 'Greater Cambridge' network of around 68 km (connecting the existing and proposed GCP 'inner corridor' schemes to the city centre and each other, via new tunnelled infrastructure through the City Centre), and around 74km of 'outer corridors' extending to St Neots, Alconbury, Mildenhall and Haverhill.
- 2.131 This is summarised in Table 2.4, with the geography of the network outlined in Figure 2.15.

Table 2.4: Summary of CAM Infrastructure Components

| Infrastructure | Description | Route length (km) |
|---|--|-----------------------------------|
| Existing Cambridgeshire Guided Busway (CGB) | <p>23km of the existing segregated corridors provided by the CGB between St Ives <> Cambridge North and Cambridge Station <> Cambridge Biomedical Campus / Trumpington P&R sections would accommodate CAM services.</p> <p>Approximately 4km of existing busway will be converted to accommodate CAM vehicles without the need for vehicles to be fitted with guidewheels.</p> | 23 (of which 4 will be converted) |
| Greater Cambridge Partnership 'inner corridors' | <p>The GCP has developed proposals for new fully segregated transport corridors covering:</p> <ul style="list-style-type: none"> • Cambourne to Cambridge: a segregated link between Cambourne and the West Cambridge Site/ Grange Road, via a future development at Bourn Airfield and served by a new Park-and-Ride site • A1307 South East Corridor: a segregated link between a new Park-and-Ride site at Granta Park, adjacent to the A11 / A505 junction, and the Cambridge Biomedical Campus, via Sawston and Great Shelford. • A10 Waterbeach New Town to Cambridge: a segregated link between Waterbeach New Town and the Cambridge Science Park, via a new Park-and-Ride site serving the A10 corridor. <p>These corridors will be developed to be fully compatible with CAM. The GCP is also currently developing proposals for a future segregated corridor to Cambridge East, for which a preferred scheme is yet to be identified, but development of which is aligned to that of the CAM network²⁴.</p> | 30 |
| 'Core' CAM infrastructure | <p>Segregated CAM infrastructure within the 'core' area, which would comprise:</p> <ul style="list-style-type: none"> • 12km of tunnelled sections linking from Cambridge North (linking to the existing GCB northern section), Cambridge Station (linking to the existing GCB southern section) and West Cambridge (linking to the planned Cambourne to Cambridge corridor). The link to the Cambridge Station also supports the development of a segregated route to the east. • 2.5 km of new at-grade segregated infrastructure providing a link to the east (to Newmarket Road P&R) | 15 |
| Combined Authority 'outer corridors' | <p>New CAM routes serving:</p> <ul style="list-style-type: none"> • Cambourne - St Neots (13km) • Newmarket Road Park and Ride – Mildenhall (30km) • Granta Park – Haverhill (16km) • St Ives – Alconbury (15km) | 74 |
| Total | | 142 |

²⁴ At the 11 October 2018 Greater Cambridge Partnership Executive Board, the GCP Director of Transport set out the context to the Better Public Transport Project – Waterbeach to Science Park and East Cambridge Corridors. The Executive Board approved the commencement of work on the A10 Waterbeach to Science Park and East Cambridge corridors, and endorsed the approach to align the high-quality public transport corridors with the emerging CAM concept.

Figure 2.15: Schematic of CAM network and different infrastructure components



Route Development – ‘Core’ CAM Infrastructure and ‘Inner Corridors’

- 2.132 The *Greater Cambridge Mass Transit Options Assessment Report*²⁵ identified a concept network for CAM including tunnelling, where required, to secure segregated running within and across the city. As part of the scheme development undertaken for the SOBC, there has been substantive work to develop this concept to a ‘feasibility’ design level. This design and development work has focused upon the ‘central’, tunnelled section, as this is the critical enabler of the overall CAM network, and also the most complex in terms of identifying design solutions which are potentially feasible, suitable and acceptable.
- 2.133 The purpose of this option design and development work is twofold:
- to ensure that there is a potentially feasible, suitable and acceptable option (or options) that provide the confidence that the scheme is viable; and
 - to provide for an assumed scheme definition, which provides the basis for the costing and forecasting for the SOBC.
- 2.134 Further scheme and option development, including additional technical work and public and stakeholder consultation, will be undertaken as part of any subsequent Outline Business Case for the CAM network. The option development work undertaken to date, for the purposes of developing the SOBC, has focused on demonstrating the engineering feasibility and deliverability of the scheme. It has examined potential station location options (serving both the City Centre and Cambridge railway station), tunnel portal locations (which interface with the existing Cambridgeshire Guided Busway and segregated public transport routes to Cambourne, Granta Park and Waterbeach currently being developed by the Greater Cambridge Partnership), together with a number of tunnel routing options connecting these corridors to the two central stations.
- 2.135 The option development process has resulted in the identification of a simple network whereby the stations at the City Centre and Cambridge rail station would be located on a common tunnel section, directly served by services from each of the six radial corridors, as outlined in Figure 2.15. The station design has been developed to ensure that any journey combination would be either direct or require a simple interchange on the same platform.

Interfaces with Greater Cambridge Partnership Schemes

- 2.136 CAM interfaces directly with the segregated public transport schemes currently being developed by the Greater Cambridge Partnership to Cambourne, Granta Park and Waterbeach New Town (marked in orange in Figure 2.15) since it is planned that CAM services will travel along these corridors prior to running through the City Centre tunnels, avoiding the need for interchange. These interfaces are in four locations:
- at the West Cambridge Site, where the proposed segregated public transport corridor to Cambourne interfaces with the western CAM tunnel portal;
 - at the Cambridge Biomedical Campus, where the proposed segregated public transport corridor to Granta Park interfaces with the existing Cambridgeshire Guided Busway;
 - at Cambridge East, where the eastern CAM tunnel portal connects to a proposed segregated public transport corridor to East Cambridge;

²⁵ <https://citydeal-live.storage.googleapis.com/upload/www.greatercambridge.org.uk/futureinvestmentstrategy/Camb ridge%20Mass%20Transit%20Options%20Assessment%20Report%20Final%202.pdf>

- in the environs of Cambridge North and the Cambridge Science Park, where the proposed segregated public transport corridor to Waterbeach New Town interfaces with the existing Cambridgeshire Guided Busway.

- 2.137 For the development of this SOBC, we have worked with the Greater Cambridge Partnership and other stakeholders (such as the University of Cambridge and the Cambridge Biomedical Campus) to establish the *principles* of these interfaces, and to ensure that there are feasible options to deliver the required segregation.
- 2.138 This is based on a set of common, shared assumptions of the required alignment for CAM (such as gradients, corridor widths, curvature, etc) from which discussions are ongoing to identify a preferred, segregated route at each interface. This dialogue is not intended to define, in detail, what the precise solution is. Rather, it is intended to develop sufficient options and flexibility such that there is confidence that the desired outcome (an end-to-end segregated route) can be achieved. Detailed design of the interfaces and adoption of a preferred alignment at each interface will be undertaken during development of any future Outline Business Case, following public and stakeholder consultation.
- 2.139 The solutions at these interface points will also need to consider what the nature of operations are before CAM, during construction, and under the 'end-state' where CAM is fully operational. Again, these issues have been considered in partnership with the GCP to help map out how the phasing of infrastructure, vehicles and operations could come forward in a manner that ensures that high-quality transport services are provided across these phases.

Scheme Development – Outer Corridors

- 2.140 There is a stated ambition that the CAM network should extend to service locations such as St Neots, Haverhill and Mildenhall. These corridors would service existing towns that have the potential for significant growth, and can potentially support the development of new settlements. As part of the SOBC, we have developed indicative costs based on potential routes that could serve these corridors.
- 2.141 There has not, to date, been any feasibility design work on these corridors as part of the SOBC. This could commence as part of (or as a parallel activity alongside) the OBC development, and would need to be aligned with the ongoing work on spatial planning and local plan development.

CAM Operations

Metro Service Levels

- 2.142 CAM will provide for a high frequency 'metro-style' level of service. This, in effect, would provide for a 'turn up and go' level of service whereby passengers can turn up at stops in the expectation that there would be a service within a few minutes. In practice, this means a service frequency of a minimum of a service every ten minutes, though the service level would be better on many parts of the network.
- 2.143 While the detailed service levels and patterns would be refined over the course of further scheme development, the analysis undertaken for the SOBC assumes that a service frequency of 12 vehicles per hour (one every five minutes) would operate during the peaks on each of the 'inner corridors', which in turn provides for a frequency of 36 vehicles per hour through the core section (between the Cambridge Station and the city centre). The analysis for the SOBC suggests that the forecast demand is sufficient to justify this level of service.

- 2.144 The expectation is that, as growth occurs over time, the level of services would increase to accommodate this growth. The options for how CAM could accommodate significant planned growth over time are set out later in this section.


High-Quality Interchange

- 2.145 It is currently envisaged that the full CAM network would operate as three 'lines', each with an initial peak frequency of at least 12 services per hour in the peak, and at least six services per hour in the off-peak. Each CAM stop would therefore benefit from a service every five minutes in the peak to Central Cambridge, providing the high-frequency, turn-up-and-go service required.
- 2.146 All CAM would provide direct services to the city centre and Cambridge Station and a number of cross-city destinations (e.g. to Cambridge Biomedical Campus from the north). There will be a requirement to interchange between services for some cross-city movements. Where passengers are required to interchange this will be achieved via a same-platform interchange in the City Centre without the need to use stairs, lifts or escalators, minimising any inconvenience for passengers.

High Quality Vehicles and Stops

- 2.147 CAM would operate with high-quality, zero-emission trackless metro vehicles, powered by electric batteries recharged overnight and at route termini throughout the day, without the need for overhead wires. Vehicles would offer a high level of ride comfort, comparable to tram operation, with a maximum speed of approximately 55mph (88kph).
- 2.148 There are several low-floor, 'tram style', fully battery powered electric vehicles 'on the market' which could be used to support CAM services. The supplier market is developing rapidly as manufacturers and technology companies are responding to opportunities that 'trackless metro' offers, and the ambition that a number of public authorities have to develop and enhance their public transport networks based on an affordable, flexible and scalable technology.
- 2.149 The vehicles on the market include the latest technology around electric operation and charging, and many vehicle manufacturers (usually in conjunction with technology partners) are piloting and testing the technology that will allow for autonomous and driverless operation, connected vehicles allowing platooning and dynamic network management which offer the prospect of more efficient and effective operation in the future.
- 2.150 Examples of such vehicles are shown in Table 2.5 below.

Table 2.5: Summary of potential CAM Vehicle Options

| Manufacturer (bold) and brand name (italics) | Image |
|---|--|
| Vanhool: <i>EquiCity</i> <ul style="list-style-type: none"> Available with battery-electric operation Vehicle length 18m (single articulation) Passenger capacity c. 105 Operating in Belfast, Hamburg, Geneva, Palma and numerous |  |

| | |
|--|---|
| <p>Vanhool: <i>EquiCity</i></p> <ul style="list-style-type: none"> • 24m version of above (double articulation) • Passenger capacity c. 180 • Operating in Metz, Linz, Luxembourg, Martinique and elsewhere |  |
| <p>Irizar: <i>ie Tram</i></p> <ul style="list-style-type: none"> • Fully electric • Vehicle length 18m (single articulation) • Passenger capacity c. 155 • Operating in the Amiens over 4 routes in the city utilising 43 vehicles, with a total project cost (including infrastructure) costs of €122 million. |  |
| <p>CRRC: <i>Autonomous Rapid Transit (ART)</i></p> <ul style="list-style-type: none"> • Fully electric • Vehicle length 31m (double articulation) • Passenger capacity c. 300 • Operating on pilot corridor in Zhuzhou, China |  |

Stops

- 2.151 Each CAM stop would include waiting facilities, covered cycle parking, ticket vending machines and smartcard readers and real-time information provision. Stops would be high-quality, providing shelter from the elements, and present an attractive, iconic and recognisable impression of the CAM system.

Guidance

- 2.152 Vehicles would be guided through tunnelled infrastructure by an optical guidance system within the tunnelled sections of the CAM network. Image processing by cameras on-board CAM vehicles allow it to follow markings along the CAM alignment, which linked to an on-board computer, guides the vehicle through the steering column.
- 2.153 Such optical guidance systems are well-proven, and the technology has been in operation in several European cities since the early 2000s, including Rouen, Nimes, Bologna, Castellon and Essen. Optical guidance is currently proposed for the segregated Cambourne – Cambridge and Granta Park – Cambridge Biomedical Campus corridors, under development by the Greater Cambridge Partnership, which will form part of the CAM network.
- 2.154 Such guidance mechanisms can readily be migrated towards driverless operation.

System Capacity to Accommodate Future Growth

- 2.155 It is essential that the CAM network provides a level of service and network coverage which is both commensurate with the expected level of demand in the early years of operation, but is also able to accommodate increased demand in future, including from housing and employment growth, and from future expansion of the network.
- 2.156 Our demand analysis, presented in the Economic Case, shows that the assumed initial service levels are sufficient to accommodate forecast demand.
- 2.157 In the longer term, to support additional demand arising from additional population and employment growth over and above 'Local Plan', and for further substantial modal shift. The capacity of the CAM system can be significantly increased by threefold or more. This could be achieved through several means:
- Increasing **service frequencies** – the tunnelled core could also support increasing the service frequency to up to 60 services per hour, or one a minute, equivalent to a capacity of up to 66%.
 - Operating **longer vehicles** – we have assumed a vehicle length of 18m, although comparable transit vehicles are available on the market with a length of 24m. This equates to a capacity increase of approximately 40%;
 - '**Platooning**' vehicles – vehicles could also operate in 'platoon', travelling in convoy a short distance apart from one another. Platforms on the CAM network have been planned with a 60m length, to enable 3x18m or 2x24m vehicles to operate as a 'platoon', increasing the capacity by up to 200%;
- 2.158 These approaches enable the capacity of the CAM network to be increased incrementally, in line with forecast demand. Increasing capacity will require additional vehicles and incur additional operating costs, although this will be balanced by the additional revenues associated with any such increase in demand.
- 2.159 Platooning vehicles would require further development of convoying and platooning technology, and associated legal powers, to permit usage on CAM infrastructure. Platooning systems are technically feasible today²⁶, but are not commercially available, although on-road trials of platooning of heavy goods vehicles have been successful in mainland Europe²⁷, and are expected to be trialled on the UK motorway network²⁸. Such technologies are fully expected to become available in the medium-term, during the development of CAM.
- 2.160 Up to three 18m vehicles could be 'platooned', and accommodated within 60m-long CAM platforms, representing a tripling of capacity compared to operating vehicles singly. Vehicles could continue to be operated by a driver (in the first vehicle), although could transition to full autonomous operation in the longer term. Platooning has the advantage that the number of vehicles being platooned can be easily changed at the start and end of routes, allowing for capacity to be easily enhanced during peak periods.

²⁶

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/637361/truck-platooning-uk-feasibility-study.pdf

²⁷ <https://www.theguardian.com/technology/2016/apr/07/convoy-self-driving-trucks-completes-first-european-cross-border-trip>

²⁸ <https://www.telegraph.co.uk/news/2017/08/24/fleets-driverless-lorries-will-trialled-britains-motorways-next/>

- 2.161 Alternatively, or in combination with platooning, vehicles of a longer length could operate. VanHool ExquiCity vehicles are already commercially available in a length of 24m, increasing capacity by approximately 40%, although would require dispensation from the Department for Transport to be operated²⁹. The Autonomous Rapid Transit (ART) has a vehicle length of 31m, and passenger capacity of around 300.

Future Autonomous Operation

- 2.162 CAM presents the opportunity to adopt rapidly emerging autonomous vehicle technology, as and when it becomes sufficiently mature for mainstream use. It has been developed to maximise segregation, which in addition to creating a faster, more reliable network, will increase the ease at which autonomous operation can be introduced. The initial piloting and then running of driverless vehicles will be easier to implement within a more controlled (i.e. segregated from general traffic) environment. Autonomous, driverless operation of CAM could deliver significant operational savings, as well as help Cambridge become a 'city of firsts' in creating a high-quality, high-capacity and automated mass transit system.
- 2.163 It should be noted, however, that the CAM concept is not *dependent* or in any way predicated on autonomous operation. It is intended that CAM will operate with a driver initially, before transiting to driverless operation as and when the requisite technology matures.

Options Assessment

Background

- 2.164 As part of the identification and development of a 'preferred option' it is necessary to identify a longer-list of potential options, 'sift' the long list to identify a shortlist of better performing options and then undertake an assessment to identify a single preferred option for the purposes of the SOBC.
- 2.165 The Greater Cambridge Mass Transit Options Assessment Report³⁰, published in January 2018, concluded that mass transit infrastructure within Greater Cambridge could play an important role in developing an integrated, high-quality transport network which supports the region's growth aspirations. As part of this work a long-list was considered, and a shortlist identified which comprised CAM, tram and the Affordable Very Rapid Transit (AVRT) concept. The shortlisted options were assessed based on their potential to meet the objectives³¹, their likely infrastructure cost and value-for-money, the ongoing affordability (whether revenues are likely to cover operating costs), whether the capacity is sufficient to cater for long-term demand growth, and deliverability.
- 2.166 The study found that, of the three options, CAM and tram had the potential to deliver the improvements in transport capacity, reliability and connectivity required to achieve the region's economic growth, housing and sustainability objectives. AVRT was also considered the least deliverable of the options. The report concluded that CAM would be more affordable and deliver better value-for-money than tram, delivering similar transport benefits (in terms of capacity, connectivity and accessibility) for significantly less capital cost, and that CAM would be more operationally viable due to its lower unit costs and greater operational flexibility.

²⁹ Current Government legislation limits bus lengths to 18m

³⁰ [Greater Cambridge Mass Transit Options Assessment Report](#)

³¹ While the scheme objectives have been developed further for the SOBC, the underlying rationale for CAM and the outcome-related objectives it seeks to support are ostensibly the same.

Modal Assessment

- 2.167 As part of the development of the SOBC, further work has been undertaken to review, test and validate the findings of the 2018 study. The outcome of this assessment confirmed that CAM is the preferred technology option for the mass transit network.
- 2.168 The central conclusions which support the identification of CAM as the preferred option over tram are:
- The capital costs and ongoing affordability means that it would not be viable to deliver a tram system over the equivalent network coverage envisaged by CAM. There is not the scale of density of demand support a tram network extending beyond the city fringe, and any such proposition would be unlikely to represent value-for-money and would be unaffordable on an ongoing basis.
 - CAM is therefore the **only viable option** for a metro-type network that extends beyond the city fringe.
 - A tram network would potentially be viable over a 'city' network broadly covering the Cambridge urban area (i.e. as far as the city fringe), but:
 - Any 'city' tram network would, by definition, require interchange between each of the existing and planned inner corridors (i.e. from the existing Guided Busway, Cambourne, Granta Park, etc) and would therefore be less attractive to passengers than the direct services that would operate with CAM;
 - A 'city' network would therefore deliver lower benefits at a greater overall cost than a CAM network.
 - The overarching objectives of CAM are to support long-term housing and jobs growth. The vast majority of this housing, and a significant number of jobs, will need to be located in areas served by the extended CAM network. CAM is the only option that provides a potentially affordable means of accommodating this growth by providing direct connectivity to key travel destinations in Cambridge.
 - CAM also provides greater flexibility in terms of routing and service levels, so that the network and services can be developed and scaled to support growth and development over time, as and when required.
 - Future phases of CAM, by virtue of being able to operate on a simple, controlled-access, road carriageway, would be significantly easier to be incorporated into future developments across Greater Cambridge as they are built out, compared to the fixed track infrastructure required for tram systems which is significantly more expensive to deliver and requires greater government powers and consents.

Part D: Strategic Assessment of CAM

2.169 This section summarises the strategic benefits of CAM in delivering a transformational improvement in public transport provision. It outlines how, as a consequence, CAM helps deliver against wider objectives including supporting additional employment and productivity growth, accelerated housing delivery and increasing equity.

2.170 This then inform our assessment of how CAM performs against the stated scheme objectives.

Transport Benefits

2.171 In Part C, the mechanisms by which the realisation of the CAM outcome-led objectives (e.g. around economic growth, housing delivery) was related to the transport outputs delivered by CAM was set out through the 'logic mapping' process.

2.172 The key outputs and measures of success for CAM have been established and set out in the Mayoral Interim Transport Statement. These are set out in Table 2.6, with an assessment of how can delivers against each of them.

Table 2.6: How CAM Delivers against Transport Outputs / Measures of Success

| Key output / measure of success (from MITTS) | How CAM specification meets requirement |
|--|--|
| Delivering high quality, high frequency, reliable services, making it the mode of choice and taking away a reliance on cars; | CAM will: <ul style="list-style-type: none"> Provide a step-change in the quality, frequency and reliability of public transport within the region; Encourage significant modal shift; Reduce reliance on private cars by, for example, transforming connectivity between where people live and the 'city fringe' employment areas. |
| Delivering maximum connectivity, network coverage, and reliable journey times; | CAM will: <ul style="list-style-type: none"> Support the development of an extensive public transport network linking previously poorly connected across the Greater Cambridge area; Ensure reliable journey times by providing complete segregation in Central Cambridge, and overcoming the key constraints imposed by the historic city core. |
| Forming part of a more active and sustainable travel choice which encourages walking and cycling at the start and end of journeys; | As part of CAM sustainable 'last mile' connections will be provided through: <ul style="list-style-type: none"> The provision of cycle facilities at stops Provision of attractive cycle and pedestrian infrastructure and wayfinding to stops |
| Providing sufficient capacity for growth and supporting transit-led development; | CAM will: <ul style="list-style-type: none"> Provide the long-term capacity required to support substantial growth across Greater Cambridge Provide the connectivity, capacity and accessibility that can support the development of expanded and / or new settlements along its route. |
| Flexibly adapting to future needs; and, | CAM provides flexibility to adapt to future needs through providing: |

| | |
|--|---|
| | <ul style="list-style-type: none"> Operational flexibility to ensure that services cater for demand Route flexibility to allow the network to develop to support future growth and development. Capacity to support long-term growth Ability to adapt to the opportunities afforded by autonomous and connected technology. |
| Using emerging technologies, including connected and autonomous vehicles. | CAM is being developed to be fully capable of responding to the opportunities that autonomous and connected technology can provide, including reduced operating costs and increased operational flexibility and efficiency. |
| Delivering high quality, high frequency, reliable services, making it the mode of choice and taking away a reliance on cars; | CAM will transform the attractiveness of public transport and make it an attractive and viable alternative to the private car, enabling growth to take place in a sustainable manner. |

Economic Benefits

How Would CAM Contribute to the Growth of the Greater Cambridge Economy?

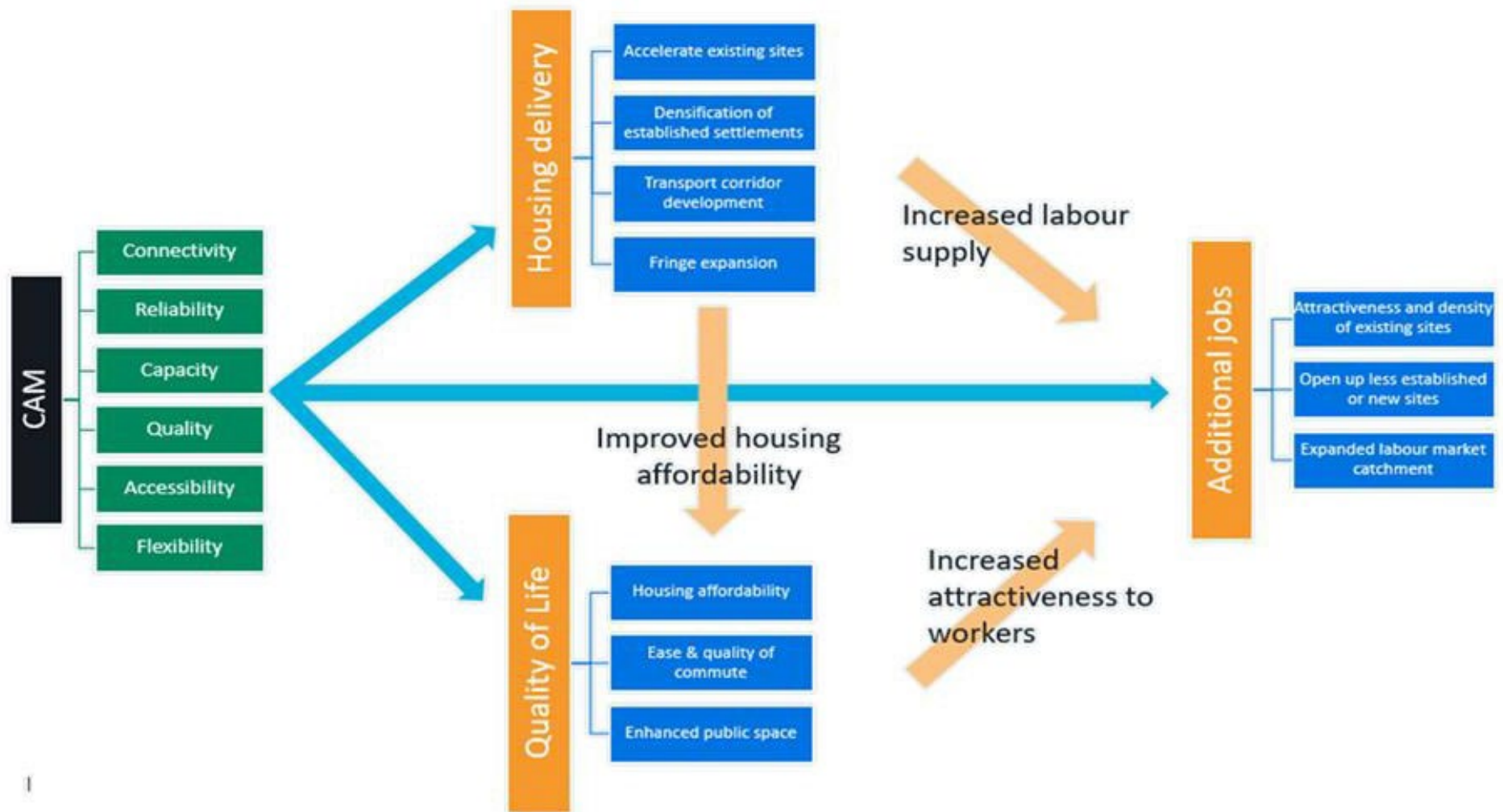
- 2.173 CAM will transform the quality of public transport provision for the benefit of existing residents and businesses. However, the scale of investment required can only be justified if CAM supports additional growth in jobs and housing within Greater Cambridge, delivering an overall level of development, growth and economic activity significantly above that which would be possible without CAM.
- 2.174 In the following sections the potential of CAM to contribute to the Greater Cambridge economy is outlined. The greater connectivity provided by CAM will benefit the economy through several mechanisms, which are described below.
- 2.175 Ultimately, as one of the most productive and specialised economies in the UK, growing the Greater Cambridge economy has the potential to bring significant benefits at both regional and national scales.

Supporting additional employment growth

- 2.176 There are several mechanisms by which CAM will support additional job growth across Greater Cambridge. These mechanisms are summarised in Figure 2.16.
- 2.177 CPIER identifies the need to accelerate housing supply and to maintain and enhance quality of life as factors important for attracting and retaining skilled labour. CAM will help to achieve both of these objectives. By spreading better connectivity beyond Cambridge City Centre, it will unlock additional sites for housing development. By providing an additional, high quality public transport option, the quality of the public realm is likely to improve.
- 2.178 Attracting and retaining skilled labour is fundamental for driving economic growth in Greater Cambridge. CPIER suggests that in the knowledge-intensive sectors, many businesses in Greater Cambridge adopt a 'Cambridge or Overseas' attitude, meaning that if they were not located in Greater Cambridge they would be located outside the UK. This means that additional jobs (and the resulting economic input) lost if CAM is not constructed are not only lost to Greater Cambridge, but the UK as a whole. Many of these businesses are attracted to Greater Cambridge because of the quality of the workforce. Maintaining and enhancing the quality of this workforce is therefore of both regional and national interest.

- 2.179 Critically, CPIER identifies that many additional firms and jobs within KI and related sectors are likely to be 'additional' to the UK economy, and would choose to locate overseas rather than elsewhere in the UK. In cases such as Greater Cambridge, with high levels of FDI and KI jobs it can be assumed that between 10-30% of jobs will be 'net additional' to the UK economy. We have quantified the benefits of additional jobs and the UK level within the CAM economic case.
- 2.180 Additionally, by enhancing regional connectivity, CAM will make more jobs accessible for more employees living in the local area. All businesses require a range of skillsets, and providing access to a wider potential pool of employees should ensure that there is a better 'fit' between opportunities and jobs. By spreading connectivity across the Greater Cambridge area CAM has the potential to provide employment for individuals living in areas with poor labour market accessibility.

Figure 2.16: How CAM supports future growth in Greater Cambridge

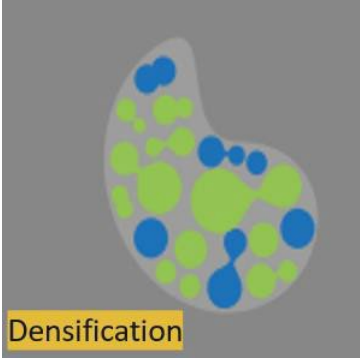
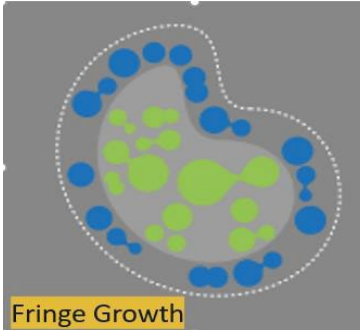
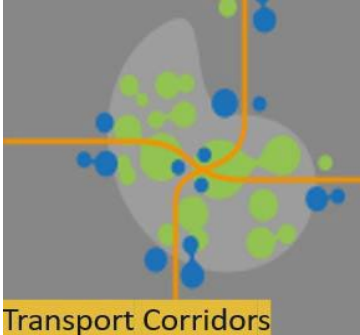


Supporting housing growth

- 2.181 CAM will provide enhanced public transport accessibility between areas of existing economic activity and planned growth, broadly linking the city centre (including around Cambridge Station), the large-scale city fringe sites, and satellite centres (such as Cambourne and Waterbeach). It also has the potential to expand further towards market towns (St. Neots, Haverhill, Newmarket and Mildenhall).
- 2.182 CAM will help to support and shape future spatial planning options. The Combined Authority is developing a Non-Statutory Framework for publication in 2019, and Cambridge City and South Cambridgeshire have started the process of developing a Local Plan which would cover the period from 2031 (the end of the current plan period) to 2046 or beyond.
- 2.183 Subject to CAM being progressed beyond SOBC stage, it will help to inform and shape some of the spatial strategy options within these plans. By providing better accessibility to a wider area CAM will open opportunities for development across the Greater Cambridge area.
- 2.184 Additionally, the ‘placemaking’ benefits brought by CAM are likely to attract more skilled workers to the area. Placemaking refers to the process of shaping public realm spaces to maximise their shared value³². Providing high quality, ‘flagship’ public transport solutions such as CAM is likely to enhance Cambridge’s reputation as a city with a good quality of public realm, therefore encouraging highly skilled workers to locate to the area.
- 2.185 Within the CPIER report different high-level spatial planning options were identified; these were densification, dispersal, fringe growth and transport corridors. The CPIER report recommended that a blended spatial strategy be developed, comprising elements of each of these, but also highlighted the pros and cons of each strategy in economic (contribution to economic growth) and sustainability (impact on use of different modes). The details of these options are summarised in Table 2.7.
- 2.186 Essentially, CAM can provide the connectivity to support accelerated housing delivery and jobs growth through densification, fringe growth and transport corridor-led development. The least sustainable land use option identified was ‘dispersal’ which CAM, by its nature, would do less to support.
- 2.187 A key benefit of CAM is that, by accommodating higher levels of growth and development in sustainable locations, the pressure and requirement for growth in other less suitable and more sensitive areas would be relieved. CAM can therefore help deliver growth in a manner that is economically and inviolately sustainable, while also being potentially more acceptable to stakeholders.

³² Project for Public Spaces, <https://www.pps.org/article/what-is-placemaking>

Table 2.7: Details of Spatial Development Options (from CPIER).

| Spatial Development Option | Summary of CPIER findings | Potential role of CAM |
|--|--|---|
|  <p>Densification</p> | <ul style="list-style-type: none"> This option is most consistent with a 'networks-based' approach to developing the economy – supporting the agglomeration of knowledge-intensive sectors. Densified accommodation is popular with young people, due to close access to amenities There is limited potential for densification within the city of Cambridge. Densification would be most feasible in new development sites towards the edge of cities. Densification is associated with the lowest increase in car use and is therefore the most sustainable transport option. | <ul style="list-style-type: none"> CAM will transform transport connectivity and therefore support greater agglomeration between the key employment (and academic and research) areas of the city centre, fringe sites and related sites. CAM will attract additional employment to the area by making existing employment sites more attractive (to businesses through better access to labour, and to workers) and developable at higher densities. CAM can open up major new development sites, making them more viable and attractive to businesses and investors, and supporting high density employment and housing. <p>Overall, CAM can help forge a better integrated and more agglomerated economic area that will support the growth of the Knowledge-Intensive economy.</p> |
|  <p>Fringe Growth</p> | <ul style="list-style-type: none"> Has the potential to create new economies which 'feed' off the economic strength of Cambridge Could allow denser developments than options within the city centre This option is likely to work best as part of well-planned urban extensions | <ul style="list-style-type: none"> CAM has the potential to open major new city fringe sites. Good public transport accessibility will be a major factor in determining whether such sites can come forward, and of the density, rate and mix of development that can be supported. These sites have the potential to be both housing and employment sites. |
|  <p>Transport Corridors</p> | <ul style="list-style-type: none"> This approach should be considered a way of expanding the productivity of urban areas to the wider region Maintains the strength of the city core, and ensures that all future dwellings are within reach of employment sites Leaves large 'green wedges' between the transport links, helping maintaining the countryside quality of life If public transport links are set up before development, it would encourage wider use of these modes Would require careful coordination between infrastructure and development projects | <ul style="list-style-type: none"> CAM will provide the public transport capacity, accessibility and connectivity required to support 'transport corridor' development. This could include the expansion of existing settlements and the development of new settlements. The planning of CAM in conjunction with new settlements would allow for the integrated planning of housing, transport and 'place' to deliver the quality of life required to encourage skilled workers to locate in the area. |

Supporting productivity growth

- 2.188 Productivity across the Greater Cambridge area is already high and driving it higher will be a challenge. However, CAM should support increased productivity in several ways.
- 2.189 The most significant of these will be through encouraging ‘agglomeration benefits’. Agglomeration benefits occur when firms are located close to one another and can take advantage of efficiencies gained from this proximity. These benefits can broadly be divided into two categories:
- **Static clustering** benefits. This is a ‘proximity effect’ which occur as the ease of making a journey within a ‘cluster’ of existing businesses is improved. This allows sharing of common resources, increased scale and specialisation, and knowledge spill-overs.
 - **Dynamic clustering** benefits. This is an inward investment effect, whereby more productive resources are attracted into the economy, encouraging an increase in the quantity of economic activity in each place. Dynamic clustering attracts high-skilled workers to the area, incentivises local people to invest in education and skills, and stimulates business investment.
- 2.190 Greater Cambridge already benefits from these ‘agglomeration impacts’, such as knowledge spill-over from the university. However, CAM will link together key ‘clusters’ around the city, decreasing the relative distance between them. Additionally, CAM will support the expansion of existing and new employment sites as the urban area around Cambridge expands.
- 2.191 The development of CAM will allow the ‘densification’ of Cambridge by better connecting the city to the city fringe employment sites (static clustering effect) and encouraging additional jobs to locate in the city (and near surrounds) due to CAM making the area a more attractive place to locate, expand and invest.
- 2.192 Improving the transport network will also expand the potential ‘pool’ of labour and jobs from which employers and employees can select from. This should allow better ‘skills matching’ as people with the ‘right’ skills can be paired with the ‘right’ jobs. All businesses require a range of skillsets to function effectively, providing a wider labour pool increases the probability they will be able to source them. CAM will improve connectivity between areas of Greater Cambridge which are currently poorly served by the public transport network, expanding this potential ‘pool’.
- 2.193 CAM will also improve the operational efficiency of businesses, through providing fast and reliable connections from employment sites, between sites (encouraging business to business activity), to markets and suppliers across (and beyond) the Combined Authority area and, indirectly, to key gateways such as Stansted Airport. CAM will also serve to relieve congestion on the road network, further benefitting businesses through reduced delay and better reliability. These effects are quantified within the Economic Case through the estimation of journey time savings.

Social and Equity Benefits

- 2.194 A key concern about the rapid growth of the Greater Cambridge economy is that the benefits of growth are overly-concentrated in and around Cambridge itself and that lower skilled and lower paid workers are increasingly being ‘priced out’ of Cambridge.
- 2.195 CAM will not, on its own, address the equity issues that are identified across the Combined Authority region, but will potentially help in a number of specific areas including:

- Improving the affordability of housing, by addressing supply-side constraints and therefore reducing the mismatch in growth between jobs and housing.
- Making areas within the commuting hinterland of Cambridge significantly more attractive as places to live, through providing an attractive and affordable public transport option.
- Encouraging increased economic activity and jobs in locations such as satellite centres (Cambourne, Waterbeach) and market towns (St Neots, Huntingdon) through providing significantly enhanced connectivity between these locations and the economic 'hub' in and around Cambridge. CPIER identified a key opportunity for supply-chain activities (much of which is sources from overseas) to develop and locate within the wider Combined Authority area.
- Providing enhanced journey opportunities to deprived residents, many of whom may not have a car available. Such journey opportunities can increase access to employment opportunities, education, leisure and health facilities.

Assessment Against Scheme Objectives

2.196 Table 2.8 summarises the performance of CAM against the scheme objectives.

Table 2.8: Performance against scheme objectives

| Objective / sub-objectives | Description of Economic Linkage | Transport metric | CAM Assessment |
|--|--|---|---|
| <i>Promote economic growth and opportunity</i> | | | |
| Improve transport connectivity | Connectivity supports access to labour, access to markets and suppliers, B2B linkages, and access to gateways. | Change in overall generalised journey times by public transport and car | <p>CAM will transport connectivity to and across the city. The overall improvements in public transport journey times are valued at £425 – 525m PV.</p> <p>Sample improvements in public transport journey times include:</p> <ul style="list-style-type: none"> • Cambridge West to Cambridge Central Station, 22 minutes today, 6 minutes with CAM; • Cambridge North to Cambridge Bio-Medical Campus (CBC), 32 minutes today, 12 minutes with CAM; and, • Newmarket Road P&R to City Centre, 25 minutes today, 10 minutes with CAM. <p>CAM is forecast to 7.5 million vehicle trips per annum per annum. Reductions in travel time on the road network is estimated at £90m PV.</p> |
| Improve journey time reliability | Journey time unreliability (car & PT) is a key problem in and around Greater Cambridge and imposes costs on businesses | Improvement in journey time reliability by public transport and car | <p>Journey time unreliability is a critical issue for business and people, and many journeys will be subject to greater delay in the future as growth places additional strain on transport networks. On a good day, a peak-time journey along the Maddingley Road in Cambridge can take 20 minutes, with congestion it can be more than double this.</p> |

| | | | |
|---|---|---|--|
| | and affects the quality of life for all. | | CAM will be fully segregated and therefore deliver fast and reliable journey times between a range of locations across Greater Cambridge that, without CAM, would be subject to significantly unreliability. |
| Promote agglomeration | Drive ambition to support growth and productivity of knowledge-based economy. | Reduction in journey times between key employment centres including city centre, city fringe sites, satellite centres and market towns. This, in turn, increases the 'effective density' (the measure of agglomeration) of employment | <p>CAM will deliver additional GVA from increasing the 'effective density' of jobs. Jobs in highly innovative and knowledge-intensive sectors, which characterise employment in Greater Cambridge, are those where the agglomeration gains will be greatest. The agglomeration benefits stem from:</p> <ul style="list-style-type: none"> • 'Static agglomeration' - the additional productivity gains from as improved transport connectivity increases the benefits of business clustering, assuming a fixed level of jobs. These benefits are valued at £465 – 575m PV. • 'Dynamic Agglomeration' - occurs as the CAM can support a higher overall level of jobs in the region, which increases effective density (by increasing the actual number of jobs) and thereby increases the productivity of all firms. This is valued under 'supporting new employment' |
| Support new employment by enhancing access to and attractiveness of key designated employment areas | Providing transport connectivity that makes employment locations more attractive place to invest or locate, can supports higher scale and/or density of development | Step change in connectivity and capacity to key employment areas. | <p>CAM will provide the connectivity, capacity and accessibility that will enhance the attractiveness of key existing and potential future employment sites. This will also enable sites to be developed to a greater density than would be the case without CAM. Sites that will be transformed in terms of their accessibility include the City Centre, CB1 (Cambridge Station) and the major city fringe sites of West Cambridge, CBC (to the south), Cambridge Science Park (north) and future potential development sites to the East.</p> |
| Increase labour market catchment | Access to labour and skills is fundamental to success and growth of knowledge economy. Supports objective to match labour skills with business needs. | Expansion of labour market catchment | <p>CAM will enable existing and future employers to be able to recruit labour from a significantly larger labour pool, as it will bring a significantly larger number of workers within easy commuting access of Cambridge. significantly higher number of workers within a reasonable public commuting time.</p> <p>Supporting the growth of additional housing where CAM will provide direct connectivity between major housing settlements (e.g. Waterbeach, Cambourne) and employment sites in the city, city fringe and satellite centres.</p> |

| <i>Support the acceleration of housing delivery</i> | | | |
|--|--|--|--|
| Direct high-quality public transport access to key housing sites (existing designations) | Accelerating the delivery of housing where improved transport connectivity makes sites more attractive to developers and occupiers | Step change in connectivity and capacity to key designated housing locations. | CAM has been developed to serve major existing and proposed housing locations. The impact of CAM will depend on the phasing of development, but in many cases, will improve the viability of development sites, enable development to be accelerated and can support development at a greater density due to enhanced public transport accessibility levels and reduced requirement for parking. |
| Serve and support new areas for sustainable housing development | New and enhanced transport links open up new areas for housing development. | Opportunities to serve areas which could support housing, including new settlements. | <p>The major challenge to realising Greater Cambridge's economic potential is the need to accelerate housing delivery to a level well above historical levels. CAM provides an opportunity to help shape a future spatial strategy around the connectivity, capacity and route flexibility that it will provide. It can support a blended spatial strategy (as recommended by CPIER) focussing on:</p> <ul style="list-style-type: none"> • The 'densification' of existing build up areas and developments; • The expansion of existing settlements that are served by CAM through 'fringe growth'; and, • The potential for new and or expanded settlements on 'transport corridors', where CAM provides fast and reliable services from settlements into (and across) the city. <p>The full extent of the CAM network enables it to support each of these spatial strategies, as appropriate, in line with future spatial plan development. The critical feature of CAM is that it will be transformational in supporting the quantum of future housing levels required in a sustainable manner.</p> |
| Provide overall transport capacity to enable and accommodate future growth | Transport system has the capacity to support long-term growth | Balancing of capacity and demand, allowing for long-term growth. | <p>CAM Is designed to be flexible and responsive, so that service and route planning can be developed, over time, to accommodate and support future growth. This flexibility includes the ability to:</p> <ul style="list-style-type: none"> • increase capacity over time. • extend the network geography to support existing or new settlements |
| <i>Promote Equity</i> | | | |
| Promote better connecting other towns within C&P to Cambridge | Improve connectivity to Cambridge / Fringe sites to enable benefits of 'Cambridge phenomenon' | Ability to improve PT access to locations poorly served / connected | Spreading the benefits of the 'Cambridge-effect' more equitably across the CA area is a key Mayoral objective. CPIER identified that, while knowledge-intensive sectors are, and will continue to be, clustered in Greater Cambridge, there are significant opportunities for the rest of the region to benefit by increasing the share of supply chain and |

| | | | |
|---|---|---|---|
| | to be spread across CA area. | | ancillary functions which are largely provided out-with the CA area. The connectivity provided by CAM can be an enabler of growth in KI-related sectors, which, if realised, can support jobs growth across a wider area of the CA. |
| Improve opportunities for deprived residents | Provide improved access to opportunities (work, education, leisure) to deprived groups, or those reliant on public transport accessibility. | Improvement in PT accessibility to areas of comparatively high deprivation. | There are pockets of deprivation across Greater Cambridge, and people across the area who may not have the skills and attainment to enable them to fulfil their own potential and, by extension, that of the area as a whole. CAM is one enabler, alongside other measures (skills and training) that can help improve the opportunities for deprived residents to participate in, and benefit from, the economic strength of the area. |
| <i>Promote sustainable growth and development</i> | | | |
| Improve air quality | Improve health by reducing particulates and NOx from vehicles | Modal shift from car to public transport | CAM is fully electric and zero-emission at the point of use. CAM is forecast to result in a reduction of around 7.5 million vehicle trips per annum, contributing to a significant reduction in local emissions across the area. The centre of Cambridge includes an Air Quality Management Area (AQMA). The proposed routing of CAM, in tunnel beneath the city centre, directly reduce the vehicular traffic that would otherwise drive (buses, cars, taxis) in the centre. CAM also offers the potential to significantly enhance the urban realm and enable a supporting city centre movement strategy that gives greater priority to pedestrians and cyclists. |
| Promote low carbon economy | Reduce carbon impact of transport | Reduction in Car km | CAM is forecast to result in a reduction of around 7.5 million vehicle trips per annum, contributing to a significant reduction in carbon. |
| Support environmental sustainability | Support growth of the CA area while minimising growth in (or reducing) car trips | Reduction in Car km | CAM will support environmental sustainability through: <ul style="list-style-type: none"> • Promoting modal shift and sustainable travel; and, • Encouraging more sustainable patterns of land use. |

3 The Economic Case

Introduction

- 3.1 This Chapter sets out the Economic Case for the CAM. The purpose of the economic case is essentially to provide an assessment of whether the scheme:
- is financially sustainable, in that system revenues exceed operating costs;
 - represents value-for-money with the benefits of the system exceeds the scheme costs over the lifetime of the project.
- 3.2 The overall strategic case for CAM rests on its ability to support additional economic (jobs and GVA) and housing growth, supporting overall economic activity and output at a level above that possible without the scheme. This 'additionality' case is included within the Economic Case, where the net additionality at both the Greater Cambridge and national level is estimated. There is therefore a direct 'read across' between the strategic and economic case for the scheme.
- 3.3 This Chapter sets out:
- the assumed specification of CAM upon which the economic assessment is based;
 - the approach and assumptions which underpin the economic appraisal, including the transport modelling used to support the Economic Case;
 - the capital costs of implementing the CAM network, including
 - the 'core' central area infrastructure including tunnelled sections and underground stations;
 - the GCP 'inner corridor' schemes to Cambourne, Granta Park and Waterbeach; and
 - the 'regional corridors' to Mildenhall, Haverhill, St Neots and Alconbury.
 - the ongoing operating, maintenance and lifecycle costs for the CAM network;
 - an assessment, informed by the transport modelling, of likely CAM demand, including:
 - forecasts for overall network demand under different growth scenarios and transport assumptions;
 - benchmarking of network demand against existing corridor demand, and comparable mass transit systems elsewhere;
 - discussion of the distribution of demand on the network, and changes in overall travel demand in the region;
 - an assessment of the 'fit' of modelled demand and system capacity;
 - the estimated revenues for the CAM network, together with an assessment of the ongoing affordability of the network and the extent to which forecast revenues exceed operating costs;
 - Our assessment, informed by the transport modelling, of the of the benefits and economic performance of the scheme. The benefits considered in the economic appraisal are:
 - Transport benefits, arising from the time savings to existing public transport users, benefits to new users, and the benefits arising from reduced congestion, carbon

- emissions and accidents as a result of modal shift away from private car. These are referred to as 'Level 1' benefits in DfT guidance;
- Wider economic benefits (referred to as 'Level 2' in DfT guidance), including static agglomeration, labour supply impacts, and output change in imperfectly competitive markets;
- Additionality benefits ('Level 3'), which capture the benefits arising from the additional housing, jobs and GVA that CAM could deliver, at both a Combined Authority and a 'net national' level, informed by the CPIER.
- The Economic Appraisal is presented for two scenarios:
 - The Economic Case for the benefits delivered by a 'Greater Cambridge' network delivered by the implementation of the 'core', predominately tunnelled, infrastructure and the GCP 'inner corridors'. The 'core' infrastructure is the fundamental enabler of the CAM network and, in economic terms, has to be justified against a 'Reference Case' which includes the GCP 'inner corridor' schemes, which are planned to come forward as initial phases of CAM independently of the central tunnel, and are subject to their own business case processes.
 - An illustrative case for the full 'regional' network, stretching to Mildenhall, Alconbury, St Neots and Haverhill, taking account of the greater scale of additionality that a more expansive, 'regional' network could deliver.

Scheme Definition – basis for Economic Case

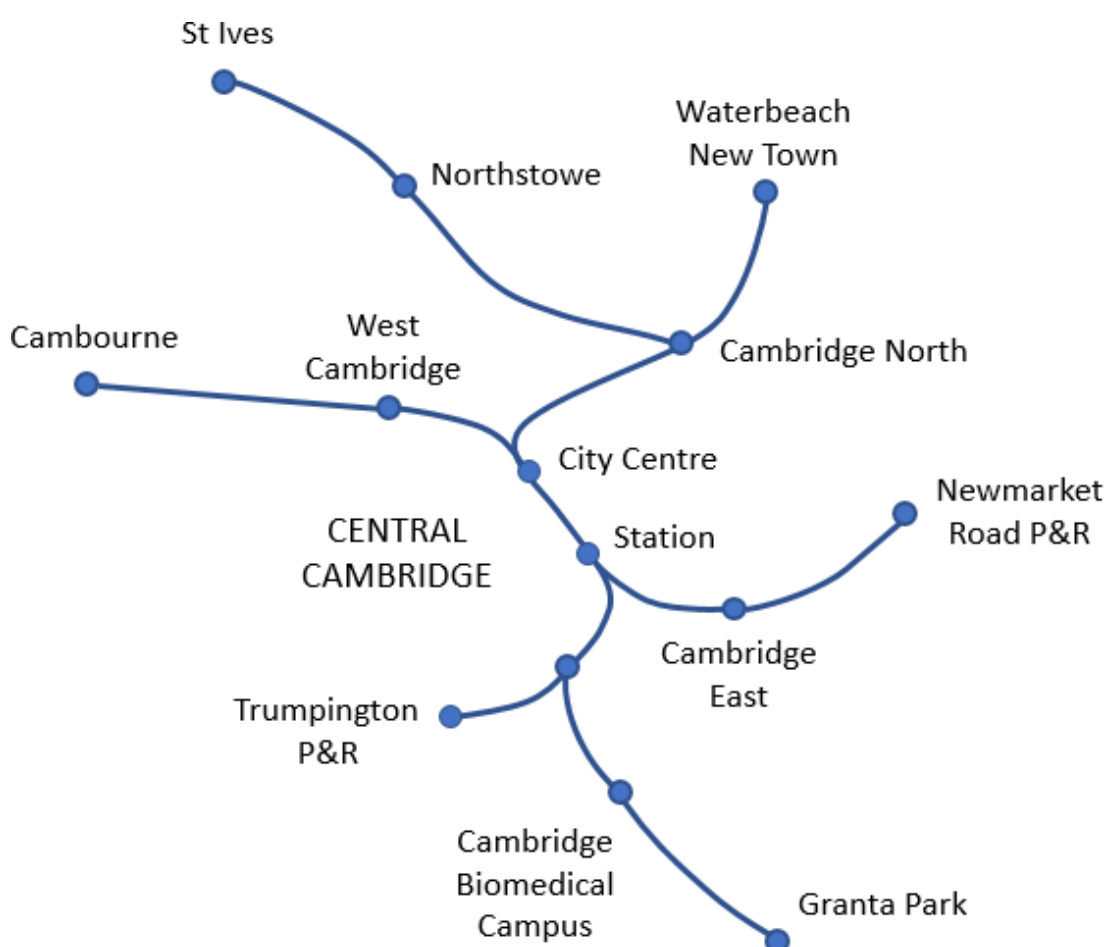
- 3.4 The vision for CAM is that it will comprise a comprehensive 'regional' network, extending to St Neots, Alconbury, Haverhill and Mildenhall, of approximately 142km in length.
- 3.5 However, in estimating the patronage, together with the transport and wider economic benefits (Level 1 and 2) for CAM, the economic assessment is based on a smaller network that extends as far as the proposed GCP 'inner corridors' to Cambourne, Granta Park and Waterbeach New Town, together with Newmarket Road P&R and Trumpington and St Ives on the existing Cambridgeshire Guided Busway. The reason for focusing upon this network is that:
- There is a much greater level of scheme development that has taken place for these sections, and therefore greater certainty about their routes and scheme costs;
 - The transport model only has sufficient geographic coverage to meaningfully forecast demand for the network above. The lack of geographic coverage, uncertainty about specific routings and the fact that the case for the development of these corridors will be based, to a large extent, on future housing growth that is not represented in current transport models, makes the forecasting of demand and benefits for the wider network using existing transport models inappropriate, and the use of any alternative approach would be too speculative to provide meaningful evidence;
 - In economic terms, it is necessary to understand and delineate the benefits that accrue from the development of different elements of the network. It is essential that the economic assessment presented in this report helps to make the incremental case for delivering the 'core', central infrastructure (and associated costs) that are addition to the schemes coming forward as part of the 'Reference Case' scenario.
 - These refer to the GCP 'inner corridor' schemes to Cambourne, Granta Park and Waterbeach, which form an integral part of the CAM network, and are being developed by the GCP as 'discrete' projects subject to their own options, scheme development, business case and powers and consents processes.

- The same principle also applies to the ‘outer corridors’, where it is also important that the economic case for the ‘core’, central infrastructure is not conflated with that of the ‘outer corridors’, as the development of these corridors will also need to be justified on a case by case basis.

3.6 Hence, the forecasts of transport benefits and wider impacts (Level 1 and 2 benefits) are based on the network set out in Figure 3.1, for which there is a better developed scheme and route definition, which is represented by the transport model.

3.7 We have made a high-level assessment of the overall economic case for the full network. This is based on indicative capital costs for the ‘outer corridors’, and an assessment of the additional levels of housing and employment growth (Level 3 benefits) they could support. This is outlined at the end of this Chapter.

Figure 3.1: Assumed CAM network (for purposes of demand forecasting and transport benefits)



Scheme Specification

3.8 The appraisal of CAM has been based on the specification as set out below.

Assumed CAM Network and Service Assumptions

3.9 The overall CAM network, for the purposes of the economic assessment, comprises:

- A segregated mass transit network linking Cambridge City Centre and Cambridge Station to the corridors outlined in Figure 3.1;
- An assumed peak ‘metro-level’ service frequency of 12 services per hour on each corridor, equating to 36 services per hour between the ‘core’ section. Services are assumed to operate at half this frequency (6 services per hour) in the off-peak;
- Services operate for 18 hours a day Monday to Saturday, and 16 hours a day on Sunday;
- High quality ‘tram-style’ vehicles, powered by electric batteries and recharged at route termini;
- Integrated ticketing between CAM and other public transport services. Ticket sales would be ‘off-vehicle’ to minimise dwell times at stops.

CAM Vehicles

- 3.10 CAM will be operated by a fleet of new, electric battery-operated high-quality vehicles, examples of which are presented in Table 2.5.
- 3.11 The peak vehicle requirement for the CAM network has been estimated based on the assumed service pattern, together with an allowance for spare vehicles which allow for a proportion of the vehicle fleet undergoing maintenance at any one time.
- 3.12 We have also included an allowance for additional vehicles, to provide provision for increased services in the medium-term to support future growth, and to reduce ongoing operating costs by enabling a more efficient use of the vehicle’s batteries. The inclusion of these vehicles allows ‘headroom’ for service growth or network expansion in the period post-opening.
- 3.13 The CAM vehicle requirements are summarised in Table 2.1. It should also be noted that these CAM vehicles will replace the vehicle requirements for the ‘GCP schemes’ to Cambourne, Granta Park and Waterbeach.

Table 2.1: CAM Vehicle Requirements

| Vehicles | |
|---|-----------|
| Peak vehicle requirement (PVR) (for currently-proposed service pattern), including spares | 59 |
| Additional vehicles | 20 |
| Total | 79 |

- 3.14 It should be noted that the vehicle requirement is based on an indicative service pattern, which is subject to future development to better match capacity to forecast demand. This will influence the overall peak vehicle requirement of CAM.

Other CAM Infrastructure Requirements

Charging Infrastructure

- 3.15 CAM will be operated by electric, battery-operated vehicles, and as such will require dedicated charging infrastructure at route termini and at depots. This will include a combination of ‘fast chargers’ and plug-in chargers, combined with the power infrastructure and grid connections required to support them.
- 3.16 Based on our assumed service pattern, we have estimated the charging infrastructure and capital costs required to operate CAM services. This includes an allowance to provide additional capacity to support an increase in service levels on the ‘core’, central section of the network.

Depot and Stabling

- 3.17 The CAM vehicle fleet will require depot and stabling facilities for maintenance, charging and overnight storage.
- 3.18 We have not identified a depot site at this stage, but depot/ stabling costs have been estimated on the basis of the assumed vehicles fleet, the area required to accommodate the fleet and allowance for the full 'fit-out' required for maintenance and staffing facilities.

Scheme Costs**Overall CAM Costs**

- 3.19 The total costs for delivering the full network would be in the order of £4,000m, as set out in Table 2.2.

Table 2.2: Summary of CAM Infrastructure Capital Costs

| Network / route sections | Cost (£m, 2018 prices) | Scope |
|---|------------------------|---|
| 'Core' CAM infrastructure | 2,360 | See Table 2.3. Bespoke cost estimates have been developed for the SOBC. |
| Greater Cambridge Partnership 'inner corridors' | 530 | Costs estimates based on published cost estimates for all schemes except Waterbeach, where a unit rate has been applied. <ul style="list-style-type: none"> • Cambourne – Cambridge; • Cambridge Biomedical Campus – Granta Park; • Cambridge Science Park – Waterbeach New Town; and • additional P&R capacity at Trumpington or a new P&R site at Hauxton <i>CAM will also integrate with GCP proposals for the East Cambridge corridor, where a preferred scheme has yet to be identified.</i> |
| Combined Authority 'outer corridors' | 800 – 1,610 | <ul style="list-style-type: none"> • Cambourne to St Neots (13km) • Newmarket Road P&R to Mildenhall (30km) • Granta Park to Haverhill (16km) • St Ives to Alconbury (15 km) |
| Total | 3,690 – 4,500 | |

- 3.20 For the 'regional corridors' we have developed indicative capital costs range for these extensions, with:
- the higher end of the range estimate based on a unit rate approach informed by cost per route km of the A1307 Cambridge Biomedical Campus to Granta Park scheme, which assumes that these extensions are segregated throughout;
 - the lower end of range estimate assuming that there would not be a requirement for new, segregated infrastructure across the entire route.

CAM Route and Related Infrastructure

- 3.21 Table 2.3 outlines the cost of the CAM elements which are integral to delivering an integrated, wholly segregated mass transit system across Greater Cambridge. This primarily consists of 12km of tunnelling under the city, two new underground stations in the City Centre and at Cambridge Station, together with depots, vehicles and charging infrastructure.
- 3.22 All 'core' infrastructure costs are presented including 66% Optimism Bias, which is an allowance made to project costs to reflect cost uncertainty. The level of optimism bias reflects the stage of scheme development, and the level assumed is based on the appropriate level at SOBC stage, in line with Treasury and DfT guidance.

Table 2.3: 'Core' CAM Infrastructure Capital Costs

| Cost element | £m, 2018 prices | Notes |
|-------------------------------------|-----------------|--|
| <i>Tunnelled infrastructure</i> | | |
| Tunnelling | 1,340 | <ul style="list-style-type: none"> approximately 12km of twin-bore tunnels four tunnel portals |
| Underground stations | 490 | <ul style="list-style-type: none"> two underground stations, at the City Centre and Cambridge Station |
| Roadway and drainage | 70 | |
| Systems | 100 | |
| <i>Surface infrastructure</i> | | |
| Surface route to Newmarket Road P&R | 50 | <ul style="list-style-type: none"> connections to existing / proposed Busway infrastructure at West Cambridge, Cambridge North and south of Cambridge station; new surface infrastructure linking the tunnel portal at Cambridge East to Newmarket Road P&R, integrated into the GCP proposals for this corridor |
| Conversion of existing guideway | 70 | <ul style="list-style-type: none"> conversion of the existing Cambridgeshire Guided Busway between the Cambridge Regional College and Cambridge North, and south of Cambridge station |
| <i>Other</i> | | |
| Vehicles | 80 | <ul style="list-style-type: none"> Vehicle cost of £1m per vehicle, based on industry knowledge. |
| Depot and stabling | 40 | <ul style="list-style-type: none"> Indicative estimate based on size and maintenance facilities required |
| Charging infrastructure | 20 | <ul style="list-style-type: none"> Cost of electric charging infrastructure |
| Scheme development costs | 100 | <ul style="list-style-type: none"> Scheme development up to contract award / implementation. |
| Total | 2,360 | Inclusive of 66% optimism bias applied to all of above. |

Note: all numbers have been rounded to the nearest £10m.

- 3.23 The total costs of the 'core' CAM infrastructure is £2.36 billion (2018 prices), in addition to the £530 million to deliver the GCP 'inner corridors, which form part of the Reference Case.

Cost Benchmarking

The capital costs have been benchmarked against other comparable infrastructure schemes, such as Crossrail and the Northern Line Extension. The costs have also been independently reviewed and, following this review, refined accordingly.

Operating, Maintenance and Lifecycle Costs**Approach**

- 3.24 Steer has developed an operating cost model to forecast the annual operating costs of the CAM system. The model uses a set of input assumptions, including the hours of operation, service frequency and journey times, to estimate the driver, staff and vehicle requirements, from which the overall operating cost, and a set of cost metrics (such as annual cost per vehicle, cost per vehicle km), are calculated.
- 3.25 This model is informed by industry best practice, and our experience from other transport operations within the UK.
- 3.26 Key assumptions which underpin the operating cost model are:
- Driver costs are included, as CAM is expected to operate with drivers on 'day 1' and move towards autonomous operation at a future date;
 - Core Monday to Saturday operating hours of 5AM to Midnight, with a service of at least six services per hour at every CAM stop (except for the first and last hour of operation);
 - Vehicles are electric, battery-operated, and costs include the ongoing maintenance of these vehicles, their batteries, and the charging infrastructure required to support operations;
 - CAM would be operated as a 'stand-alone' transport operator, and allowances have been made for management, control, maintenance, cleaning and revenue protection staff;
 - Costs have been estimated for maintenance of the tunnelled and surface infrastructure, and the required control systems for CAM operation;
 - Stops are unstaffed, except for the underground stations at Cambridge City Centre and Cambridge Station are staffed from first to last service. Ticketing is off-vehicle, with ticket vending machines at each CAM stop; and
 - An allowance has also been assumed for the depreciation of CAM vehicles, to account for the financing of their replacement every 15 years.

Operating, Maintenance and Lifecycle Cost Estimate

- 3.27 From the assumptions above, we estimate that CAM will cost approximately £25 - £30 million (2018 prices) to operate annually on 'day 1', including lifecycle costs and ongoing vehicle replacement.
- 3.28 Staff costs are assumed to increase by RPI +1% annually within the 60-year appraisal period, and other operating costs are constant in real terms.

Benchmarking

- 3.29 This operating cost equates to approximately £3.30 to £4.00 per vehicle kilometre (2018 prices), compared to a typical cost of £2.04 per kilometre³³ for Great Britain (outside London) local bus operations, and £6 to £8 per kilometre³⁴ for light rail and tram operations.
- 3.30 We would expect CAM operating costs to fall within the range of local bus and tram operating costs, since CAM:
- will use high-quality ‘tram-like’ vehicles, which are more expensive to operate and procure than local buses, but significantly cheaper than LRT or tram vehicles;
 - includes a section of tunnel and two underground stations, which add additional maintenance and operating costs; and
 - compared to typical UK bus and tram operators, CAM is assumed to be operated by a smaller stand-alone transport company with greater overhead and management costs.

Segregation

- 3.31 It should be noted that the delivery of a segregated network, including tunnelling under Cambridge City Centre, results in significantly higher average operating speeds and a lower operating cost compared to on-street running, since fewer drivers and vehicles are required to operate any given service level.
- 3.32 Higher average speeds, and hence faster journey times, are also key to the attractiveness of the system to passengers, and hence maximising revenue, and therefore the overall ongoing financial position of the CAM network.

Longer term

- 3.33 Increasing CAM capacity, either by increased services or longer or platooned vehicles, to support future population growth will result in an increase in operating costs. However, it should be noted that the *marginal* cost of increased service provision is less than presented above, since some system and management costs are effectively ‘fixed’, and running additional services allows for more efficient overall operation.
- 3.34 Full driverless operation could reduce annual operating cost by up to 30%. In practice, some vehicles may still be staffed, such as to provide customer service for passengers or to support revenue protection.

Savings from existing Greater Cambridge bus operations

- 3.35 CAM services will supplement, and to an extent replace the need for, some existing ‘Busway’ and Park-and-Ride services within Cambridge. For example, CAM will provide a faster, higher-frequency link between Trumpington P&R and Cambridge City Centre, and between many destinations on the existing St Ives CGB corridor.
- 3.36 Hence, CAM will therefore present the opportunity to reconfigure the existing bus network, to better integrate into CAM, deliver operating savings by removing ‘duplicated’ services, and reduce existing bus flows through Cambridge City Centre. We have not assumed any changes to the existing network within this business case, although have undertaken a high-level

³³ Department for Transport Statistics Table BUS04089b, Operating cost per vehicle kilometre on local bus services by metropolitan area status and country

³⁴ Informed by industry experience

estimate of the potential operational savings from a reduction in existing Busway or Cambridge P&R services once CAM is fully operational.

- 3.37 An indicative reduction of 50% of existing services could result in an operational saving of approximately £5.5 million per year³⁵. It should be noted that, under the current deregulated model of bus operation in Cambridgeshire, any reduction in services would be the decision of private operators on the basis of their assessment of costs and revenues.

Demand Forecasting Approach and Assumptions

Approach

- 3.38 Our approach has used evidence from transport modelling, the Cambridgeshire and Peterborough Independent Economic Review (CPIER) and recent growth trends to inform our assessment of CAM patronage and the magnitude of benefits it could deliver.

Modelling

- 3.39 The Cambridge Sub Regional Model 2 (CSRM2) forms the strategic multi-modal transport model for Cambridgeshire, maintained by CCC with the geographic coverage of the county. Based on a modelled transport network (both highway and public transport), and the locations of housing and jobs, it forecasts volumes and journey times across the transport network for a 2031 model year (calibrated against existing 2015 base year travel demand).
- 3.40 We have used CSRM2 to estimate patronage and transport user benefits for CAM for a 2031 model year, which assumes growth in line with current Local Plan assumptions. We have coded an indicative CAM network and service specification within the model (the 'Do Something') to compare the performance of the transport network against a 'Reference Case' without CAM, and better understand the level of demand and benefits that CAM could deliver.
- 3.41 This is supported by a spreadsheet-based forecasting tool to understand how CAM demand could change in response to longer-term growth and development in line with the CPIER scenarios, which forecast a significant level of population and employment growth over and above that committed in the Local Plans.

Forecasting

- 3.42 This approach has been used to develop estimates for:
- An 'opening' forecast of 2031, reflecting Local Plan growth and representing a date shortly after the assumed operation of the full CAM network;
 - Forecasts for growth post-2031, which considers the impact of possible growth and development beyond the current Local Plan period in line with the 'central case' CPIER scenario. This reflects the shared ambition of the Combined Authority and Greater Cambridge Partnership for Greater Cambridge to seek to fulfil its full growth potential;
 - Peak-hour forecasts, to inform the overall capacity requirements of the system, including service frequencies and vehicle capacities.

³⁵ Informed by Stagecoach East data (<https://www.stagecoachbus.com/about/east>) and DfT bus operating statistics

Limitations

- 3.43 Reflecting the proportionate nature of a Strategic Outline Business Case, and the project timescales, we have used outputs from the CSRM2 model to *inform* our estimation of the likely demand and benefits associated with the delivery of the CAM network.
- 3.44 Notably, we have *not* used multiple model runs against different assumptions regarding future growth, network geography, public transport fares and/or fuel and parking costs to produce detailed forecasts which link directly to the outputs of the transport modelling under different scenarios. Instead, we have used the outputs from a limited number of model runs of an indicative CAM network, under one specific set of assumptions, as the basis for our estimates of likely CAM demand and benefits, combined with our spreadsheet-based forecasting tool.
- 3.45 More detailed transport modelling, which will assess the performance of the CAM network under different growth and transport charging scenarios, will be undertaken during the development of an Outline Business Case for the scheme.

Demand Forecasts

- 3.46 Table 2.4 presents the annual demand forecasts for the CAM network, for 2031 and 2051 under Local Plan and CIPER 'central case' growth scenarios.
- 3.47 These are informed by the CSRM2 2031 CAM model run, under Local Plan growth assumptions, combined with our spreadsheet-based forecasting tool.

Table 2.4: CAM Annual Demand Forecasts

| Scenario | 2031 demand million trips per year | 2051 million trips per year |
|--------------------|---------------------------------------|--------------------------------|
| Local Plan | 15 – 18 | 19 – 23 |
| CIPER Central Case | 18 – 22 | 27 – 33 |

- 3.48 It should be noted that ultimate CAM demand will be dependent on a range of factors, including:
- Population and employment growth within Greater Cambridge, which impacts both:
 - the total demand for travel (all modes) in Greater Cambridge;
 - the relative journey time of CAM relative to private car, as additional growth will result in worsening traffic congestion and longer journey times by car.
 - Changes in the relative financial cost of travel of different modes (fares for public transport, parking and fuel costs for private car);
 - The extent to which demand management (workplace parking, congestion charging, etc) are adopted to actively control highway demand within the city of Cambridge;
 - Any changes to existing Busway and Park-and-Ride services;
 - The fares structure adopted for CAM journeys; and
 - The precise geographical extent of the CAM network.
- 3.49 Our forecasts are intended to capture these different factors on CAM demand. Table 2.4 presents a range forecast under two different future population and employment forecasts. The 'low' range estimate for each is based on a continuation of current trends, with:
- no future highway demand constraints in Cambridge e.g. Workplace Parking Levy or Intelligent Charging;
 - continued fare increases for public transport journeys (at RPI +1%), compared to a reduction in fuel costs for private car in real terms; and

- no change to existing Busway or P&R services.

3.50 The 'high' range estimate is designed to be indicative of the higher level of CAM patronage that could be achieved if demand management was introduced, or if substantive changes were made to the existing Busway and P&R network to better integrate with CAM services.

Demand Benchmarking

3.51 Forecast annual demand of 15 – 18 million trips per year in 2031 under Local Plan growth assumptions (and up to 22m in 2031 under a CIPER 'central case' growth scenario), benchmarks against a current demand of 4 million trips per year on Cambridgeshire Guided Busway services (which provides services along two of the six corridors served by CAM – Trumpington and St Ives) and 3.1 million on dedicated Cambridge Park-and-Ride bus services.

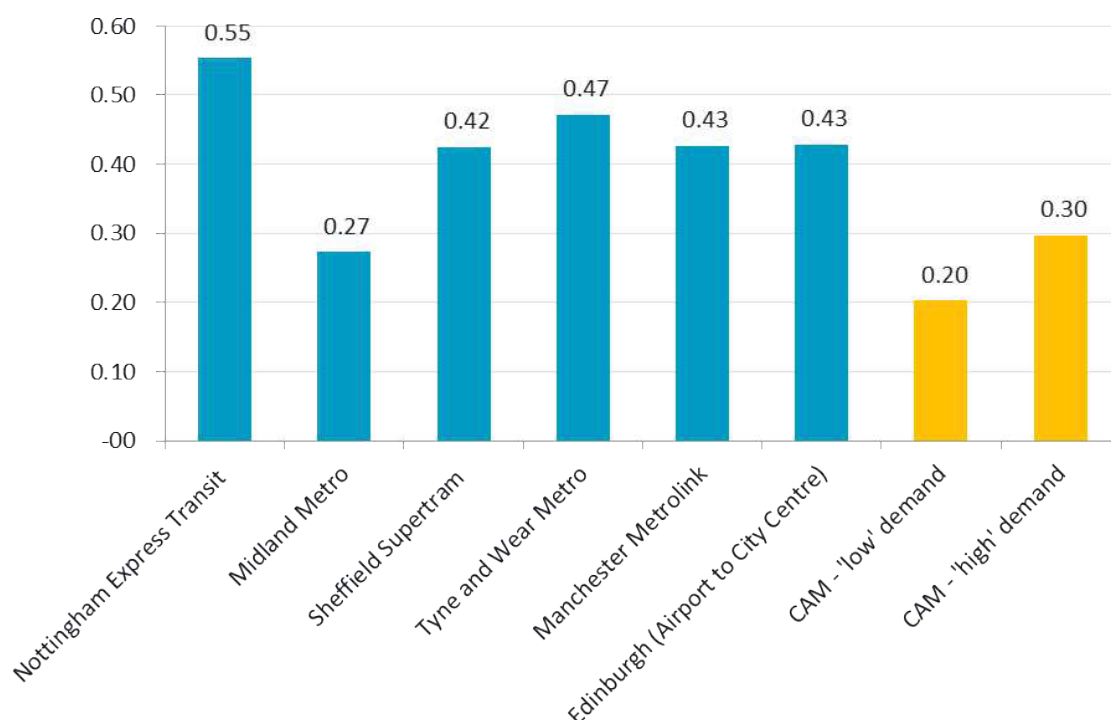
3.52 Figure 3.2 presents estimates for the number of journeys per route km (assuming a network to St Ives / Granta Park / Cambourne), benchmarked against other tram and light rail systems within Great Britain³⁶.

3.53 It demonstrates that, whilst CAM generates significant demand as a total network, it benchmarks towards the lower end of other systems on a demand per route km basis. This is reflective of the expansive geography of the network (at 74 kilometres), and the comparatively rural geography of Greater Cambridge compared to the urban conurbations against which CAM is benchmarked.

3.54 For example, tram and light rail systems in Nottingham, Sheffield, Manchester and Tyne and Wear all have a demand per route km of between 0.42 and 0.55 million trips per km (in 2017/18), compared to forecast trips on CAM between 0.20 to 0.30 million per route km (2031 forecast, based on the range estimate of 15m to 22m trips per year). Route kilometrage is a reasonable proxy for unit operating costs, and the lower demand per route km for CAM underscores the fact that a tram-based system for CAM would be likely to be operationally unaffordable³⁷.

³⁶ Note that ridership for other tram and light rail systems is for 2017/18, whilst the forecast for CAM is assumed as 15 million

³⁷ Indeed, our understanding is that most UK tram systems require an operational subsidy.

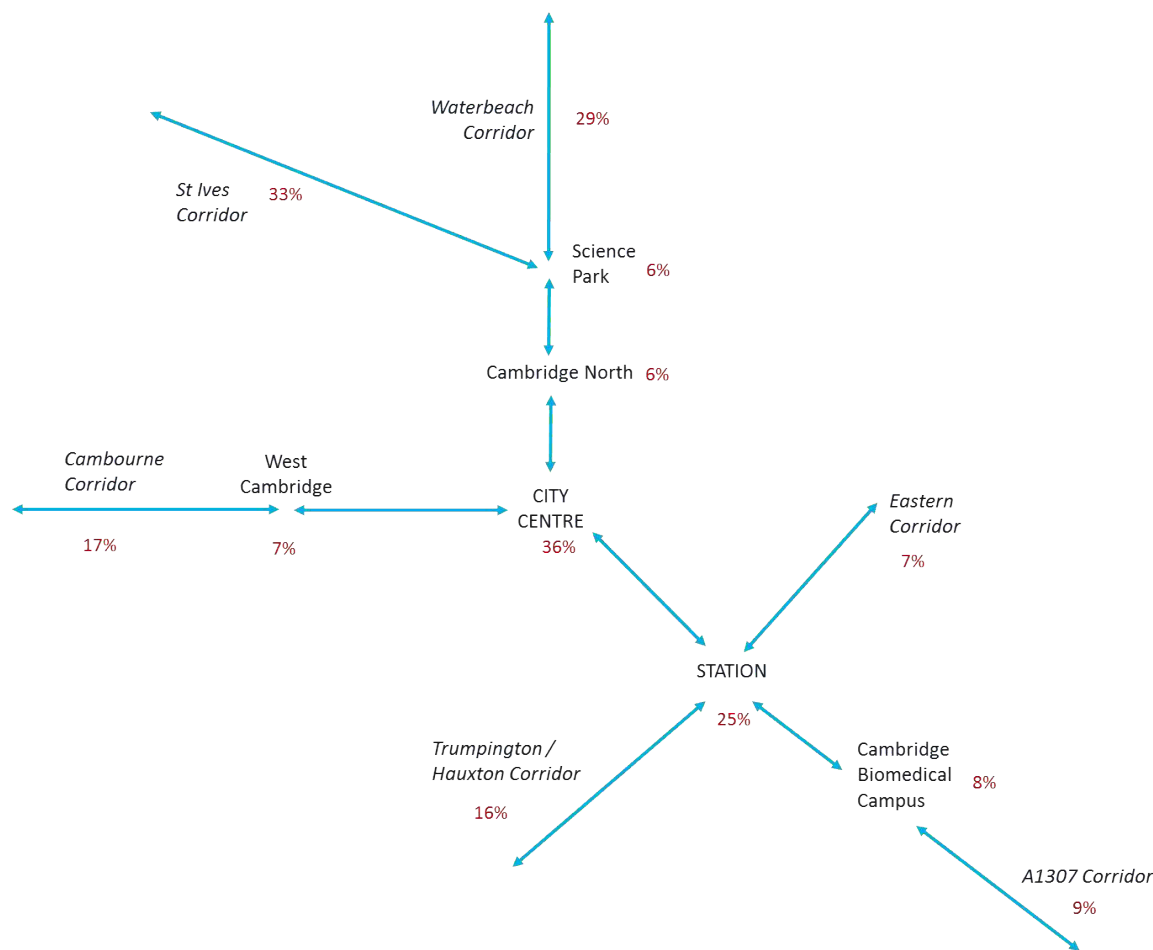
Figure 3.2: CAM Forecast Demand per route km, benchmarked against other GB tram and light rail systems

Note: Patronage for existing systems is based on 2016/17 data, and for CAM for 2031 based on Local Plan 'low' forecast of 15 million per year and 'high' estimate of 22m per annum.

Distribution of Demand

- 3.55 Outputs from the transport modelling indicate that demand is broadly well-distributed across the CAM network. Figure 3.3 presents in red the proportion of boardings and alightings estimated for each corridor and key stops.
- 3.56 The busiest corridor is forecast to be the existing Busway corridor to St Ives, followed by the Waterbeach corridor serving Waterbeach New Town and Milton P&R. Demand is lower on the Eastern corridor to Newmarket Road P&R, reflecting the lack of development along this corridor and within the Cambridge and South Cambridgeshire Local Plans.
- 3.57 Demand, as would be expected, is strongly focused on journeys to and from central Cambridge. In total over 60% of demand is forecast to be to or from the City Centre (36%) or Cambridge station (25%). The 'city fringe' employment sites collectively account for over 20% of trips (8% to / from the Cambridge Biomedical Campus and 6% to / from Cambridge Science and 7% to / from West Cambridge). Demand to / from the east is comparatively low, reflecting the less densely developed nature of this corridor (as per now and the current Local Plan).

Figure 3.3: Demand by CAM Corridor



Informed by CSRM2 modelling. Note that totals equal 200%, as each journey will involve boarding and alighting at two different stops.

3.58 Demand is concentrated in the peak period, with an estimated 31% and 28% of daily (12 hour) demand in the three-hour AM and PM peak respectively. However, inter-peak demand is still high, with average demand in an inter-peak hour equivalent to approximately 65% of an average peak-hour. This helps to ensure that operating a high-frequency, turn-up-and-go service in off-peak hours is commercially viable to operate.

Sources of CAM Demand

- 3.59 Informed by outputs from the CSRM2 model, we have estimated the ‘origins’ of CAM demand in order to understand how those forecast to travel by CAM could instead have made their journeys without the scheme. This does not assume any demand management or further parking constraints or charging on private traffic in Cambridge.
- 3.60 It should be noted that this analysis is intended to be illustrative in nature. The CSRM2 model does not forecast the travel behaviour of *specific* individuals; instead it forecasts travel patterns in aggregate across Cambridgeshire, based on an assumed transport network. Schemes such as CAM can result in significant changes in travel behaviour, including ‘destination switching’ whereby users change where they travel to (for work or leisure) due to new travel opportunities.

3.61 It is not therefore the case that any given user assumed to 'switch' to CAM from private car in the analysis below would make the same journey by car without CAM, and these figures are designed to be illustrative of the overall change in demand and modal shift that could be achieved by the scheme.

3.62 This is summarised in Table 3.5.

Table 3.5: Estimates of the 'origins' of CAM demand

| 'Origin' of CAM demand | % of total CAM demand |
|---|-----------------------|
| <i>Previously travelled by:</i> | |
| Private car | 44% |
| Existing Bus, Guided Bus and Rail Park-and-Ride | 13% |
| Guided Bus (not accessed via P&R) | 18% |
| 'Conventional' bus | 11% |
| Rail | 4% |
| Generated demand and other modes | 11% |
| Total | 100% |

3.63 Overall, this indicates that approximately 44% of CAM demand will originate from users who would otherwise have travelled by car for the entirety of their journey. This equates to a reduction of 25,000 daily private car trips (or 2% of total car trips) in Cambridgeshire.

3.64 These users are primarily forecast within the model to access CAM via Park-and-Ride. Complementary transport interventions, such as improved cycleways to CAM stops and connecting transit, would be expected to be delivered in parallel with CAM to provide more viable alternatives to the use of the car to access CAM, and hence significantly reduce the proportion of demand accessing via Park-and-Ride.

3.65 The remainder of demand is primarily expected to be abstracted from existing public transport modes, predominately from the Cambridgeshire Guided Busway and from dedicated Park-and-Ride bus services.

Demand and System Capacity Analysis

3.66 Our modelling has assumed an indicative CAM service pattern, with broadly 12 services per hour in the AM and PM peak on each corridor, which collectively provide 36 services per hour in each direction through the tunnelled section between Cambridge City Centre and Cambridge Station. These are assumed to be in addition to existing services along the Cambridgeshire Guided Busway.

3.67 Our analysis indicates, for 2031 'Local Plan' demand, the capacity provided on the network by these assumed services, operated by vehicles with a 120-130 capacity, can accommodate the forecast demand. Services are busiest on the existing, St Ives 'busway' corridor, and quietest on the eastern corridor to Newmarket Road P&R site. This reflects the population density, and level of committed development, along each corridor.

3.68 In the longer term, to support additional demand arising from additional population and employment growth over and above 'Local Plan', the capacity of the CAM system can be significantly as set out in Part C of the Strategic Case.

Revenue Forecasts and Operating Performance

Revenue Forecasts

- 3.69 We have developed a revenue forecasts by multiplying the annual demand by an assumed average fare yield of £2.00 per trip (in current prices). This is informed by:
- Current Stagecoach bus fares of £4.50 and £7.00 for a 'Cambridge' and 'Cambridgeshire' Dayrider, equivalent to a single journey within Cambridge of £2.75 or between Cambridge and St Ives / Cambourne / Granta Park / etc of £3.50;
 - An allowance for weekly and monthly Megarider tickets (a weekly ticket for Cambridge / Cambridgeshire, assuming ten journeys per week, is equivalent to a single fare of £1.50 / £2.50;
 - An allowance for concessionary travel for elderly and disabled people, which accounts for approximately 30% of all bus journeys in England³⁸.
- 3.70 This therefore takes account of concessionary fares that apply to certain users, and for travelcards, which we assume would be eligible on CAM services.
- 3.71 We have not, within this SOBC, considered potential fares and ticketing regimes in detail, but we note that there would be the potential to charge higher or differential fares for:
- Longer-distance trips, or those that cross more than one fares zone; and
 - Park-and-Ride trips to discourage longer-distance trips to strategic P&R sites and / or better manage demand and capacity at sites.

Operating Performance

- 3.72 Based on a 2031 'Local Plan' ridership forecast of 15 – 18 million trips per year, we would therefore expect CAM to generate annual revenues of approximately £30 – 35 million per annum, sufficient to fund ongoing operating and maintenance costs CAM, which is estimated to be £25-30m per year.
- 3.73 This suggests that the CAM network is likely to be operationally affordable in the early years of operation, based on a prudent assessment of forecast demand.

Scheme Benefits and Appraisal

Development of a Reference Case

- 3.74 Our modelling of the CAM scheme is intended to support an assessment of the overall demand, revenue and costs of the CAM network. This reflects the need to identify the full capital costs (and hence funding requirement, set out in Table 2.2) of the infrastructure that is required to deliver CAM, and also to forecast and assess whether CAM is an affordable proposition (i.e. revenues exceed operating costs) at the network level.
- 3.75 However, for the assessment of benefits it is important to recognise that the GCP 'inner corridor' schemes to Cambourne, Granta Park and Waterbeach, which form an integral part of the CAM network, are being developed by the GCP as 'discrete' projects subject to their own option, scheme development, business case and powers and consents process.
- 3.76 As such, the costs and benefits of delivering segregated public transport infrastructure in these corridors have been 'captured' within their individual respective business cases, each of which is at a different stage of scheme development. The case for these schemes has, to date, been

³⁸ DfT Annual Bus Statistics, England 2016/17

developed upon their merits as ‘freestanding’ projects, albeit within a clear, overarching GCP strategy to deliver a step-change in the quality of public transport provision on key radial corridors. While the delivery of these corridors is integral to the overall CAM vision, they are not dependent upon the ‘core’ tunnelled infrastructure.

- 3.77 These schemes therefore form part of a ‘Reference Case’ to ensure these benefits are not ‘double counted’. Moreover, it is essential that the economic assessment presented in this report helps to make the incremental case (costs and benefits) for delivering the ‘core’, central infrastructure (and associated costs) that are addition to the schemes coming forward as part of the ‘Reference Case’ scenario.
- 3.78 Therefore, within the benefits assessment, we have delineated between the benefits that accrue as a result of the entire CAM network – including the ‘Reference Case’ infrastructure – and those that are incremental, and delivered solely by the additional services facilitated by the ‘core’ infrastructure.

Delineation of Benefits

- 3.79 The benefits to users of CAM include the generalised journey time savings and benefits from increased service frequencies, improved journey times and reliability, more direct journeys and reduced need for interchange and enhanced journey quality. These benefits will be facilitated by the ‘core’, predominately tunnelled infrastructure in Central Cambridge, and would apply to all trips to and across Central Cambridge.
- 3.80 The improved service frequencies and quality that will operate on existing and planned GCP corridors, following the implementation of the full CAM network, will also result in additional benefits to users wholly on the GCP ‘inner corridor’ sections.
- 3.81 There is a strong inter-relationship and complementarity between the Economic Case for the GCP ‘inner corridor’ infrastructure and the ‘core’ infrastructure whereby each bolsters the case for the other. This arises from the fact that having the full CAM network makes public transport as a whole more attractive, and therefore delivers a greater overall level of demand to which the benefits of infrastructure element (i.e. the time saving over a given section of route) is applied.
- 3.82 This means that, for example, the benefits case for any of the GCP corridors would be significantly enhanced from the central infrastructure as the schemes in combination provide the ‘end to end’ segregated infrastructure to and across the city, which underlies the CAM concept. As such, there would be significantly more demand (and proportionate increase in benefits) on the ‘corridor’ section of route, whereas costs would be the same.

Appraisal Approach

- 3.83 Our appraisal of the benefits of the CAM network have been developed from the outputs of the Cambridge Sub Regional Transport Model (CSRM2), as outlined on page 93. Reflecting the limitations of the transport modelling, we have not explicitly modelled the ‘Reference Case’ scenario, but have developed our estimate of the incremental benefits of the ‘core’ infrastructure by ‘screening out’ benefits that are attributable to the Reference Case.
- 3.84 We have used the 2031 CSRM2 model run, based on ‘local plan’ assumptions, for our appraisal of the benefits of CAM, assuming:
- an annualisation factor of 300, from 12-hr modelled day to annual;
 - an opening year of 2029;
 - a ‘ramp-up’ effect, such that ‘opening year’ demand is 75% of modelled 2031 demand;

- a 60-year appraisal period from scheme opening year (until 2088), in line with WebTAG guidance;
- growth in CAM patronage and user benefits in line with Local Plan growth of 1.2% until a 'cap year' of 2048; and
- value-of-time growth, discounting and market price adjustments in line with WebTAG guidance.

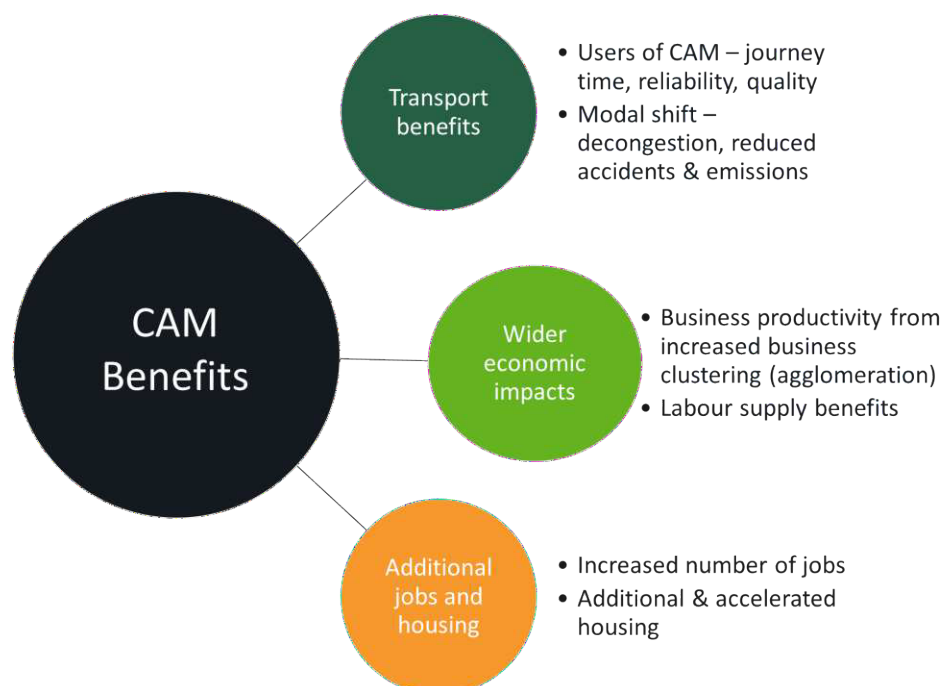
3.85 We have not assumed that user benefits increase over time in excess of 'local plan' growth of 1.2% to avoid 'double-counting' with the 'additionality' benefits arising from the additional GVA delivered through housing and employment growth. Transport user benefits from this growth are assumed to be captured within the estimate of the additional GVA to the Greater Cambridge economy delivered by the scheme.

Benefits Considered

3.86 Under DfT WebTAG guidance, the benefits from transport interventions can be considered under three different 'levels' of analysis. These reflect the different economic impacts of transport investment, and the level of confidence in the analytical methods used to appraise these impacts, as outlined in WebTAG Unit A2-1³⁹.

3.87 These benefits are summarised in Figure 3.4.

Figure 3.4: Overview of different types of benefits delivered by CAM



3.88 **Transport Benefits (Level 1)** include the **direct impacts** of transport investment on journeys. These primarily include the savings in generalised journey time – to both existing and new users – generated by a transport scheme, which include:

- reductions in journey time;
- reduced need to interchange;

39

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/712878/tag-unit-a2-1-wider-impacts-overview-document.pdf

- improved journey 'quality' (e.g. a typical individual's preference to travel by rail than bus);
- reduced wait times from increased service frequencies; amongst others.

3.89 These benefits are valued by monetising the reduction in generalised journey time, based on an assumed value of time derived from DfT WebTAG guidance. These typically – but not exclusively – form the largest category of benefits within a transport appraisal.

3.90 **Wider Impacts (Level 2)** benefits include the **wider 'connectivity' benefits** arising from transport investment. These include the 'agglomeration' or 'clustering' benefits that arise from firms and workers being located 'closer' to one another as a result of improvements in transport connectivity, together with labour supply effects and benefits from increased market competition.

3.91 These benefits are based on well-established economic principles (such as productivity benefits arising from increased agglomeration) but there is a greater degree of uncertainty in their estimation compared to Level 1 benefits.

3.92 **Level 3** benefits refer to a range of benefits arising from the **relocation of economic activity** and a change in land use. These include:

- *employment effects* – where transport investment moves jobs between different locations, or results in additional local employment growth which would not otherwise be delivered;
- *dependent development* – where transport investment 'unlock' additional development which would not otherwise have been delivered;
- *dynamic clustering* – where the increased concentration of economic activity from the above increases the productivity of firms within the areas

3.93 These benefits are subject to a greater degree of uncertainty, as it is difficult to predict the impacts on transport on the decisions of individuals and businesses of where to live, work or locate a business. Valuing these benefits typically requires a bespoke land-use transport interaction (LUTI) model, which was not available for the purposes of the developing the SOBC.

3.94 Key to the case for CAM, however, is the ability of the scheme to support additional economic growth and housing development which would not otherwise be possible without the scheme, and hence achieving the aspirations outlined in CPIER to double the region's GVA by 2050. We have therefore adopted a simplified approach, which considers different scenarios for the level of additional employment and housing development that the CAM network could support, and the value of this additional economic output to the Combined Authority and the UK economy. This is presented on page 105.

Transport Benefits (Level 1)

Transport Benefits – CAM User Benefits

3.95 Transport user benefits are those benefits that accrue to users of CAM. These are measured in the form of generalised time savings, which take account of the reductions in journey time, increased frequencies, reduced need to interchange and improved journey 'quality'. Generalised minutes more accurately reflect how individuals perceive travel time, accounting for (for example) an individuals' preference to avoid lengthy wait times for public transport, or catching a bus or train in preference to walking.

- 3.96 Table 3.6 presents the transport user benefits expected to be delivered by CAM, including the benefits to both existing and new public transport users.
- 3.97 This is informed by a 2031 'Local Plan' CSRM2 run, for a 60-year appraisal period, solely for the 'core', tunnelled infrastructure, assuming that GCP schemes are delivered separately to the 'core' infrastructure and are included in the 'Reference Case'.
- 3.98 We have not estimated the transport user benefits attributable to the regional extensions to Alconbury, Mildenhall, Haverhill and St Neots. These extensions are planned solely to serve new development opportunities which have not yet been identified, and are hence not included in the transport modelling which is based on Local Plan assumptions. It should be noted that, in the absence of the any new development along these corridors, the transport user benefits are expected to be small in comparison to the capital cost of the extensions.

Table 3.6: Transport User Benefits, 2010 £m PV

| Network | £mill, 2010 PV |
|---|----------------|
| 'Core' infrastructure <i>CAM vs Reference Case</i> | 425 – 525 |

- 3.99 It should be noted that the figures presented in Table 3.6 are an initial estimate, based on a small number of CSRM2 model runs. Different assumptions – such as assuming City Access demand management measures, or different levels of background population growth – could result in a greater volume of transport user benefits (and overall CAM patronage).
- 3.100 Future modelling work will explore how these changes could result in a greater level of benefit for CAM.

Transport Benefits – Non User Benefits

- 3.101 Non-user benefits originate from reduction in highway kilometres expected to be delivered by modal shift to the CAM network (including to Park-and-Ride). Modal shift results in 'externality benefits', primarily in the form of reduced congestion (time savings to existing highway users), together with accident savings, reduced emissions and noise and reduced cost of maintenance of the highway network, balanced against the reduction in fuel duty paid to the Exchequer.
- 3.102 Table 3.7 presents these benefits, against the Reference Case, for the CAM network.

Table 3.7: Non-user benefits, 2010 £m PV

| Benefit | £mill, 2010 PV <i>CAM Network vs Reference Case</i> |
|---|--|
| Congestion | 85 - 95 |
| Infrastructure and Accidents | 35 - 40 |
| Local Air Quality and Greenhouse Gases | 10 - 15 |
| Noise | 2 |
| Indirect Taxation | - 36 to 41 |
| Total | 95 - 120 |

Reliability benefits

- 3.103 Poor journey time reliability is frequently cited as a major concern for residents and businesses in Greater Cambridge, and CAM is expected to deliver significant reliability benefits, both:
- for existing public transport users, switching mode from existing bus, guided bus and Park-and-Ride services which suffer from traffic congestion to segregated, more reliable CAM services; and
 - for existing highway users, who benefit from improved reliability as a result of modal shift from private car to CAM leading to a reduction in congestion on Cambridgeshire's roads.
- 3.104 We have not quantified these benefits for this SOBC, since comprehensive reliability data is not currently available. However, the reliability benefits of CAM are expected to be substantial, and future work at OBC stage will seek to value these benefits.

Level 2 Wider Economic Benefits*Agglomeration*

- 3.105 Greater Cambridge is one of the UK's most productive regions, with a large volume of high-skill, high-value jobs within knowledge-intensive sectors. Firms in these sectors benefit from productivity gains from being located within close proximity to one another, such as improved labour market accessibility and greater knowledge transfers and 'spillovers', known as increased 'agglomeration'.
- 3.106 Reflecting the nature of the Greater Cambridge economy, we estimate that the agglomeration benefits of the CAM network are approximately £465 to £565 million over the 60-year appraisal period (2010 PV) compared to the reference case.

Labour Supply

- 3.107 Improvements in transport connectivity can encourage new workers into the labour market, who would not otherwise be in work, by better connecting areas of higher unemployment to employment centres elsewhere.
- 3.108 Reflecting the comparatively low level of unemployment in Greater Cambridge compared to the national average, we would expect these benefits to be comparatively small. Based on WebTAG guidance, we have estimated the labour supply impacts of the CAM network at approximately £5 million over the 60-year appraisal period (2010 PV) compared to the reference case.

Output Change in Imperfectly Competitive Markets

- 3.109 Improved transport connectivity can also stimulate additional competition within the economy, encouraging new suppliers to enter the market and increasing economic output.
- 3.110 WebTAG guidance values these benefits at 10% of the value of the business user benefits of the scheme, and we would therefore expect the CAM network to generate approximately £7 million (2010 PV) in output change benefits over the 60-year appraisal period compared to the reference case.

Summary

- 3.111 The wider economic benefits of the CAM network are summarised in Table XX below.

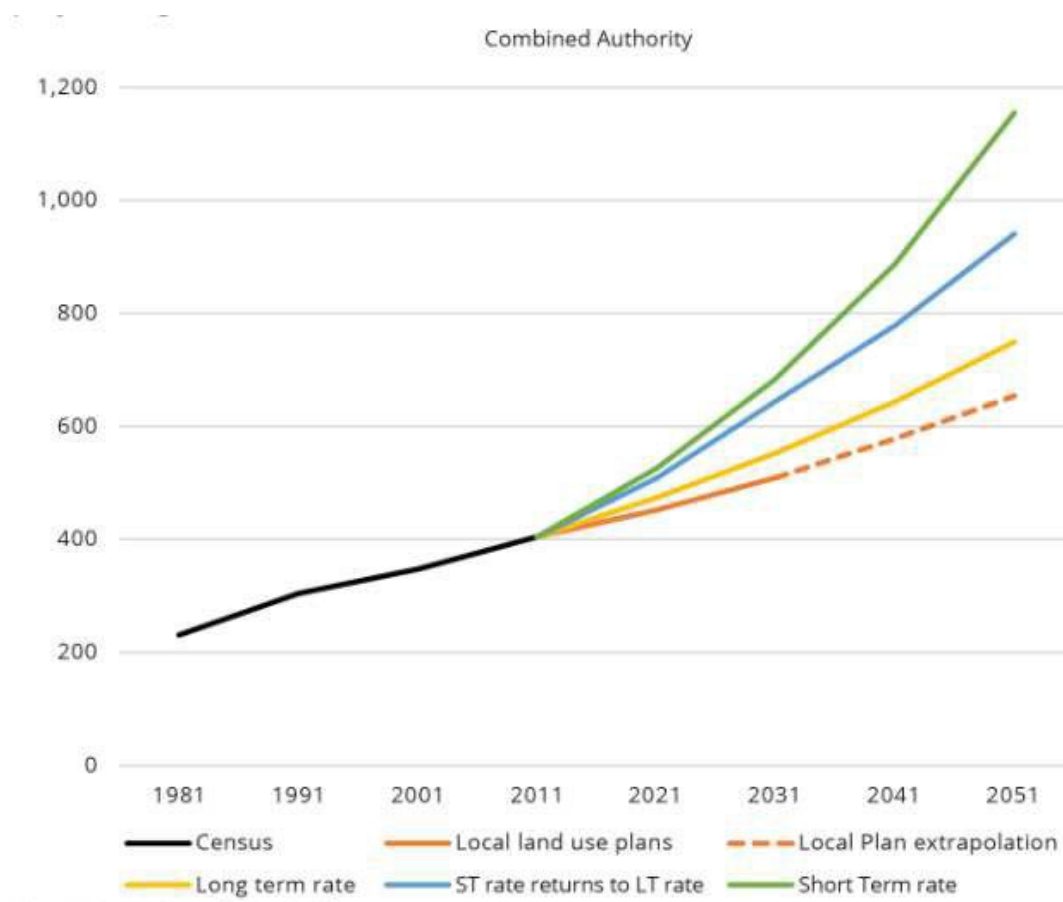
Table 3.8: Wider Economic Benefits, 2010 £m PV

| Benefit | £mill, 2010 PV <i>CAM Network vs Reference Case</i> |
|--|--|
| Agglomeration | 465 – 565 |
| Labour Supply | 5 |
| Output Change in Imperfectly Competitive Markets | 7 |
| Total | 475 - 575 |

Level 3 Investment and Additionality Benefits

Background

- 3.112 The Strategic Case for CAM focuses on how the scheme, through significantly enhancing transport accessibility and capacity across Greater Cambridge, can act as a critical enabler of additional housing and employment growth above ‘Business-as-Usual’ levels. Valuing the benefits of this additional growth – which would not otherwise occur without the scheme – forms a key part of this Economic Case.
- 3.113 In the absence of a land-use transport interaction (LUTI) model, we have developed a series of ‘additionality’ scenarios which are designed to capture the benefits – both to Cambridgeshire and Peterborough and the UK economy as a whole – of additional growth. It is based on our assessment of the level of employment and housing growth required to support the aspiration to double the region’s GVA by 2050, as outlined in the ‘central case’ forecast in the Cambridgeshire and Peterborough Independent Economic Review (CPIER).
- 3.114 Figure 3.5 outlines the employment growth forecasts from CPIER required to meet the region’s growth aspirations. The CPIER ‘central case’ forecast required to achieve a doubling of GVA by 2050 is shown as the ‘blue’ line, and assumes an increase in Combined Authority employment from 400,000 in 2011 to approximately 930,000 in 2051, combined with an annual increase in productivity of 0.8%. This projection assumes first a continuation of growth in line with recent employment growth as recorded by the Office of National Statistics (ONS), before gradually returning to longer-term ONS growth rates.
- 3.115 This ‘central case’ projection compares to the ‘orange’ line, which assumes growth in line with that committed in existing Local Plans to 2031, and a continuation of this trend to 2051. This ‘Business as Usual’ projection forecasts an increase in Combined Authority employment from 400,000 in 2011 to 640,000 in 2051.
- 3.116 Broadly, this equates to a difference in jobs of 250,000 between the two scenarios by 2051 – equivalent to 6,200 per annum. Approximately 60% of these jobs are in Greater Cambridge, equating to a difference in jobs of 150,000 by 2051.
- 3.117

Figure 3.5: CPIER employment growth scenarios

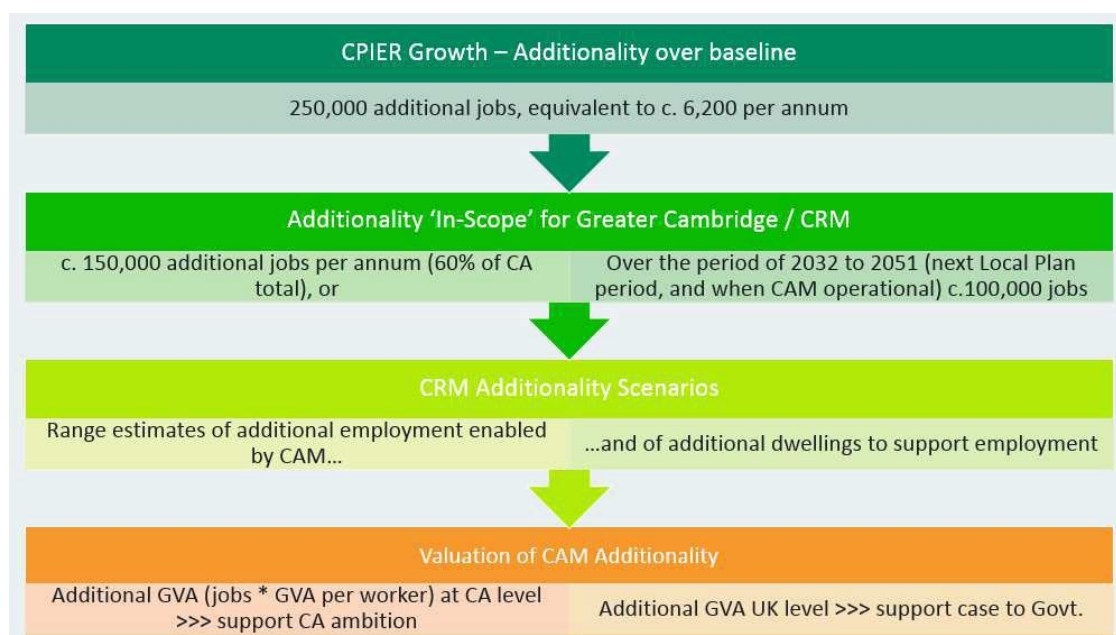
Source: Dr Ying Jin, University of Cambridge, reproduced from CPIER, page 20

Approach

- 3.118 We have developed our estimates of the value of the ‘additionality’ that CAM could support by assuming:
- Employment growth for Greater Cambridge follows the CPIER ‘central case’ forecast until 2031 (shortly after CAM becomes operational), in line with recent observed growth, equivalent to 2.2% per year;
 - **Without CAM**, growth in *Greater Cambridge* (not the Combined Authority) after 2031 can only take place at a lower, constrained rate, as poor transport accessibility and capacity hinders growth. From 2031, we assume that employment growth occurs at the lower, ‘Local Plan extrapolation’ rate of 1.2% until 2051, and the goal of doubling GVA by 2051 is missed;
 - **With CAM**, the transport network is sufficient to support continued employment growth in Greater Cambridge in line with the CPIER ‘central case’ of 2.2% a year until 2051, and the goal of doubling GVA by 2051 is met; and
 - No further employment growth after 2051.
- 3.119 Our estimates of the ‘additionality’ that CAM can support are therefore developed from the divergence between the lower, Local Plan rate of employment growth (1.2%) and the higher, CPIER ‘central case’ rate (2.2%), from 2031 to 2051. This divergence in the two trends equates to a difference in jobs in Greater Cambridge of around 100,000 by 2051, deemed ‘in-scope’ to be dependent on CAM.

- 3.120 In practice, not all of this 'additionality' will be wholly attributable to CAM. We have therefore developed a set of range estimates which outline the number of jobs, and the associated GVA, enabled by CAM, based on the proportion assumed to be 'CAM-dependent'.
- 3.121 Additional employment will also only be delivered in parallel with additional housing required to support it. The CPIER identifies that, to support the 'central case' employment forecast, Cambridgeshire and Peterborough must deliver an additional 6,000 to 8,000 homes per year to support this level of employment growth. We have also estimated, based on this figure, the number of additional, 'CAM-dependent' homes required to support the additional employment growth outlined in each scenario, which would be up to 60,000.
- 3.122 This approach is summarised in Figure 3.6.

Figure 3.6: Summary of additionality approach



Greater Cambridge Additionality

- 3.123 Based on the approach outlined above, we estimate that CAM could support a significant number of additional homes and jobs which would not otherwise be delivered. Our estimates for the additional housing, employment and GVA that CAM could support within Greater Cambridge is outlined in Table 3.9.

Table 3.9: Scenarios for additional housing, jobs and GVA in Greater Cambridge supported by CAM

| CAM-enabled development (% of 100,000 jobs by 2051) | Additional jobs by 2051 | Additional housing units by 2051 | Additional GVA per annum in 2051 (£m 2010 prices, undiscounted, single-year estimate) | Present Value of additional GVA (£m, 2010 PV, over 60 year appraisal period) |
|--|-------------------------|----------------------------------|--|---|
| 100% | c. 100,000 | Up to c.60,000 | 6,100 | 66,300 |
| 75% | c. 75,000 | Up to c. 45,000 | 4,600 | 49,800 |
| 50% | c. 50,000 | Up to c. 30,000 | 3,000 | 33,200 |
| 25% | c. 25,000 | Up to c. 15,000 | 1,500 | 16,600 |

- 3.124 It should be noted that, if only 50% of the 97,300 'in-scope' jobs – the divergence between the two trends – are deemed attributable to CAM, this would still imply that CAM would support

up to 30,000 additional homes and £3.0 billion of additional GVA annually in Greater Cambridgeshire – equivalent to £33.2 billion in Present Value terms.

- 3.125 In our view, this represents a realistic level of additional growth that could be supported by a CAM network stretching to St Ives, Waterbeach, Newmarket Road P&R, Granta Park and Cambourne, subject to suitable sites being identified through the planning process and the Non-Statutory Spatial Plan.
- 3.126 Levels of housing and employment growth above this could be supported by an expanded network, with additional extensions to Alconbury, Mildenhall, Haverhill and / or St Neots. Whilst this would result in additional capital and operating costs, this would be balanced by the additional housing, jobs and GVA generated by such development, and the additional revenue generated by new passengers living and working in developments along these corridors.

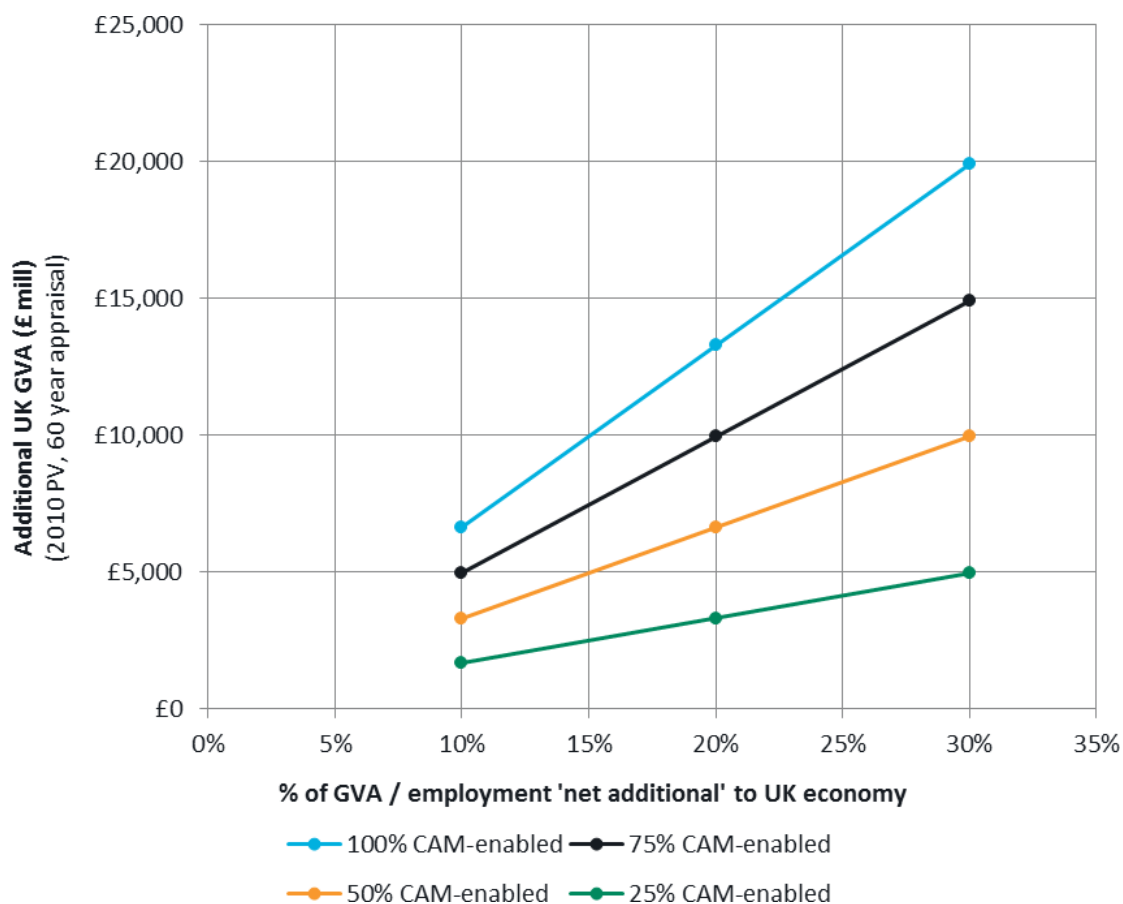
Net Additionality at the UK Level

- 3.127 Not all additional housing, employment and GVA presented in the scenarios above will be additional to the UK economy. In practice, a significant majority will be displaced from elsewhere in the country. Whilst this can generate productivity benefits – jobs in Greater Cambridge are typically more productivity than elsewhere in the country, so if a job moves from elsewhere to Greater Cambridge, this will be associated with a productivity uplift at the national level⁴⁰ – this benefit is small compared to the GVA generated by a ‘new’ job displaced from abroad.
- 3.128 HM Treasury guidance therefore assumes that 100% of jobs are displaced at the national level, but in unique cases – such as Greater Cambridge – it can be argued that some jobs will be displaced from abroad, and genuinely ‘net additive’ to the UK economy. CPIER demonstrates that for many businesses in Greater Cambridge, particularly in high-value, knowledge-intensive sectors such as scientific research and life sciences, Greater Cambridge is the only place in the UK that they would locate. These firms rely on the benefits of being ‘clustered’ in close proximity to one another for their success – as outlined in Para 2.14 to 2.18 – and for many specific high-value industries, Cambridge forms the only such ‘cluster’ in the country.
- 3.129 If Greater Cambridge is not sufficiently attractive, such as due to housing unaffordability or transport constraints, they would instead locate abroad – the ‘*Cambridge or overseas*’ argument – representing a significant loss to national economic output. One of the key recommendations of the CPIER report (#3) was therefore that:
- “the UK government should adopt a ‘Cambridge or overseas’ mentality toward knowledge-intensive (KI) business in this area, recognising that in an era of international connectivity and footloose labour, many high-value companies will need to relocate abroad if this area no longer meets their needs. Ensuring that Cambridge continues to deliver for KI businesses should be considered a nationally strategic priority”*
- 3.130 Experience from other transport business cases – notably Crossrail 2 and the Northern Line Extension to Battersea – indicates that employment displaced from abroad can represent 10% - 30% of that forecast to be generated by a transport scheme in a local area. We have therefore applied this range estimate to indicate the value of additional GVA to the national economy that could be attributable to CAM.

⁴⁰ This is referred to as the ‘Move to More Productive Jobs’ (M2MPJs) effect in WebTAG guidance

- 3.131 This is outlined in Figure 3.7. Each line represents a different scenario for the proportion of additional employment deemed 'CAM-enabled'. The vertical axis presents the additional 'net national' GVA associated with each scenario, assuming that a given percentage is 'net additional', as shown on the horizontal axis.

Figure 3.7: Additional 'net national' GVA supported by CAM



- 3.132 Based on these scenarios, this indicates that the CAM network could support a significant level of additional GVA at the national level. If 50% of the 97,300 'in-scope' jobs – as outlined in Table 3.9 – are assumed to be delivered in Greater Cambridge as a result of CAM, and 15% of these were 'additional' at the national level, this would equate to £5.0 billion in additional UK GVA over the 60-year appraisal period in 2010 Present Value terms.

Value for Money Assessment

Background

- 3.133 Based on the appraisal results, we have developed an assessment of the overall value-for-money (VfM) performance of the CAM network. As discussed in Para 3.74, this is based on considering the CAM network against the 'reference' case, whereby the GCP schemes are funded and developed separately to the 'core' CAM infrastructure, and such their respective costs and benefits are 'captured' in their respective business cases.
- 3.134 The Strategic Case for the CAM network is focused around supporting significant levels of additional population and employment growth, over and above that currently envisaged in the local planning process, in order to achieve the economic potential of Greater Cambridge. These 'additionality' benefits are integral to the overall case of the scheme.

- 3.135 Conventional business cases do not include these benefits, and they are not hence included in the 'initial' BCR for the scheme. Since the CAM network has been developed primarily to support the region's growth, one would not expect CAM (nor the GCP schemes such as Cambourne to Cambridge) to perform strongly against an 'initial' BCR. This forms one element of the value-for-money assessment, and should not be read in isolation.

Results

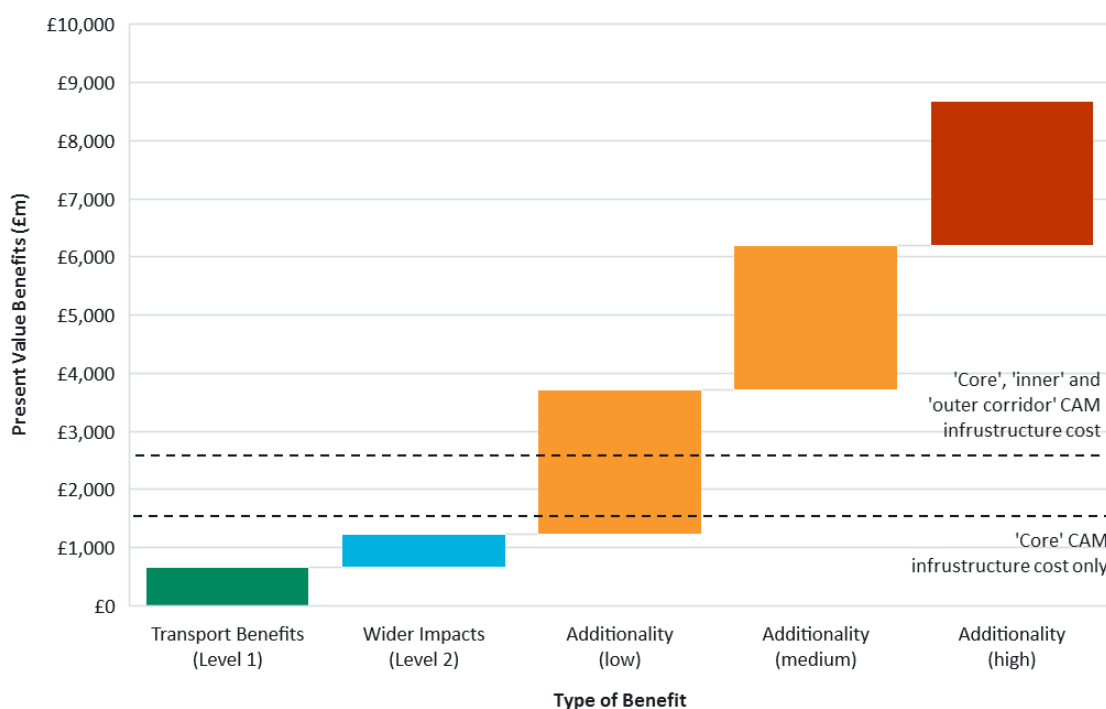
- 3.136 Figure 3.8 summarises our assessment of the benefits and costs of the CAM network, in present value terms.

Costs

- 3.137 The two dotted lines represent the capital costs of two network options:
- a 'Greater Cambridge' network, including the 'core', predominately tunnelled, infrastructure and the GCP 'inner corridor' schemes extending to St Ives / Waterbeach / Newmarket Rd P&R / Granta Park and Cambourne, with a capital cost of £1.55 billion (2010 PV). The costs (and benefits) of the GCP infrastructure are included in the Reference Case, and are hence not represented in the diagram.
 - a 'regional' network, consisting of the above plus the 'outer corridors' to Mildenhall / Haverhill / St Neots and Alconbury, with an assumed capital cost of £4.00 billion (2010 PV), inclusive of all GCP 'inner corridor' and CA 'outer corridor' scheme costs;
- 3.138 The operating costs and incremental revenues for the 'Greater Cambridge' network broadly balance in present value terms. We have not estimated the operating costs and revenues for the 'regional' network, but it is assumed for this assessment that the revenues delivered by the additional extensions meet their operating costs.

Benefits

- 3.139 The coloured bars represent the different 'levels' of benefits any CAM network would be expected to deliver. These include:
- Level 1: Direct transport benefits of £425 - £525 million (2010 PV) and non-user benefits of £95 - 120 million (2010 PV), for the 'Greater Cambridge' network. We have not assumed any additional transport benefits from the 'regional' network, as it primarily is intended to serve new developments which have not yet been identified;
 - Level 2: Wider economic benefits (predominately agglomeration) of £475 - £575 million (2010 PV), for the 'Greater Cambridge' network;
 - Level 3: 'Additionality' benefits, for the development that CAM is expected to facilitate that would not come forward without the scheme. Each bar represents the additional economic output (GVA) at the **national** level of an assumed 24,000 additional jobs in Greater Cambridge (each equivalent to '25% CAM-enabled development' shown in Table 3.9), assuming that 15% of these jobs are net additional to the UK economy.

Figure 3.8: Assessment of Scheme Costs and Benefits (£m, Present Values, 2010 prices)

- 3.140 Figure 3.8 demonstrates that, when 'additionality' benefits are **not** included, neither CAM network generates sufficient benefits to exceed capital costs and hence represent VfM. This is largely reflective of the nature of the scheme, in that it is primarily developed to support additional growth which is not captured within the Level 1 and Level 2 benefits.
- 3.141 When a low level of 'additionality' benefit is included, equivalent to CAM enabling 24,000 additional jobs and up to 15,000 additional homes by 2051 in Greater Cambridge of which 15% are additional at the national level, the scheme performs strongly. Both CAM networks achieve VfM, with an indicative BCR of 2.3 for the 'Greater Cambridge' network and 1.4 for the 'regional' network, representing 'high' and 'low' value for money respectively.
- 3.142 If a medium level of 'additionality' benefit is included, equivalent to CAM enabling 49,000 additional jobs and up to 29,000 additional homes by 2051 in Greater Cambridge of which 15% are additional at the national level, the scheme performs very strongly. The CAM 'Greater Cambridge' network achieves an indicative BCR of 3.8, and the 'regional' network 2.3.
- 3.143 In our view, the 'high' additionality scenario, which envisages CAM enabling 73,000 additional jobs and up to 44,000 additional homes by 2051 in Greater Cambridge of which 15% are additional at the national level, could only be supported by delivery of the 'regional' network. This level of benefit would represent an indicative BCR of 3.2.

4 Commercial Case

Introduction

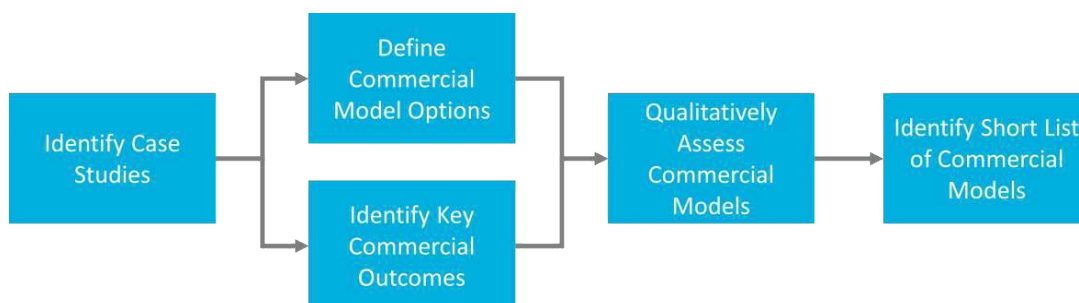
- 4.1 The delivery model adopted should ensure that the Promoting Authority is able to oversee the delivery of a project and ensure that it meets the output specification, in terms of quality, service level and performance, and hence delivers against the objectives of the scheme and the transport benefits and wider outcomes which relate to the output specification being delivered.
- 4.2 The delivery of a successful project is dependent on its commercial viability. The delivery of CAM should be delivered in a way that: allocates risk appropriately across contracts; incentivises the intended outcomes in terms of performance, efficiency and innovation; facilitates the delivery of the project to time and budget; and secures the targeted economic, social and environmental benefits of the project as discussed with stakeholders and agreed with decision makers. Furthermore, the commercial model should best commercialise CAMs attributes.
- 4.3 While the commercial model is based on principles adopted on other projects, the details should be bespoke to the project and account for the specific context. This includes achieving the intended strategic outcomes, such as, enabling Cambridge to meet growth projections over a given timeframe and intended commercial outcomes, such as limiting the impact on the public balance sheet or maximising commercial opportunities. The nature of these outcomes often leads to trade-offs where the improvement of one outcome leads to the need to manage another. The commercial model for CAM therefore seeks to strike an appropriate balance between these outcomes and identify a strategy to deliver the best commercial output for the public sector.
- 4.4 A broad range of commercial models have been used in previous transport infrastructure projects, ranging from fully public-sector delivery, finance and ownership, such as the Northern Line Extension, to fully private sector delivery, finance and ownership, such as many toll roads or airports. We have applied a sliding scale of combined public and private involvement between these options, such as a Public Private Partnership.
- 4.5 This chapter considers the possible commercial models for CAM, drawing on previous public transport projects. In line with the guidance of an SOBC, at this stage the commercial models are outlined at a high-level and a short list of options are suggested to be taken forward for OBC (as opposed to a single preferred option). Likewise, the current powers and constraints for the Mayor, Cambridge and Peterborough Combined Authority (CPCA) and partner public organisations have also been considered in shaping the models. Further analysis will be undertaken to develop the short list of options in the subsequent OBC stage.
- 4.6 This chapter is structured as follows:
 - An overview of the approach undertaken as part of the Commercial Case is outlined;
 - The key commercial outcomes and outputs of the commercial model are presented;
 - Several commercial model options for CAM are outlined based on case studies;

- A discussion of bus franchising is outlined; and
- A summary of the Commercial Case is given.

Overview of Approach

4.7 The approach undertaken as part of the Commercial Case is summarised in Figure 4.1 with the work undertaken in each task outlined after.

Figure 4.1: Commercial Case Approach



- **Identify Case Studies.** Research into a series of case studies of recent public transport investments was undertaken in terms of the commercial model utilised. Best practices from these case studies are identified to consider whether these can be replicated. This feeds into the commercial model options considered in this Commercial Case.
- **Identify Key Commercial Outcomes.** Based on the context of the project and recent public policy, a list of key commercial outcomes has been defined. The procurement options are qualitatively rated against these outcomes.
- **Define Commercial Models.** A selection of four commercial model options are identified for CAM based on recent case studies of public transport investment.
- **Qualitative Assessment of Commercial Model Options.** Each of the commercial model options were qualitatively assessed against the key commercial outcomes.
- **Identify Short List of Commercial Models.** Based on the qualitative assessment of the various commercial model options, a short list of options has been recommended to consider further in the OBC.

Key Commercial Outcomes

4.8 To ensure the successful delivery of CAM, the commercial model should seek to achieve a series of key commercial outcomes that fulfil the requirements of major stakeholders of the project. A list of the key commercial outcomes for the commercial model has been defined and are outlined Table 4.1. This is followed by a further description of each outcome.

Table 4.1: Key Commercial Outcomes

| Key Commercial Outcome | Description |
|----------------------------|---|
| Public Balance Sheet | Limit the impact on the public balance sheet and maximise third party funding options |
| Risk and Responsibilities | Efficient allocation of roles, risks and responsibilities between delivery parties |
| Interfaces and Integration | Limit the number of interfaces in the commercial structure and facilitate integration with other services |
| Procurement Compliance | Ensure compliance with procurement rules |
| Competition | Maximise the opportunity for competition to drive the best Value for Money of the public sector |
| Timescales | Facilitate the delivery to optimal timescales |

Public Balance Sheet

- 4.9 As outlined in the Financial Case, recent UK government policy has encouraged projects to identify alternative funding sources to support the delivery of infrastructure. While recent trends have suggested a more flexible approach to total government debt, this constraint will continue to be a major factor in determining the overall feasibility of any project. In line with this is the reluctance within UK government to approve infrastructure investments that lead to significant funding or financing liabilities on the public balance sheet (e.g. significant public finance or a long-term public-sector payment obligation). As such, the preferable commercial model should seek to limit the impact on the public balance sheet and maximise third party funding options.

Risk and Responsibilities

- 4.10 Effective commercial models assign responsibilities and risks to parties that are best placed to deliver and/or manage them. This approach can leverage in skills, experience and innovation from other parties (such as the private sector) where necessary to support delivery of the project and can transfer risk where necessary to reduce budget and timescale risk. The preferable commercial model should therefore seek to allocate risk and responsibilities effectively across delivery parties.

Interfaces and Integration

- 4.11 Introducing additional interfaces between different parties in the commercial structure of a commercial model leads to greater complexity and a need to manage the interface to ensure each party is incentivised to deliver the desired outcomes. Furthermore, a transport infrastructure project should be procured in a manner that supports integration with other transport services. The preferred commercial model should look to minimise the number of interfaces in the commercial model and facilitate integration with other services to serve the areas targeted for economic growth within Cambridge. In addition, the capacity of the CPCA or partner organisations to deliver CAM as well as other priority projects also should be considered in determining the optimum commercial structure.

Procurement Compliance

- 4.12 Any procurement should be compliant with procurement laws including State Aid.

Competition

- 4.13 A commercial model that incentivises competition and reduces barriers to entry in private sector involvement will drive the best value for money for the public sector and help facilitate innovation. The preferred commercial model should therefore seek to maximise competition within the selected commercial structure.

Timescales

- 4.14 It is key to deliver the project within the committed timescales in order to facilitate the growth ambitions of the CPCA. A preferable commercial model would therefore minimise the risk to delivery timescales.
- 4.15 The key commercial outcomes above are used to qualitatively assess the commercial model options on a scale from 1 to 5, in order to identify a short list of commercial models to be considered at OBC stage. Figure 4.2 outlines the qualitative rating framework used to assess each procurement option.

Figure 4.2: Qualitative Rating between 1-5 of Key Commercial Outcomes

| Outcome | 1 | 2 | 3 | 4 | 5 |
|----------------------------|--------------------|---------------|----------------------|-------------|-------------------|
| Public Balance Sheet | Very high impact | High impact | Neutral | Low impact | Very low impact |
| Risk and Responsibilities | Very inefficient | Inefficient | Neutral | Efficient | Very efficient |
| Interfaces and Integration | Very high number | High number | Neutral | Low number | Very low number |
| Compliance | Major concerns | | Minor concerns | | No concerns |
| Competition | Very uncompetitive | Uncompetitive | Neutral | Competitive | Very competitive |
| Timescales | High Risk of Delay | | Medium Risk of Delay | | Low Risk of Delay |

Commercial Delivery Options

4.16 In this section of the Commercial Case we outline four commercial model options based on the commercial model of previous public transport investments. These four scenarios are:

- Fully public delivery;
- Private Operations and Maintenance (O&M);
- Design, Build, Operate and Maintain (DBOM);
- Design, Build, Finance, Operate, and Maintain (DBFOM).

4.17 These options are intended to present a broad spectrum ranging from a fully public model to a private delivered and financed model. Note, these options are not exhaustive and there are various other variants within each of the model scenarios. However, these present a broad menu of options, in order to discuss the key commercial outcomes and define a narrower short list to be considered as part of an OBC. Similarly, while CPCA should continue to progress CAM through the next stage of development, serious consideration of establishing a separate delivery organisation should be made given the scale and complexity of CAM and the wider transport investment portfolio. A separate delivery organisation can work with any of the four commercial delivery options identified.

4.18 Note, a fully privately delivered, financed and owned commercial model (e.g. similar to a toll road) has not been considered as this would require ownership of CAM assets to lie with the private sector which we understand is not seen as a desirable or viable option for the Combined Authority.

Vehicle Ownership

4.19 One particular asset which lends itself to either private sector or retain public ownership are the vehicles which would operate on CAM. The majority of buses in Greater London that operate the bus franchised services in the city are owned by the operator while TfL sets standards on the quality such as on age and specification of the fleet in use. Elsewhere, in unregulated bus markets outside of London, operators own and operate buses with no or limited controls which are largely safety in nature.

4.20 Conversely, the New Routemasters in London were purchased by TfL and are leased to transport operators. This was considered the most cost-effective approach for TfL to purchase and retain ownership of the buses directly, taking advantage of its preferential cost of capital. As the New Routemaster was designed specifically for use in London, they cannot be easily

deployed anywhere in a private sector operator's national fleet after use in London (which they typically do with other buses owned by the operator). Limited public ownership can be seen elsewhere in the country: for example, in Greater Manchester, TfGM own the buses used on the Metroshuttle services and some other routes.

- 4.21 Transferring the ownership of vehicles to the private sector could reduce the impact to the public balance sheet as some of the investment from the private sector is offset by retention of the vehicles. This financial benefit is dependent on the asset having a value to the private sector. The vehicles under consideration for CAM, are likely to be built to a particular specification which might reduce the residual value as the fleet could not be easily sold or used in other transport systems after their use for CAM had expired. In this case, transferring ownership of the vehicles would expose the private sector to lack of a re-sale risk leading to marginal or nil financial benefit of introducing private sector ownership.
- 4.22 It is possible for a Local Transport Authority to own and lease a fleet to a transport operator in the circumstances where the vehicles are used for tendered services. Tendered service could include franchises, concessions and tenders let under the 1985 Transport Act, but not a commercial partnership arrangement as this could constitute State Aid.
- 4.23 Further analysis into private and public-sector ownership of vehicles is required in the next stage of analysis to identify the preferred procurement option for the public authority where an important consideration is the level resale risk.

Separation of Delivery Responsibilities

- 4.24 In order to outline the responsibilities under each of the four commercial models considered in the Commercial Case, the delivery of CAM has been separated into a series of separate responsibilities. These are outlined below:

Table 4.2: Various Delivery Responsibility of CAM

| Delivery Responsibility | Description |
|----------------------------|--|
| Planning and Design | The planning and design of the construction work to deliver CAM |
| Construction | The construction of the new infrastructure and enhancement of existing infrastructure to deliver CAM (e.g. tunnels, track, stations, signalling, etc.) |
| Vehicles | The procurement of the CAM vehicles based on the specifications defined by the CPCA |
| Operations and Maintenance | The operation and on-going maintenance of vehicles and infrastructure once CAM is operational |
| Ownership of Assets | The party that ultimately owns the assets |
| Funding/Finance | The responsibility to fund and finance the project |

- 4.25 Figure 4.3 outlines the four possible commercial models against the delivery responsibilities. Option 1 is a fully publicly led option, in which the CPCA or the contractors engaged by the CPCA deliver the project. Option 2 is similar to Option 1, with the exception that the 'operations and maintenance' responsibility is contracted to a private contractor. Option 3 is a 'design, build, operate and maintain' contract with the private sector, where there are several different variants in the structure of how the contracts are tendered. Option 4 is a 'design, build, finance, operate and maintain' contract to the private sector, where, similarly to Option 4 there are several different variants in the structure of how the contracts are tendered.

Figure 4.3: Commercial models by Delivery Responsibilities

| | Option 1 Public Led | Option 2 Private O&M | Option 3 Private DBOM | Option 4 Private DBFOM |
|--------------------------|------------------------|-------------------------|--------------------------|---------------------------|
| Planning & Design | Public | Public | Private | Private |
| Construction | | | | |
| Vehicles | | | | |
| Operations & Maintenance | | Private | | |
| Ownership of Assets | | Public | Public | Public |
| Funding/Finance | Public | Public | Public | Public/Private |

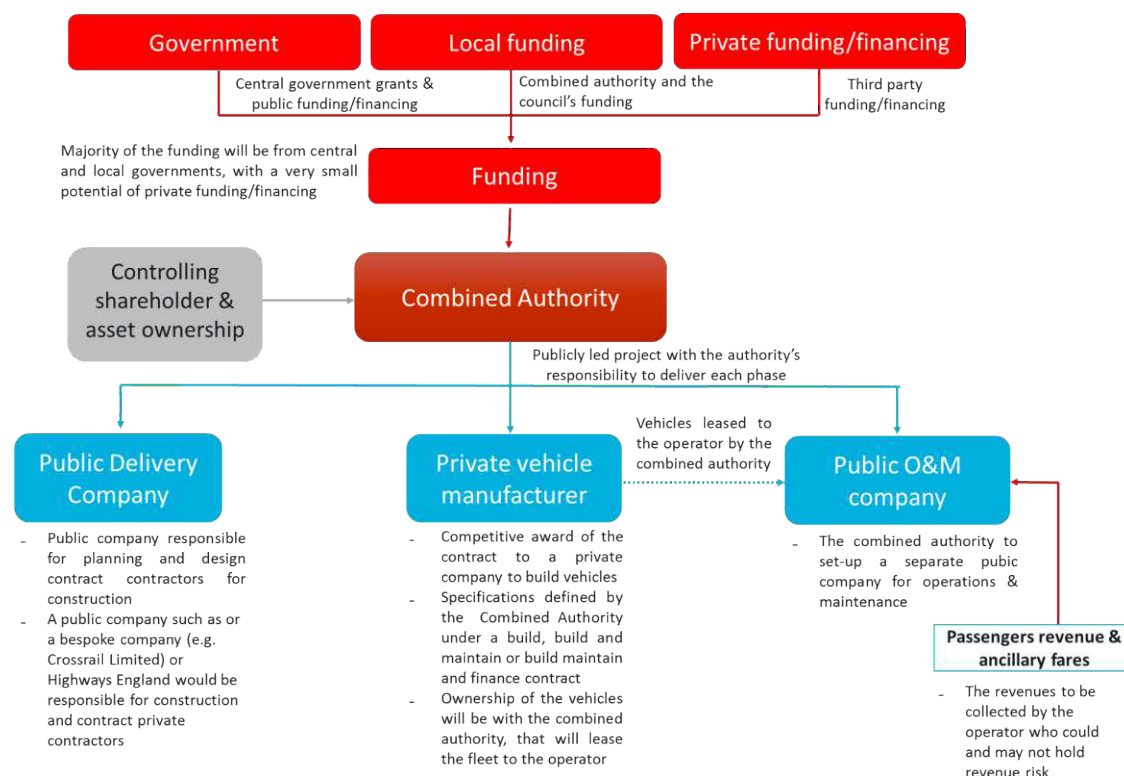
Option 1 – Public Led*Overview*

- 4.26 This Option is similar to the commercial model of the Northern Line Extension. In this Option, the CPCA would be the controlling shareholder with asset owner (infrastructure and vehicle), with the responsibility for the delivery and funding/financing of the whole project. The capital expenditure would be funded by the UK government and local authorities, whereas the operational expenses would primarily be met by passenger revenues (although there may be a need for an additional premia/subsidy to the public operator based on the difference between the operational costs and revenues).
- 4.27 The public sector would be responsible for delivering the ‘planning, design and construction’ phase by using ‘in-house’ capability and would most likely procure capital works to a private contractor(s) with the capability and expertise for delivering such projects. This model could allow the CPCA to directly deliver the project or it would require a public delivery company to be created (similar to Crossrail Limited and Transport for London) or could form part of Highways England responsibilities. It would require significant additional resources to develop and deliver projects.
- 4.28 The procurement by the CPCA or delivery company to a private contractor(s), would be through a competitive bidding process to determine the most economically advantageous tenderer, as follows:
- Issue an expression of interest;
 - Review submissions and shortlist most suitable contractors;
 - Issue the full tender to the shortlisted contractors; and
 - Assess the return and award the contract to the most suitable contractor.
- 4.29 The CPCA would lease the vehicles to the operator that would be a newly incorporated public company to deliver on-going ‘operations and maintenance’ of the project. The operator would also have the authority to collect passenger revenues to meet operational and maintenance expenses (such as lease payments), however there may be a need for a subsidy or premium from/to the CPCA from the public operator based on the difference between operational revenue and costs.

4.30 The CPCA (or local authority) being responsible for delivering the construction of CAM and the operations and maintenance would require a significant and fast expansion in terms of capacity and capabilities. While the CPCA already carries out various transport duties, the scale of CAM would likely require recruitment of as much as 200 project staff based on similar projects such as the Northern Line Extension or Crossrail.

4.31 Figure 4.4 outlines the structure of this option and the various entities involved.

Figure 4.4: Option 1: structural flow diagram



Advantages

4.32 The CPCA would own and control all assets and there is a low structural complexity with the public sector responsible for the delivery of the whole project with minimum private sector involvement thus leading to a low number of interfaces to manage. Furthermore, the combined funding streams from the user and local generated funding (e.g. local taxes) would facilitate the beneficiaries contributing to the service. Lastly, additional powers needed by the CPCA to deliver CAM is likely to be relatively limited.

Disadvantages

4.33 This option is very reliant on the public sector having the necessary experience and capabilities to deliver the construction and operations of the project. This would need to be achieved within a few years from a 'standing start' in order to meet the delivery timescales and would be a significant challenge. This also does not leverage private sector skills and experience which could reduce 'value for money' to the public sector as there would need to be the establishment of the organisational structure of the expanded public-sector organisations and a learning of new skills.

4.34 Furthermore, this option would have significant impact on public finances (public balance sheet) due to the large proportion of funding required from the public sources for capital expenditure, with only a small opportunity for leveraging private financing. The CPCA would

retain the majority of risks in terms of financing, revenue, operations and maintenance as these would not be transferred to the third parties. Due to no or minimum private sector involvement, this option would neither enhance competition nor lead to efficient allocation of roles and responsibilities.

- 4.35 The Figure 4.5 outlines the qualitative rating of Option 1 based on the advantages and disadvantages outlined above.

Figure 4.5: Qualitative Rating of Option 1

| Outcome | Qualitative Rating Option 1 |
|----------------------------|-----------------------------|
| Public Balance Sheet | 2 |
| Risk and Responsibilities | 2 |
| Interfaces and Integration | 5 |
| Compliance | 5 |
| Competition | 2 |
| Timescales | 1 |

Northern Line Extension – Public Led Delivery

The Northern Line is being extended from Kennington to two new tube stations, Nine Elms and Battersea Power Station and is expected to be operational by 2020. The project has cost around £1 billion which has come from an innovative funding package set between Transport for London, the Greater London Authority and Wandsworth and Lambeth Councils.

Tax Increment Financing was used to largely fund the scheme, whereby the GLA borrowed £1 billion to fund the scheme, to be paid back through future business rates growth, Community Infrastructure Levy and Section 106 contributions from development. This has led to the beneficiaries and developers, both private and public paying for the majority of the extension but involves the GLA underwriting the risk that future business rate revenues, used to fund loan repayments, do not meet forecasts.

A consortium of Ferrovial Agroman and Laing O'Rourke was awarded the 6-year contract to build the extension. The line will continue to use existing rolling stock from the Northern line as well being operated and maintained by the TfL subsidiary, London Underground Limited.

West Midlands Metro – Public Led Operations

West Midland Metro is a tram that serves the cities Birmingham and Wolverhampton. In 2018, the operation of the service was nationalised with the new 15-year contract for operations and maintenance being awarded to the Transport for West Midlands subsidiary, Midlands Metro Ltd. This shift to public ownership will allow future profits to be invested back into the system as it undergoes significant expansion in the coming decade, which plan to triple the network size and substantially increase ridership and revenue. A key factor in bringing

Option 2 – Private Operations

Overview

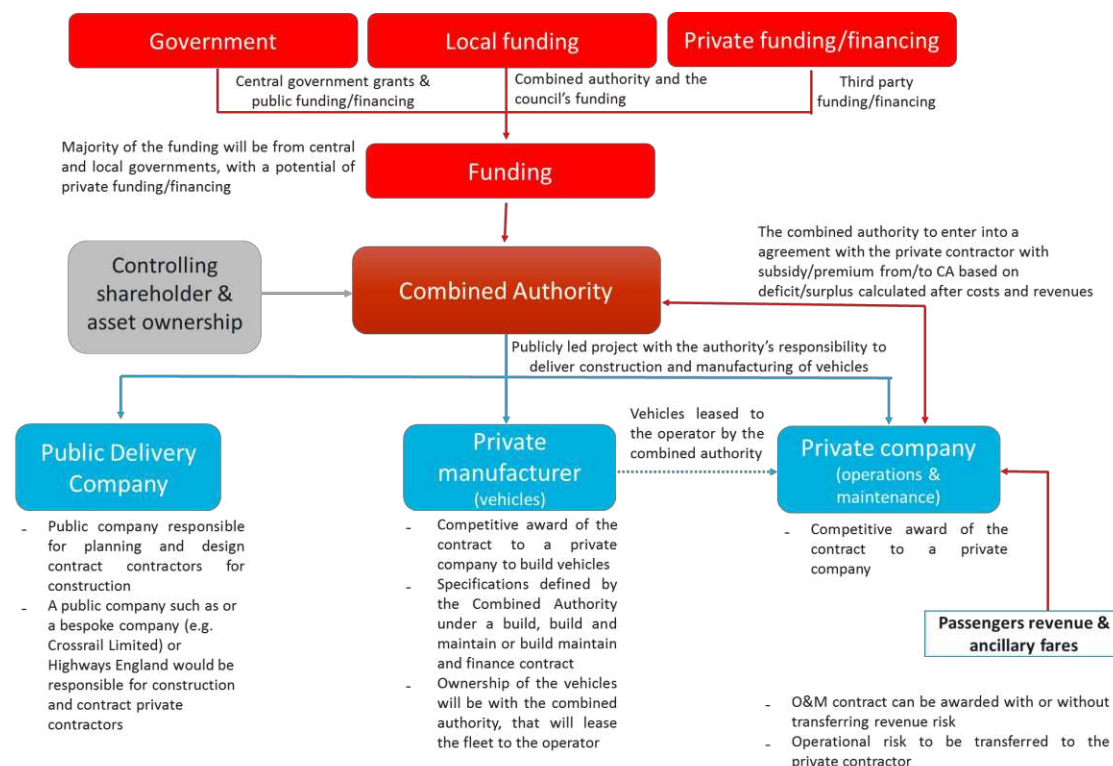
- 4.36 This Option is similar to Option 1 with the exception that a private contractor, through a competitive bidding process, would be contracted for ‘operations and maintenance’⁴¹. This approach would be similar to that adopted for Crossrail. The structures for the responsibilities, planning, design and construction, manufacturing of vehicles and funding/financing are same as in Option 1.
- 4.37 The ‘operations and maintenance’ responsibility under Option 2 would be contracted to a private operator through a concession or franchise agreement, where the private contractor would run operations for a defined period of time, collecting passenger revenues and ancillary fares (where they may or may not take revenue risk), and pay an agreed premium to or receive subsidy from the CPCA based on a surplus or deficit calculated after meeting operational and maintenance expenses and the revenues they are taking risk on. As such, under this structure some of the risk of operation and maintenance would be transferred to the private sector.
- 4.38 The advantages and disadvantages of transferring revenue risk to the private operator are discussed later in this Chapter in the ‘Option 2, 3 and Option 4 outlined above, include a private entity operating CAM services. Given the high-quality specification for CAM, a bus franchising model is likely to be the best approach to procure operation services as it would facilitate the public sector specifying services and vehicles while ensuring a proportion of the schemes operating profits are captured (which would otherwise be difficult through the de-regulated UK bus market).
- 4.39 Furthermore, broader bus franchising across the wider region may be required to ensure the other services across Cambridge compliment CAM, in terms of connectivity and commercials. In the absence of bus franchising, there is a risk that existing bus operators will seek to compete with CAM (likely through undercutting fares) which could:
- 4.40 reduce overall CAM demand, and hence future CAM revenues;
- 4.41 impact the ability for the CPCA and local stakeholders to fully integrate other bus services in Cambridgeshire into the CAM network (such as through dedicated interchanges, and integrated ticketing), reducing the overall benefit of CAM to passengers; and
- 4.42 reduce the environmental benefits of CAM in reducing bus movements through historic, congested streets in Cambridge City Centre.
- 4.43 The Bus Services Act from 2017 provides mayoral Combined Authorities, such as the CPCA, the powers to implement bus franchising in their area, under a model similar to the system operated by Transport for London. This could be used for franchising of CAM services as well as broader franchising across the region.
- 4.44 However, the Bus Services does not prescribe the commercial elements of the franchise and as such if franchising is pursued further consideration of the commercial model would be required including: who takes revenue risk; the prescriptiveness of the service specification; fare and ticket specification; the length/size of individual contracts; and the nature of any incentive arrangements. Further consideration of revenue risk is outlined below.

⁴¹ Note, these contracts could be tendered separately or together.

4.45 Revenue Risk

4.46 Figure 4.6 outlines the structure of this option and the various entities involved.

Figure 4.6 - Option 2: structural flow diagram



Advantages⁴²

4.47 This Option can transfer some of the 'operation and maintenance' risk to the operator with the potential of transferring revenue risk as well. There would be some potential for leveraging private sector experience for the 'operations and maintenance' responsibility. This Option is therefore less reliant on the public-sector capabilities and would not require a public-sector operator to be established which reduces delivery risk.

Disadvantages

4.48 Although the operations and maintenance responsibility has been transferred to the private sector, this option still requires the public sector to deliver the 'planning, design and construction' phase, which would still require significant in-house capabilities. This could magnify the delivery risk, which could significant delay the introduction of the project. This Option also introduces an additional interface between the public sector and the private O&M which would require management to ensure the private O&M entity is appropriately incentivised.

4.49 Table 4.3 outlines the qualitative rating of Option 2 based on the advantages and disadvantages outlined above.

⁴² Note, only the advantages and disadvantages compared to the previous Options are outlined

Table 4.3 - Qualitative rating: Option 2

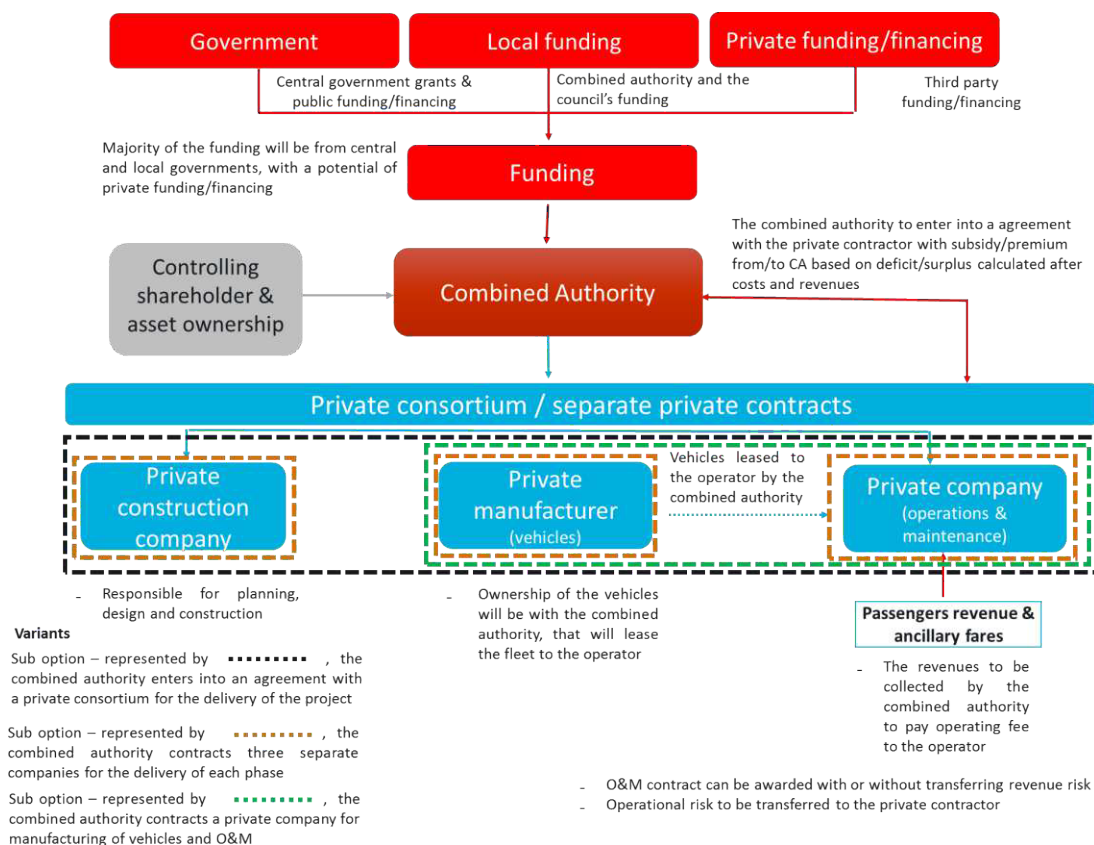
| Outcome | Rating |
|----------------------------|--------|
| Public Balance Sheet | 2 |
| Risk and Responsibilities | 3 |
| Interfaces and Integration | 4 |
| Compliance | 5 |
| Competition | 3 |
| Timescales | 2 |

Crossrail

Crossrail, a £14.8 billion railway line, was given royal assent in the Crossrail Act 2008. Crossrail Ltd. was established in 2001 to build the railway, it is an owned subsidiary of Transport for London and is jointly sponsored by Transport for London and the Department for Transport. Crossrail has primarily used the NEC3 suite for its main delivery contracts, primarily through a Design/Build arrangement but also outsourcing certain programme management activities. Bombardier was awarded the contract to supply and maintain the rolling stock for 32 years while MTR Corporation (Crossrail) Ltd. was awarded the £1.4 billion contract to operate Crossrail for 8 years with the possibility of extending it to 10 years.

Option 3 – Design Build Operate Maintain (DBOM)*Overview*

- 4.50 Option 3 is similar to Manchester Metrolink Phase 2 and 3, and the Docklands Light Railway extension to Stratford International in London. In this Option, the CPCA would be the controlling shareholder, own assets and finance the project, but the private sector would be contracted, through competitive bidding process, to deliver the project (i.e. the responsibility for planning, design, construction, vehicles procurement and O&M). Although, note the private sector would not provide finance to delivery of the project.
- 4.51 The private sector would be paid a sum for the ‘planning, design and construction’ and manufacturing of vehicles responsibilities, payable in instalments or on completion of defined milestones. There would then be an on-going fixed premium or subsidy (or operator fee) for the operations and maintenance responsibility (based on the balance of revenue and cost operations and the allocation of revenue risk).
- 4.52 Note, as outlined in the Financial Case there are a large number of land owners who would benefit from CAM which could allow for CAM to be partially funded by these owners. If these land owners were involved in delivery of CAM it would allow those benefits to be directly offset delivery costs and would not be dissimilar to a pure private finance scheme. This could reduce the new costs to deliver the project.
- 4.53 Figure 4.7 outlines the structure of this option and the various entities involved.

Figure 4.7 – Option 3: structural flow diagram

Variants in Private Sector Contracts

- 4.54 There can be several different options for splitting private sector contracts for the delivery of different responsibilities of the project, for instance, a private consortium could be contracted to deliver all aspects, or each responsibility could be contracted separately.
- 4.55 For instance, the CPCA could tender separate contracts for the construction, vehicles, operations and maintenance. The payment structure would be such that the CPCA would pay fixed separate sums for 'planning, design and construction' and 'manufacturing of vehicles' phases, while pay a then an 'on-going' fee for the operations and maintenance responsibilities. This option would enhance competition due to the lower barriers for entry in each contract, it would allow the authority to select the best individual bid for each element, and would allow elements of the commercial proposition, such as contract length, be tailored to the specific responsibility. However, this would increase structural complexity due to high number of interfaces with would require tightly defined contracts to ensure risks are not passed up the supply chain.
- 4.56 Alternatively, two separate private companies could be contracted, one for the 'plan, design and construction' responsibility, and another for the 'manufacturing of vehicles' and 'operations and maintenance' responsibilities. This approach has the advantage that the interface between the vehicle manufacturer and the operator and maintainer of the vehicles is removed, reducing the risk the operator and maintainer would lack the capabilities to use the vehicles or receive vehicles that were not-fit for service. However, it could reduce value for money as there would be fewer potential bidders which could supply a combined manufacturing, operations and maintenance services.

4.57 Finally, a private consortium could be contracted to provide all responsibilities of CAM e.g. design, build, operate and maintain. This reduces the complexity and interfaces but further reduces competition, the ability for tailored contracts and potentially reduces the value for money. Furthermore, there is a greater level of risk at the start of the project due to construction risk and the greenfield nature of operations. As such, if a consortium approach is pursued, consideration of an initial shorter-term contract followed by a longer-term contract should be examined as a method to minimise the impact of the initial risk on the long-term price of the contract.

4.58 Similarly, for the infrastructure, if a private consortium is responsible for delivering all responsibilities including the 'operations and maintenance', the risk of additional capital expenditure for infrastructure prior to its assumed life span would sit with the consortium.

Advantages

4.59 Due to the private sector involvement, this Option is less reliant on the CPCA's need to develop 'in-house' capabilities to deliver the construction and O&M of the project within the project delivery timescales from a 'standing start'. As such, this Option reduces the delivery risk within the planned timescales.

4.60 Furthermore, this could result in better value for money due to relatively high competition and leveraging in private sector experience to deliver the project however the transfer of construction, operations and maintenance risks to the private sector would be factored into their price. As such, the impact on the Value for Money would be dependent on the scale of potential cost efficiencies driven by the private sector and the 'price' of the risk transferred. However, transferring risk to the private sector would reduce the potential for cost variation.

4.61 A 'turnkey' design and construction contract could be used with an additional operating contract, or a section to the construction contract covering operations.

Disadvantages

4.62 This Option would still require the CPCA to raise a significant proportion of the funding and finance for the capital expenditure as the private consortium would not take financing responsibility. This could reduce the cost of capital compared to private finance but would have a greater impact on the public balance sheet.

4.63 As noted above, the private sector would 'price-in' the construction and operational risks in the price charged to the CPCA which could be offset by cost efficiencies. This Option would result in more structural complexity than Option 1 or 2 due to multiple interfaces between the CPCA and the private sector. In order for this Option to be effectively delivered, the private contractors would require access to the existing infrastructure owned by the CPCA.

4.64 Table 4.4 outlines the qualitative rating of Option 3 based on the advantages and disadvantages outlined above.

Table 4.4 - Qualitative rating: option 3

| Outcome | Rating |
|----------------------------|--------|
| Public Balance Sheet | 3 |
| Risk and Responsibilities | 4 |
| Interfaces and Integration | 2 |
| Compliance | 5 |
| Competition | 4 |

Manchester Metrolink Phase 2

Manchester Metrolink Phase 2 had a budget of around £160 million and added a 4-mile extension to the existing line and was fully operational by 2000. The project was delivered by a consortium Altram who provided a DBOM contract for 17 years. Serco operated and maintained the line. The contract allocated revenue risk to the private sector and the obligation to share part of the upside with GMPTE but allowed the operator the power to set tariffs.

Manchester Metrolink Phase 3A

Phase 3A of Manchester Metrolink, with a budget of around £575 million, was approved in 2006 and was financed mostly from UK government and Greater Manchester Passenger Transport Executive (GMPTE) borrowings. Unlike Phase 2, Phase 3A broke up the DBOM concession and awarded the contract for Design-Build to the consortium M-pac Thales, and the Operation-Maintenance contract to Stagecoach. GMPTE now takes responsibility for all revenue risk but Stagecoach is (and since July 2017, Keolis) held responsible for revenue security.

Docklands Light Railway

The Docklands Light Railway (DLR) is currently operated and maintained privately by a joint company, KeolisAmey Docklands, led by Keolis in conjunction with Amey, as part of a £700m, near seven-year contract from December 2014 until April 2023. Prior to 2014, it has been operated and maintained by Serco Docklands, part of the Serco Group. Recent extensions to the network have been delivered privately: the 2012 extension to Stratford International was delivered by VolkerRail, in joint venture with Skanska, with design provided by Mott Macdonald. TfL hold all responsibility for revenue risk.

Option 4 – Design Build Finance Operate Maintain (DBFOM)*Overview*

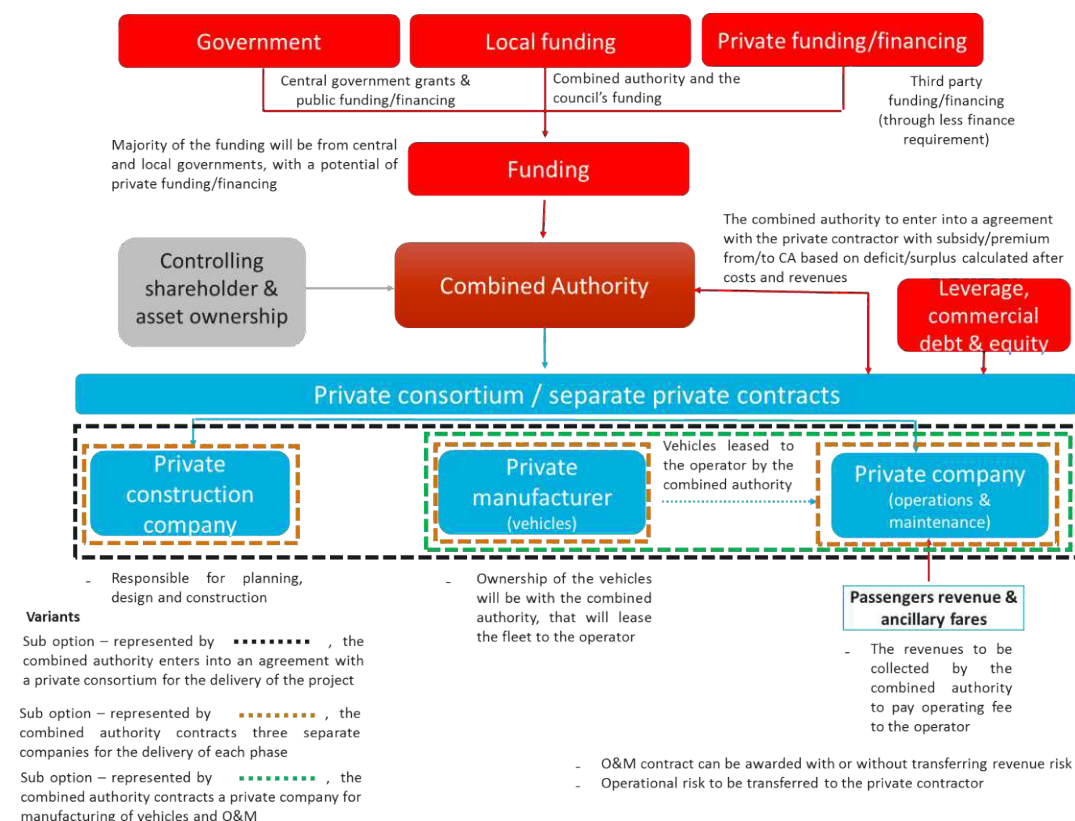
- 4.65 Option 4 is similar to Nottingham Express Transit Phase 2. This Option has similarities to Option 3 but the responsibilities for financing would be bundled together with the designing, constructing, and operating and maintaining and transferred to the private sector through a competitive bidding process.
- 4.66 Part of the financing responsibility (along with all other risks) would be transferred to the private sector that would, seek equity investments and commercial debt (or bonds) to finance at least part of the, leveraging revenue stream dedicated to the project. The total passenger and ancillary revenues into the private sector would be unlikely to cover the total project costs and financing costs incurred and as such there would be a likely need for the CPCA to contribute an on-going subsidy to the private sector to support the private sectors financing obligations. This could be partially met by the CPCA through the funding options outlined in the Financial Case.
- 4.67 The private sector would design and construct the project, manufacture vehicles, and operate and maintain the project for a fixed time period. During this time period, the private sector would recover their investments through passenger revenues and/or subsidies from the CPCA.

After the expiry of the 'operations and maintenance' contract, the assets would be returned to the CPCA.

4.68 As in Option 3, there is also a potential of splitting private sector contracts for delivering different responsibilities, in this Option.

4.69 Figure 4.7 outlines the structure of this option and the various entities involved.

Figure 4.8 - Option 4: structural flow diagram



Advantages

4.70 The primary difference between the advantages outlined in Option 3, is Option 4 could facilitate a reduction in the impact on the public balance sheet of the project if financing and importantly, sufficient risk were transferred to the private sector. Furthermore, this Option could reduce high upfront costs to the public sector with instead a longer-term payment being paid to the private sector who finance the project. The engagement of the private sector under a DBFOM contract could support an accelerated project delivery compared with the other options.

Disadvantages

4.71 Related to the transfer of the financing requirement, this Option is likely to increase the total costs to deliver CAM as the private sector would 'price-in' the cost of capital and risks in the price charged to the CPCA and consumers. Furthermore, if the private entities become bankrupt or face funding problems, then there is a high risk of the whole project being significantly delayed with the ultimate risk sitting with the public sector. There is also a risk of lengthy procurement process due to lack of the public-sector skills to obtain a good DBFO contractors.

- 4.72 Table 6 below qualitatively assigns the ratings to each outcome based on the advantages and disadvantages discussed above.

Table 4.5 - Qualitative rating: Option 4

| Outcome | Rating |
|----------------------------|--------|
| Public Balance Sheet | 3 |
| Risk and Responsibilities | 4 |
| Interfaces and Integration | 2 |
| Compliance | 5 |
| Competition | 4 |
| Timescales | 4 |

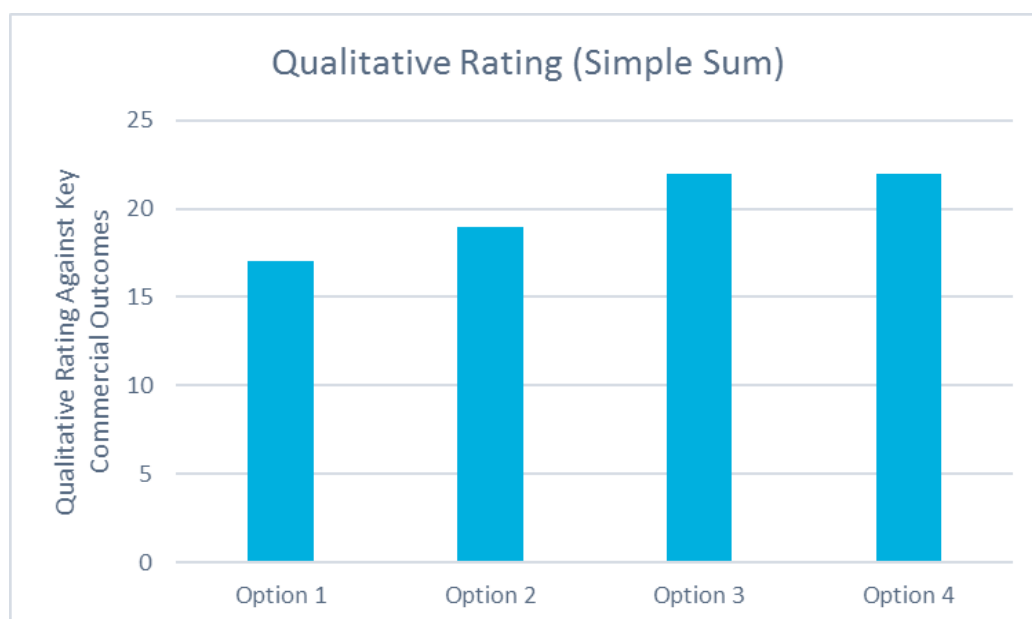
Nottingham Express Transit Phase 2

Phase 2 of the Nottingham Express Transit, a £570 million doubling of the pre-existing track length, opened for public use in 2015. The procurement consisted of a 22-year DBFOM to take over operations and maintenance of the original line and construct the extension. Phase 2 was awarded to the consortium Tram Link Nottingham. Nottingham City Council and Nottingham County Council have sponsored phase 2 and jointly provided £140 million where the remaining was provided from the UK government through Private Finance Initiative.

Option Summary

- 4.73 The above sections outline the four commercial models based on a series of recent transport infrastructure investments in the UK where each option is qualitatively assessed against the key commercial outcome criteria outlined in 'Key Commercial Outcomes'.
- 4.74 A simple sum of the qualitative rating for each of the four Options is presented in Figure 4.9.

Figure 4.9: Qualitative Rating of Key Commercial Outcome (Simple Sum)



- 4.75 CAM is a fundamental requirement for the CPCA to reach their growth ambitions over the next few decades. As such, meeting the delivery target of the late 2020s is crucial.
- 4.76 Under Option 1 and Option 2, there is a significant reliance on the public sector to establish public entities with the experience and capabilities in very short timescales, which could introduce a significant risk to the delivery timescales of CAM. Options 3 and 4, based on the assessment above, are likely to reduce overall project risk, but this would be a result of the private sector 'pricing-in' the construction and operational risks (and, for Option 4, funding risks) into the overall 'price' charged to the CPCA for the project.

Delivery Corporation

- 4.77 The Cities and Local Government Devolution Act 2016 permits the creation of Mayoral Development Corporations in combined authority areas, with the first being created in South Tees in 2017 by the Tees Valley Combined Authority. MDCs can draw on a wide range of powers, covering infrastructure, financial incentives, regeneration and land acquisition, devolving powers from central government to the local area.
- 4.78 Due to the potential land value uplifts enabled by CAM, establishing a MDC could be an effective way to ensure the land value uplift supports the delivery of CAM.

Bus Franchising

- 4.79 Option 2, 3 and Option 4 outlined above, include a private entity operating CAM services. Given the high-quality specification for CAM, a bus franchising model is likely to be the best approach to procure operation services as it would facilitate the public sector specifying services and vehicles while ensuring a proportion of the schemes operating profits are captured (which would otherwise be difficult through the de-regulated UK bus market).
- 4.80 Furthermore, broader bus franchising across the wider region may be required to ensure the other services across Cambridge compliment CAM, in terms of connectivity and commercials. In the absence of bus franchising, there is a risk that existing bus operators will seek to compete with CAM (likely through undercutting fares) which could:
- reduce overall CAM demand, and hence future CAM revenues;
 - impact the ability for the CPCA and local stakeholders to fully integrate other bus services in Cambridgeshire into the CAM network (such as through dedicated interchanges, and integrated ticketing), reducing the overall benefit of CAM to passengers; and
 - reduce the environmental benefits of CAM in reducing bus movements through historic, congested streets in Cambridge City Centre.
- 4.81 The Bus Services Act from 2017 provides mayoral Combined Authorities, such as the CPCA, the powers to implement bus franchising in their area, under a model similar to the system operated by Transport for London. This could be used for franchising of CAM services as well as broader franchising across the region.
- 4.82 However, the Bus Services does not prescribe the commercial elements of the franchise and as such if franchising is pursued further consideration of the commercial model would be required including: who takes revenue risk; the prescriptiveness of the service specification; fare and ticket specification; the length/size of individual contracts; and the nature of any incentive arrangements. Further consideration of revenue risk is outlined below.

Revenue Risk

- 4.83 The options available to the CPCA on revenue risk (passenger fares and ancillary revenues) are to either retain the risk, transfer it completely or share it with the operator.
- 4.84 The benefit of transferring revenue risk to the private operator, is that it incentivises the operator to maximise revenue (passenger revenue and ancillary revenue) which often incentivises the operator to provide a service that attracts customers. Maximising the revenue from the service, has a positive implication on the public-sector balance sheet due to reducing funding requirements from other sources.
- 4.85 However, note that the transferring of revenue risk would lead the private sector to ‘price-in’ this risk which could outweigh the increase in revenue driven by transferring risk. For instance, the private operator may evaluate the risk as very high due to the lack of historical trend information, and due to unknown quality of vehicles, and therefore risk ‘priced-into’ the bid may result in poor value for money to the public sector. As such, it is recommended that the CPCA would need to test the market appetite for taking revenue risk and undertake analysis operator cashflows estimating the potential revenue growth against the cost of taking revenue risk.
- 4.86 If revenue risk is not transferred to the private operator, there would be a need to introduce adequate incentivise measures which contain sufficient penalties/bonuses to ensure that the operator provides the service desired by the authority. These may include ticketless travel metrics, service performance metrics, vehicle maintenance requirements and other ‘softer’ quality metrics. These metrics would need to be tighter defined to drive the desired behaviour in the operator however they are ultimately mitigation measures to reduce the risk of poor quality service and are unlikely to be as fully effective as transferring revenue risk to the operator.
- 4.87 There are options that partially transfer risk to the operator, such as a ‘cap and collar’ risk sharing mechanism where the operator takes the full risk on revenue up to a certain level of variation from an agreed baseline and after which any further downside or upside in revenue is shared between the public sector and the private operator. Alternatively, a small proportion of revenue risk (e.g. 10%) could be allocated to the private operator alongside incentivise metrics.
- 4.88 Related to the above, is the choice of whether to regulate passenger fares. If revenue risk is retained by the public sector, they would set the fare. While if revenue risk were transferred to the private sector, the fare could be set by the public sector or the private operator where in the scenario that the public sector regulates the fare and the private sector takes revenue risk, the private sector would need to be held harmless against fare changes and would factor in the agreed fare into their price.
- 4.89 If fare levels are unregulated, and the private operator takes revenue risk, this will inevitably result in the private operator setting fare levels to maximise revenue, which may not necessarily align to the objectives of the CPCA. For example, lower fares would be expected to attract additional usage and could help CAM better achieve wider objectives, such as reduced congestion or social equity, balanced against a reduction in overall revenues.
- 4.90 As such, the decision of whether to regulate the fare can account for whether there is a strategic objective to subsidise the passenger fare or change a commercial rate.

Contract Length

- 4.91 An important consideration when letting private sector contracts is the contract period. This should seek to strike the right balance between attracting private sector investment and involvement through a sufficient payback period but maximising the VfM and the ability to reflect policy and strategic updates through regular the re-tendering process.
- 4.92 In relation to CAM, there is a greater level of risk at the start of the project due to its greenfield (i.e. a new system with, by definition, no actuals in respect of performance, costs and revenues) nature. As such, letting an initial shorter contract followed by a longer-term contract could minimise the impact of the greenfield risk in the longer term.

Summary

- 4.93 The commercial model for CAM should seek to best commercialise CAM's attributes while allocating risk appropriately, incentivising the best behaviour and securing the targeted economic, social and environmental benefits of the project. As such, the best commercial model would strike the optimal balance between the potentially conflicting key outcomes of the project, such as:
- Limiting the impact on the public balance sheet and maximising third party funding;
 - Efficiently allocating of roles, risks and responsibilities between delivery parties;
 - Limiting the number of interfaces in the commercial structure and facilitating integration with other services;
 - Ensuring compliance with procurement laws;
 - Maximising the opportunity for competition;
 - Facilitating the delivery of CAM to the optimal timescales; and
 - Deliver the project for the best Value for Money
- 4.94 Based on recent transport infrastructure investments, there are several commercial model options available to the CPCA for CAM which range from public design, delivery and operation model to a private designed, built, financed, operated and maintained (DBFOM) model. Qualitative analysis of these options has highlighted the advantages and disadvantages of each option, but has not identified a preferred commercial model to take forward, which would be considered in more detail at the Outline Business Case (OBC) stage.
- 4.95 Broadly, a publically led commercial model has the advantage that the CPCA would own, control and manage all assets, but would also retain the majority of risks in terms of financing, revenue, operations and maintenance. It would also require significant investment in the public sectors capabilities and capacity in a short timeframe, such as a need to recruit around 200 additional staff members to deliver and manage the project, which would impact on the timescales CAM could be delivered to. It would also have a significantly greater impact on the public sector balance sheet.
- 4.96 Conversely, a privately-led commercial model (such as DBOM or DBFOM) has the advantage that it less reliant on the CPCA to develop 'in-house' capabilities to deliver the construction and O&M of the project within the project delivery timescales from a 'standing start', and hence reduce deliverability risks. This may, however, be at the extent of the private sector 'pricing in' construction and operational (and, for a DBFOM model) financing risks, which could impact the overall price and Value for Money of delivering CAM. This would, however, be balanced by the potential cost efficiencies of private sector involvement, such as through increased completion and better leveraging private-sector expertise.

- 4.97 The key distinction between the DBOM and DBFOM models is the extent of private sector involvement in scheme funding; the difference between the selection of the option depends on the appetite for the private delivery partners to raise their own finance and the advantages and disadvantages of this. Consideration of contract length is also recommended where an initial shorter-term contract followed by a longer-term contract should be examined as a method to minimise the impact of the higher risk profile at the start of the project.
- 4.98 In terms of operations, a private operator approach combined with a bus franchising model is likely to be the best approach to procure operation services as it would facilitate the public sector specifying services and vehicles while ensuring a proportion of the schemes operating profits are captured. The Bus Services Act from 2017 provides the Cambridge and Peterborough CPCA the powers to implement bus franchising in their area, however the commercial elements of a bus franchise model are not prescribed.
- 4.99 Furthermore, broader bus franchising across the wider region is likely to best complement CAM, allowing the CPCA to better integrate wider bus services into the future CAM network. It is possible that CAM could also be operated publicly, through an 'arms length' public company to deliver ongoing operations and maintenance, but it is unclear whether the CPCA currently have powers under the Bus Services Act to facilitate this.
- 4.100 A particular consideration is whether public or private ownership of CAM vehicles would be preferable. The vehicles for CAM are likely to be based on the specifications bespoke to the CAM network, which may limit the resale market as use of the fleet in other transport systems after their use for CAM had expired would be limited. This risk could significantly reduce the financial benefit of transferring ownership to the private sector. Further analysis is required to determine whether public sector vehicle ownership similar to the system used for Routemasters in London and the Metroshuttle in Manchester would be preferable over private sector ownership.

5 Financial Case

Introduction

- 5.1 Unlike the Economic Case, which focuses on welfare benefits to society, the Financial Case focuses on the costs and revenues associated with the project and their impact on government accounts. However, like the Economic Case, the Financial Case is cognisant of the Strategic Case objectives - the financial impact of CAM should be considered in the context of the benefits and value it realises for the region.
- 5.2 An important question in developing and implementing a large-scale transport infrastructure scheme is identifying how it can be funded. This is particularly important given the wider economic and political environment of a tighter public purse leading to the end of an era where UK central government grant funding could be made available provided the proposed scheme had a strong case and was technically feasible. There is now a clear expectation that a large proportion of funding for major transport investment should be secured from local sources, whereby the funding strategy seeks to capture part of the value from the investment that accrues to a range of beneficiaries.
- 5.3 A robust funding strategy for large-scale transport infrastructure schemes should therefore consider finding ways of capturing the uplift in benefits enabled by the scheme as this can reduce reliance on the public purse. For instance, a mass transit network in Cambridge will help increase land values a proportion of which could, through the use of an appropriate funding mechanism, be retained by the public sector to help pay for the initial infrastructure costs (e.g. by providing a revenue stream that supports borrowing). This approach to funding is particularly pertinent in Cambridgeshire and Peterborough given the ambitious growth aspirations of the area, and the additional growth that can be enabled by CAM.
- 5.4 Capturing these benefits to generate funding for transport infrastructure can be achieved by developing an appropriate funding package that utilises the powers available to local authorities and combined authorities. This chapter covers the Financial Case for CAM and considers the affordability of the scheme.

Funding vs. Financing

- 5.5 It is important to distinguish the difference between funding and financing. Funding refers to what capital ultimately pays for the up-front costs of the scheme i.e. it does not need to be directly repaid while financing refers to how the capital requirements of the scheme are met through sources that are repaid over time. Financing is generally required for a project if funding is insufficient to cover the project full costs during construction. For instance, a loan (financing) may be used to meet the upfront capital costs of the project which is then repaid over time through surplus passenger revenue (funding). Financing costs (e.g. interest payments) will be payable on financing sources which increases the costs to deliver the project and therefore additional funding, over and above the capital costs, are required to complete the project.

- 5.6 Given the early stage of development for the CAM project, this financial case focuses on the options to fund the upfront capital costs of the project. The funding of the on-going operation and maintenance costs is estimated to be met by the passenger farebox and ancillary revenues generated by the system based on initial analysis. This will need to be confirmed at the next stage of CAM development

Policy Context

- 5.7 Public investment in the UK is more dependent than ever on finding sufficient funding and increasingly the ability to raise income locally is determining whether any scheme is taken forward or not. As central government funding has become increasingly constrained, the days when a public investment would be centrally funded largely on the economic, social or environmental benefits it generates have gone. In addition, devolution has focused decision making on seeking to find local sources for any particular investment.
- 5.8 Crossrail can be seen as setting the benchmark for establishing the case for public investment in transformative transport infrastructure and, in particular, identifying and securing an appropriate funding package. These include the following broad principles:
- A significant proportion of funding required to deliver a transport infrastructure project is from local sources;
 - That the project should be able to cover its longer run operating, maintenance and ideally renewal costs;
 - That a mix of local funding can be secured, supported by local businesses, developers and users; and
 - That the wider economic benefits of the project are significant and that increased taxes can help recover any central government outlay (particularly through increased productivity, generating additional and higher paying jobs).

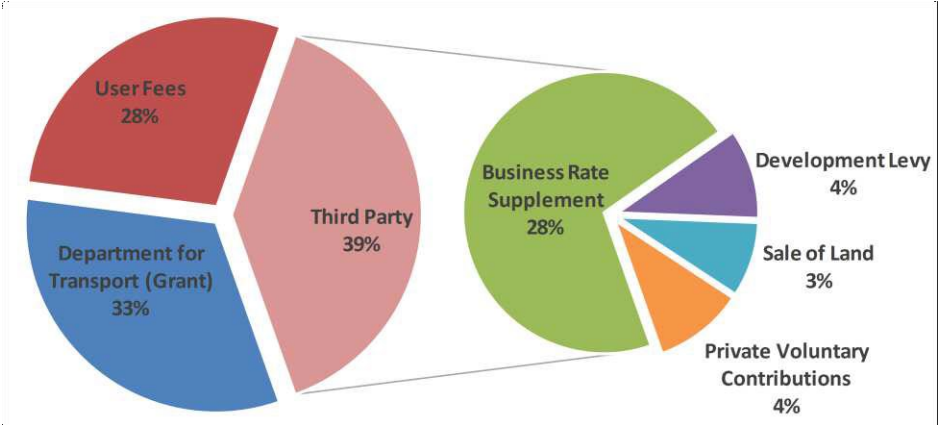
Chapter Structure

- 5.9 The Financial Case is structured as follows:
- The Funding Challenge – scale of funding required to deliver the full CAM network;
 - The additionality of CAM – the ability of CAM to transform the wider Cambridge region beyond pure transport user benefits is outlined;
 - Beneficiary Pays – the concept of beneficiary pays is introduced;
 - Funding Case Studies – case studies from recent transport investments are presented;
 - Funding Options – an overview of potential funding mechanisms is discussed;
 - Financing – the requirement for financing is considered;
 - Summary – the key points and next steps for CAM from a financial perspective are outlined.

Crossrail

Crossrail is Europe’s largest transport project, delivering a new 21km underground urban railway and connections to the existing UK national rail network, increasing capacity of London’s transport network by 10% along with transforming the city-region’s connectivity.

One of the biggest challenges was developing a robust funding strategy for the £15bn project and securing its approval. Crossrail is being funded by a range of income streams, many of which have never been used before, including a business rate supplement and development levies across London including a Mayoral CIL. Analysis was undertaken to make the case for investment in Crossrail and the value generated, for example by assessing how local businesses will see increased activity resulting from Crossrail’s opening. This was critical in securing support from stakeholders to introduce the new income streams representing over 2/3 of total funding.



The Funding Challenge

- 5.10 The focus of this Financial Case is to identify a selection of potential funding sources that could be utilised to meet the capital cost of the CAM project. This has been estimated at around £4,000m (2018/19, real prices), for the delivery of the full regional network, and includes the capital cost elements set out the Economic Case. While the costs represent the full funding that would need to be secured, in practice the funding required would spread in-line with the phased development of the network.

The Additionality of CAM

- 5.11 One of the most important aspects of any proposed investment is the question of the scale of change it can generate directly or unlock indirectly. This change can be in reducing the time or cost of transporting people or goods, increasing the capacity of the transport network or in improving access to a poorly served location. The key determinant of scale of change is whether the benefit impact decisions made by people or companies to increase activities or even start a new business or establish facilities in a location due to the investment.
- 5.12 Investment in CAM provides a step change in the capacity and capability of Greater Cambridge's transport network supporting growth but importantly, unlocking the opportunity to transform the region's economy in a more sustainable manner.
- 5.13 The transformational impact of CAM and the additional scale and productivity of economic activity, in the form of additional jobs, homes and productivity is set out in the Strategic and Economic Cases. In summary, CAM has the potential to contribute to the delivery of around 50,000 additional jobs under a 'central case' scenario, and support higher levels of productivity per worker within the Greater Cambridge area. There are a range of potential ways in which the additional value of jobs can be captured, from the landowners, developers and businesses that would gain from such additionality. Likewise, landowners, developers and residents would benefit from additional housing, and there are various potential mechanisms that can be used to capture a proportion of this value.

Manchester Metrolink



The Metrolink 'Big Bang' expansion includes a £1.5bn Metrolink investment programme which will triple the size of the network. The extent of the project will help reduce congestion levels, with an estimated five million fewer cars on the road network, increasing public transport trips per day from 55,000 to more than 90,000.

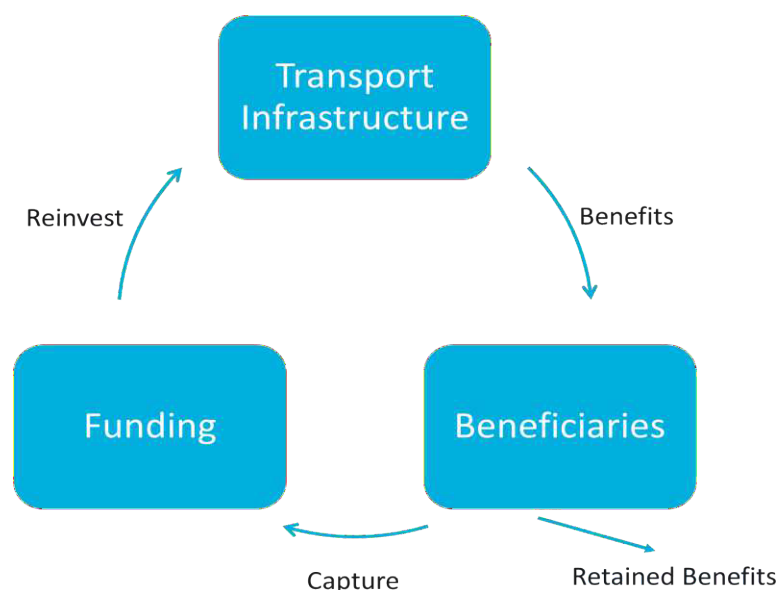
The project's successful delivery is highly attributable to Greater Manchester Combined Authority (GMCA) and their ability to resource innovative funding sources following the rejection of a new road pricing scheme by public referendum.

The ten councils worked together to generate funding through a series of authority-wide mechanisms. The final funding package was agreed due in part to the demonstrated benefits to the regional economy and included European grant funding, a council tax precept, pooling local transport budgets, surplus farebox revenue, and direct contributions including from Manchester Airport. Over 25% of total funding was from local sources.

The Metrolink extension is part of the transformational growth project which is seeing major investment, including bus priority measures, six new and better cycle routes into the city centre and major rail improvements, all of these align with the GMCA vision of become a self-reliant city-region.

Beneficiary Pays

- 5.14 A key concept in our assessment of funding sources is the concept of 'beneficiary pays'. This concept is based on the principle that those who benefit from the improvement in transport should contribute to its cost where beneficiaries include direct users of the development such as passengers and economic beneficiaries i.e. those who obtain increased economic benefit either in capital or revenue terms from the improved transport provision.
- 5.15 This approach creates an invest cycle where transport infrastructure generates benefits to a series of beneficiaries and funding mechanisms then capture a proportion of these benefits to invest into transport. Figure 5.1 outlines this process.

Figure 5.1: Beneficiary Pays Cycle

- 5.16 A step-change improvement in transport accessibility, connectivity and capacity enabled by CAM will result in a range of beneficiaries. Whether its passengers who benefit from the improvement in service or developers who benefit from increased land values near the stations. An overview of beneficiaries of the mass transit options in Cambridge is set out in Table 5.1, including how they may benefit from the project.

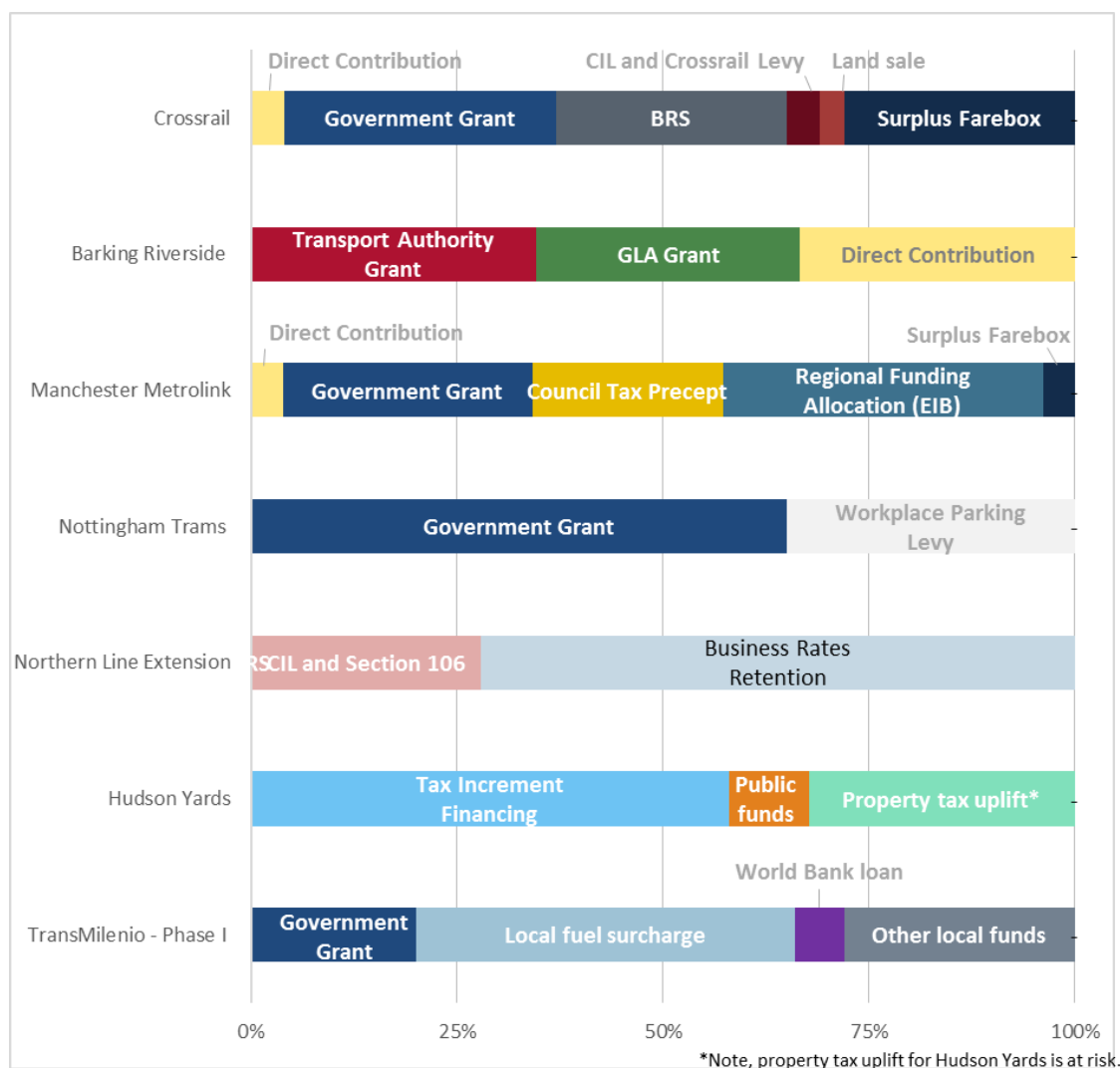
Table 5.1: Beneficiaries of Transport Infrastructure

| Benefactor | How they benefit from transport | How could it be captured |
|----------------------------|---|--|
| Developers and land owners | Increased land value as more businesses and/or residents look to relocate to the area. This benefit translates into a financial benefit as higher land values can result in higher density developments and/or an increase to rental values and/or sale incomes. | <ul style="list-style-type: none"> Developer / Direct contributions CIL/MCIL/SIT Land Value Capture Stamp duty retention |
| Businesses/ Workers | Agglomeration as greater productivity and lower costs arising from the concentration of economic activity. The increased concentration has a productivity 'bonus' that is shared between businesses and workers that can lead to increased revenues and/or reduced costs. In addition, businesses can benefit from being able to draw from a wider pool of prospective employees who can more easily access their business. | <ul style="list-style-type: none"> Business rate uplift retention Business rate supplement Workplace parking levy |
| Residents | Better connectivity and increased mobility providing access to more jobs and amenities and (if they own their property) through an uplift in land values. | <ul style="list-style-type: none"> Council tax supplement Council Tax retention |
| Transport Users | Reduced journey times, improved reliability and/or increased frequency. These benefits allow users to access a wider pool of jobs and can lead to productivity gains where both may result in financial benefits to the user. | <ul style="list-style-type: none"> Intelligent charging/ Parking levy Operator access fee Farebox surplus |
| The Road Maintainer | Reduced road usage as people increasingly travel by public transport, walking or cycling as opposed to by private car. In | <ul style="list-style-type: none"> Shadow Tolls |

| Benefactor | How they benefit from transport | How could it be captured |
|------------|---|--------------------------|
| | this instance, it may reduce the need to expand the road network around Cambridge to meet growing demand. | |

Funding: Recent Case Studies

- 5.17 As noted in the Introduction, a robust funding strategy for large-scale transport infrastructure schemes should look to reduce reliance on the public purse and seek locally sources for funding which seek to capture a proportion of the benefits generated. This is evident in recent infrastructure investments in the UK and overseas where local funding has provided a crucial component of the infrastructure funding strategy. Figure 5.2 shows the breakdown of funding strategies for recent transport projects.
- 5.18 A notable example of a successful application of a local funding mechanism is the **Northern Line Extension**. It involved a creation of an Enterprise Zone which enabled 100% of the incremental business rates to be retained locally for 25 years. This mechanism alone is expected to contribute over 70% of the total project cost. With the addition of the funds collected via CIL and Section 106 regimes, of which a portion will be dedicated to the project, the funding potential will be sufficient to fully fund the Northern Line Extension.
- 5.19 Alternative funding strategies have also been implemented outside of London. Manchester has introduced a Council Tax Precept, where the council tax was raised 3% for a period of 6 years on the justification that residents would benefit from the new transport links, predominately in the form of the expansion of the **Manchester Metrolink**. Combined with direct contributions from specific developments along the Metrolink route, it allowed the Combined Authority to raise over £300m, covering 27% of the £1.5bn transport development strategy.
- 5.20 Nottingham City Council adapted a different approach, where employers are liable for charges applied to the workplace parking spaces through a Workplace Parking Levy (WPL). WPL focuses on reducing peak time congestion, which is mainly generated by the commuters and funds collected via the mechanism are used to aid the public transport improvements. Furthermore, it incentivises employers to utilise parking spaces for more productive land uses including releasing land for higher density development. Amongst other projects, WPL proceeds are expected to cover circa 35% of the cost of the extension of **Nottingham Trams**.
- 5.21 Outside the UK, alternative funding strategies have also been implemented to deliver transport infrastructure projects. One of the highest profile projects is the over \$3bn New York City **Hudson Yards redevelopment** which included an extension of the subway, plus road and public space enhancements. While there have been changes in the financing of the infrastructure works due to delays in developments, the majority of funding is being generated from developer contributions and an increase in property taxes generated by the development and surrounding properties.
- 5.22 Also, outside the UK, the **TransMilenio Bus Rapid Transport (BRT)** system secured funding from alternative sources. The cost of infrastructure was split between the national government and the City of Bogota including utilising local powers to introduce a petrol surcharge. This allowed the City to collect over \$320 million, covering the costs of 46% of Phase I and 34% of Phase II of the project.

Figure 5.2: Funding strategies from Recent Transport Investments

- 5.23 Therefore, a variety of local funding schemes, complemented by central government grant funding, has been applied to a range of transport development projects where an important lesson is to tailor the funding strategy to the context of the transport development particularly in terms of beneficiaries, local powers, and legislation.

Overview of Funding Options

- 5.24 A number of funding options with the potential to support CAM are presented below which focus on funding that can be generated locally and is informed by the case studies alongside the additionality driven by CAM and the concept of beneficiary pays. A qualitative assessment of these options is presented. Further consideration of each source is recommended as part of future work.

Source 1: Committed Central Government Funding

- 5.25 The initial phases of CAM – the A428 Cambourne to Cambridge and A1307 South East Corridors - would be delivered by the Greater Cambridge Partnership and funded through the City Deal.
- 5.26 The City Deal has been agreed between the local government and the Greater Cambridge Partnership. It is a partnership of councils, academic institutions and businesses which aim to work together and with the local communities and partners to facilitate continued growth in

the region and create an increase in prosperity and quality of life for the local residents. The four partners of the Greater Cambridge Partnership are Cambridge City Council, Cambridgeshire County Council, South Cambridgeshire District Council and University of Cambridge. The City Deal was signed in 2014 and resulted in additional powers and investment potential of up to £1bn over 15 years starting from April 2015.

- 5.27 The first tranche of the funding available to the Greater Cambridge Partnership is £100m to be spent between years 2015 and 2020. If the transport investments funded from this pot prove to be successful, further two tranches of funding will become available in the future – £200m from April 2020 onwards and £200m from April 2025 onwards. Also, local partners have committed to provide further £500m. Part of the CAM network will utilise infrastructure delivered in part through City Deal funding. In addition, City Deal funding has the potential to part-fund, alongside developer funding, further planned phases of CAM, such as the A10 corridor to Waterbeach.

Source 2: Additional Central Government Funding

- 5.28 Following on from the above, there may be additional opportunities, such as, through future 'devolution deals', whereby the additionality that CAM could deliver in terms of housing, jobs and GVA provide a strong rationale for securing such funding.
- 5.29 In addition to central government 'deals', the CAM project could apply and receive other alternative funds from UK central government, such as the Housing Infrastructure Fund (HIF). HIF is a £2.3bn infrastructure fund which the combined authorities are eligible to bid for, provided that the infrastructure development they are proposing is going to unlock housing potential. The first investment round of HIF (2017/18) allocated a total of £866 million to help deliver a total of 200,000 homes which represents an average funding amount of £4,330 per home though there is significant variation across successful bids.
- 5.30 Since CAM is expected to generate significant amount of new homes and jobs, it should have a high chance of qualifying for such schemes. While the bid period for the HIF has now been closed, a similar scheme would be expected to appear in the near future.

Source 3: Direct contributions

- 5.31 There are several examples where major beneficiaries of a transport improvement have contributed directly to the implementation costs. For instance, the Crossrail funding package included direct contributions from several private companies; Canary Wharf Group contributed £150m to develop the Isle of Dogs station as Crossrail will increase the transport capacity to Canary Wharf supporting expansion of the area. Similarly, another developer, Berkeley Homes, has agreed to support the construction of the Crossrail station in Woolwich, which will increase the land value around the station and effectively improving property sales in the area nearby.
- 5.32 Private companies and academic institutions have a strong presence in Cambridgeshire. However, sites in the city centre which are easily accessible are limited and therefore companies and universities could be willing to contribute towards a new transport solution to support growth across the wider region. Increased accessibility can lead to a wider pool of skilled labour and increase in the quality of life of the students and employees, allowing greater density developments. Also, customers who are currently discouraged by the lack of accessibility might start visiting customer-orientated business, which in return might see an increase in their market share.

- 5.33 Direct contributions could also be expected from the landowners and / or developers of specific sites that would be more attractive and valuable due to the accessibility provided by CAM.

Source 4: Cambridge City Access Programme

- 5.34 An important target in the Cambridge City Deal is to reduce the number of vehicles on the road by 10 - 15% below the 2011 level. The scale of the challenge continues to increase through growth in the city where the City Deal target today equates to a 24% reduction to congestion. As such, options are being explored locally to manage demand on the roads.
- 5.35 Some of the options being explored include introducing charges to manage demand which would incentivise modal shift while and also generate local funding to invest in public transport improvements to offer road users a reasonable alternative. A Workplace Parking Levy, such as the mechanism implemented in Nottingham, is one option being explored while other options, include off street parking charges, pollution charging and intelligent charging. The estimates of potential funding from these sources are up to £40m - £60m per annum⁴³ and as such could generate a significant funding pot to support with public transport improvements such as CAM which enables many benefits to the potential contributors to the charges.

Source 5: Mayoral CIL/Strategic Infrastructure Tariff

- 5.36 The developer levy, Mayoral CIL was introduced across Greater London to support Crossrail and generated above its £300m target over the first four years of implementation. This is estimated to only be a fraction of the uplift in land values driven by Crossrail which real estate research suggesting the residential and commercial property values around Crossrail stations grew by more than £5.5bn compared to the wider London property market.
- 5.37 The Strategic Infrastructure Tariff proposed by government for Combined Authorities, would be like a Mayoral CIL introduced across the Combined Authority, where the charge could be introduced on residential developments, commercial developments or both. This would be payable by new developments only (i.e. existing properties are not charged) where this would seek to capture a proportion of the land uplift driven by CAM with the remainder being retained by local developers. If the levy were introduced at a rate of £20 per square metre on only residential developments initial estimates suggest this could raise close to £300m towards CAM development over a 30-year period. There is currently no CIL charges in place across the Combined Authority area.

Source 6: Business Rate Increment Retention

- 5.38 Wider areas of potential development enabled by CAM could be subject to an introduction of additional funding mechanisms or to an increase in charges compared to the wider Combined Authority area.
- 5.39 For instance, new developments enabled by CAM will be a subject to local taxes, such as the Business Rates paid by the businesses, or council tax paid by the households. A proportion of those charges, collected by the local council could be allocated to fund CAM on the rationale that these developments would not come forward, nor the increased level of economic activity and resulting increase in rateable values without such a funding mechanism. This retention would seek to 'top slice' these taxes or retain a proportion of these taxes within a

⁴³ <http://scambs.moderngov.co.uk/documents/s108578/7-City%20Access.pdf>

defined area which could provide a significant additional funding stream for CAM. There are examples in the UK of such mechanisms being used to support transport infrastructure improvements, most notably the developments in Vauxhall, Nine Elms, and Battersea and that were enabled by the Northern Line Extension (NLE).

- 5.40 Under this model, this mechanism would not result in additional charges to land owners/developers in the area but would instead ring-fence a proportion of tax receipts. Since these developments rely on the improvements to the transport network, and as such would not come-forward (nor would the tax receipts) without them, the contribution towards CAM would be justifiable. An agreement of this funding source would be dependent on central government approval and potentially with local businesses and as such consultation to ascertain whether there is appetite for such a mechanism is recommended in future work.
- 5.41 An illustrative scenario based on 30 000 new jobs enabled by CAM has been analysed. Assuming 100% of business rates are retained over £500m funding could be generated over a period of 30 years which would make a significant contribution towards CAM's funding needs.

Source 7: Business Rates Supplement

- 5.42 A "2p in the pound", Business Rate Supplement (BRS) was introduced across Greater London to support Crossrail generating over a quarter of the funding for the project.
- 5.43 The 2017 Cambridgeshire and Peterborough Devolution Deal with the Combined Authority notes that following the implementation of the necessary primary legislation, the Mayor will be given the power to place a supplement on business rates to fund infrastructure. This rate would be payable by business above a certain size to ensure smaller businesses were not impacted. A key consideration when calibrating the supplement would be to ensure the benefit to businesses from CAM is greater than their contribution through a BRS. If implemented, a BRS could generate significant funding for CAM and should be considered further.

Source 8: Council Tax Precept

- 5.44 Although council tax is traditionally paid to support the provision of services within the local areas, there are examples of the introduction of a council tax precept to support infrastructure developments including in Greater Manchester to support Metrolink extensions and Greater London to support the London Olympics. Furthermore, an Adult Social Care (ASC) Precept, which supports adult social care services has been introduced across England in recent years.
- 5.45 However, the Combined Authority do not currently have the ability to apply a council tax precept on local authorities within the Combined Authority area and there is likely to be significant challenging obtaining support of increasing council tax. As such introducing a precept on council tax would seem unlikely for CAM.

Source 9: Council tax Increment Retention

- 5.46 Similar to Business Rate Increment Retention (Source 6), a proportion of council tax generated at developments enabled by CAM could be set aside for transport improvements. This retention would seek to 'top slice' these taxes which could provide a significant additional funding stream for CAM. Under this model, this mechanism would not result in additional charges to land owners/developers in the area but would instead ring-fence a proportion of tax receipts.
- 5.47 Growth on council tax is limited to 3% per annum (plus 3% growth to ASC), with the general understanding that growth in council tax receipts is needed to meet the cost of additional

services resulting from additional housing/population and as such is unlikely to provide a funding stream to support CAM.

Source 10: Stamp Duty Increment Retention

- 5.48 Stamp duty is a tax levied upon the sale of property, as a proportion of the sale value. The concept of Stamp Duty Increment Retention is that, where infrastructure results in an increase in the value of residential property, some of the increase in value can be ‘captured’ at the point of sale and retained (or hypothecated) to provide a funding source to support the infrastructure cost. Retention of a proportion of stamp duty receipts could generate significant revenues. However, the powers for such a retention mechanism do not exist, nor has any project been allowed to capture a proportion of the stamp duty funds generated. Discussions with UK Central Government are recommended before this option is taken any further.

Source 11: Farebox Surplus / Premium Fare

- 5.49 As noted in the introduction, based on initial analysis, the passenger revenue and ancillary revenue from CAM is estimated to meet the ongoing costs of operation and maintenance of the system. Alternatively, the fare on CAM could be charged at a premium rate to generate additional income to part fund its construction as is planned for Crossrail.
- 5.50 There is significant risk around such a mechanism in the context of CAM as the level of ridership and elasticity between fare and demand is effectively a greenfield risk before the project is operational and as such predicated funding of the capital costs against future passenger revenue would have a considerable amount of risk associated. Further analysis on this is required before this can be considered as a potential funding source.

Source 12: Shadow Toll

- 5.51 The benefit of CAM includes supporting a modal shift from road to public transport. Furthermore, aligning land development with public transport provision may further increase the modal share of public transport.
- 5.52 While the case for CAM does not currently assume that alternative transport infrastructure investments would be needed if CAM is not constructed, expansion of existing infrastructure would likely be needed just to cope with existing issues with Cambridge’s transport network. This could require an A-roads and motorways to cater for future growth in road demand over the next 25-30 years (e.g. adding an additional lane or converting a motorway into a smart motorway).
- 5.53 While the application of this funding source would need to be negotiated and agreed with Highways England and local authorities, a ‘shadow toll’ could generate a useful funding stream to part fund CAM.

Other Sources: Land Value Capture Mechanism

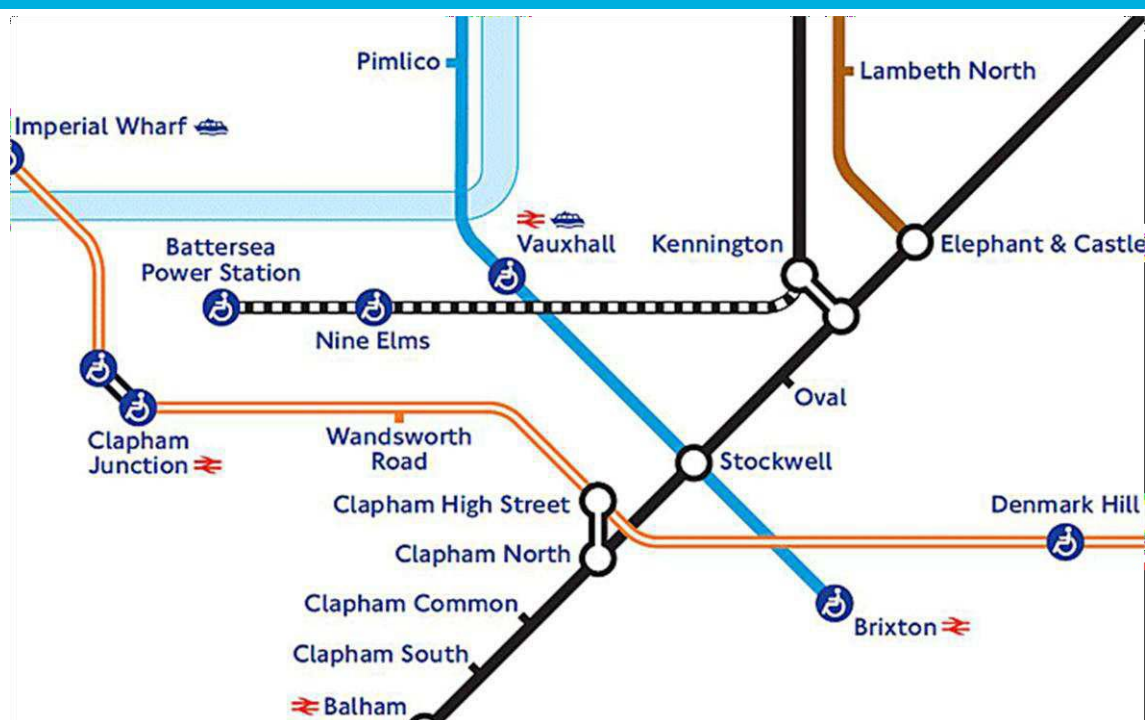
- 5.54 The premise of the Land Value Capture Mechanisms is that the uplift in the land value due to a land use change enabled by CAM would be shared between the land owners and the local government. Currently there is not legislation for such a mechanism and the potential options for such a mechanism are currently under review. However, as a very illustrative example of an uplift of £30,000 per unit, would generate £30m per 1,000 units. Considering that the potential of CAM to deliver a significant increase in residential and commercial development, a LVC mechanism could make a significant contribution towards the project cost. It is

understood that a separate investigation into the potential and practicality of such a mechanism has been commissioned by the Mayor.

Consultation

- 5.55 Many of the funding options outlined above are subject to support/agreement from public or private bodies. For instance:
- Direct contributions from beneficiaries would need to be negotiated and agreed with each contributor on a case-by-case basis.
 - Local tax retention within a defined area would need to be agreed and approved by various levels of government
 - For Cambridgeshire and Peterborough Combined Authority to introduce a council tax levy, powers need to be granted through a government deal with support from the local authorities within the Combined Authority and government; and
 - For Cambridgeshire and Peterborough Combined Authority to introduce a BRS, primary legislation would need to be approved.
- 5.56 It is important to consult with the various local public and private bodies to gauge views on funding options in order to help filter the funding options/scenarios presented and identify the most feasible funding strategy. Preparing and presenting evidence that illustrates the benefits from the mass transit options during this consultation will increase the chance of support for the scheme. For instance, when introducing a BRS in London, a wider economic benefits assessment of Crossrail was undertaken to demonstrate that the benefits received by businesses in each borough was greater than the support being they would provide.
- 5.57 Undertaking a consultation exercise with the relevant stakeholders impacted in Cambridgeshire and Peterborough is recommended.

Northern Line Extension



Working with developers and local authorities, Transport for London (TfL) decided to extend the Northern line to help regenerate the areas of Vauxhall, Nine Elms and Battersea at a cost of £1bn. An estimated 25,000 jobs and 20,000 new homes could be created as a result of improved public transport accessibility. Upon project completion, the journey time from the new Nine Elms and Battersea Power Station stations to the City should not take more than 15 minutes, making the area an attractive location for commuters and employers such as the US, China and Dutch Embassies and Apple who will re-locate its UK Headquarters.

The Chancellor's 2011 Autumn Statement confirmed that the Government would establish an Enterprise Zone at Battersea, enabling 100% of incremental business rates to an agreed baseline would be retained locally for a period of at least 25 years. The Enterprise Zone will encompass an area of over 227-hectares across two London boroughs: Wandsworth and Lambeth within 1km of the two new stations which would be constructed. Funding from the Enterprise Zone is forecast to total c.£700m.

With the addition of the funds collected from the local developers under Borough CIL and Section 106 regimes, this will be sufficient to repay the debt required to pay for the up-front costs of building the Northern Line Extension. The extension is currently under construction and is planned to open in late 2021.

Qualitative Assessment – Sifting of Potential Local Funding Sources

- 5.58 A qualitative assessment of the funding mechanisms outlined above has been undertaken to highlight the advantages and challenges across the different potential sources. The qualitative assessment is based on the following criteria with a 5 being the most valuable or practical and

a 1 considered either low value or unlikely to be acceptable (further details are provided in Table 5.3):

- Potential contribution – the scale of funding the mechanism could generate for CAM;
- Certainty of income – the level of certainty/predictability in the income and its reliance to external economic risks such as market fluctuations (note for clarity this is not an assessment on the likelihood of implementing the given mechanism);
- Justification – the level of alignment between the mechanism and beneficiaries of the scheme;
- Acceptability – the level of appeal to stakeholders in implementation or utilising the mechanism and alignment with their objectives; and
- Deliverability – the legal and practical deliverability of the mechanism.

Table 5.2: Qualitative Assessment of Funding Mechanisms

| Mechanism | Potential Contribution | Certainty of Income | Justification | Acceptability | Deliverability |
|---|------------------------|---------------------|---------------|---------------|----------------|
| 1. Committed Central Government Funding | 5 | 5 | 5 | 4 | 5 |
| 2. Additional Central Government Funding | 5 | 2 | 4 | 3 | 3 |
| 3. Direct Contributions | 4 | 2 | 5 | 3 | 3 |
| 4. Cambridge City Access (e.g. WPL, intelligent charging) | 5 | 3 | 4 | 3 | 3 |
| 5. Mayoral CIL/Strategic Infrastructure Tariff | 3 | 3 | 4 | 4 | 4 |
| 6. Business Rate Increment Retention | 4 | 3 | 4 | 3 | 2 |
| 7. Business Rate Supplement | 4 | 4 | 4 | 3 | 2 |
| 8. Council Tax Precept | 3 | 4 | 3 | 1 | 2 |
| 9. Council tax Increment Retention | 3 | 4 | 2 | 2 | 3 |
| 10. Stamp Duty Increment Retention | 4 | 2 | 3 | 2 | 1 |
| 11. Farebox surplus/Premium Fare | 2 | 2 | 3 | 2 | 4 |
| 12. Shadow Toll | 2 | 1 | 3 | 2 | 1 |

Table 5.3: Qualitative Assessment Criteria

| Score | Description |
|-------|--|
| 5 | Very good or excellent. e.g. very high potential contribution, highly secure income source; very strong alignment with beneficiaries; strongly supported by stakeholders; straightforward to implement. |
| 4 | Good e.g. high potential contribution, secure income source; strong alignment with beneficiaries; generally supported by stakeholders; practicable to implement. |
| 3 | Reasonable e.g. reasonable potential contribution, generally stable income source; reasonable alignment with beneficiaries; acceptable by stakeholders but with caveats/preconditions/reservations; some challenges to implementation |
| 2 | Weak/risky e.g. low potential contribution, unpredictable and exposure to market fluctuations; weak alignment with beneficiaries; unappealing by stakeholders; difficult to implement |
| 1 | Very Weak/Very risky e.g. very low potential contribution, very unpredictable and significant exposure to market fluctuations; very weak alignment with beneficiaries; unacceptable by stakeholders; very difficult to implement and/or untied |

5.59 This analysis highlights some key challenges with certain funding options. For instance, a council tax precept (or council tax increment retention) is likely to face challenges in terms of acceptability from stakeholders whether it be residents or government where the charge would likely be paid across a wider geographical area. As such if this mechanism were to be

pursued, a very strong case would need to be produced that justified the rationale for its implementation (e.g. benefits received are greater than costs incurred) and communicated this effectively to stakeholders. While a stamp duty increment retention is also likely to have challenges with acceptability alongside deliverability as such a mechanism has not been used before in the UK. Furthermore, council tax mechanisms have a reasonable potential contribution rating however this should be considered alongside the lower acceptability and deliverability ratings as if the mechanisms in unacceptable any notional potential is unrealisable.

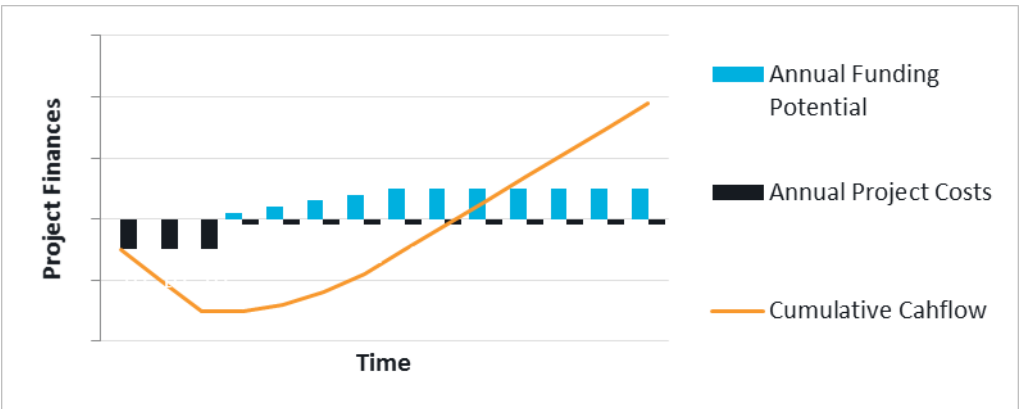
- 5.60 This analysis highlights the local funding mechanisms with higher contribution potential, which, alongside government grants, include Business Rate Retention, Cambridge City Access, Business Rate Supplement. This is driven by these mechanisms having the potential to be charged on a relatively large volume of beneficiaries such as the vehicles travelling within central Cambridge during certain periods of the day or the businesses operating within a defined area. Furthermore, these mechanisms create an on-going funding stream as they would be paid periodically which increases the contribution potential.
- 5.61 The funding mechanisms with greater certainty of income, in terms of the ability to forecast or model the level of income, include those based on existing charges such as council tax or business rates as the ability to forecast future receipts from existing revenue streams or demand is considerably more robust than a new charge/demand. For instance, there is less certainty with developer charges as they are more dependent on the development market and as such fluctuate considerably year-on-year. Note, the certainty of income is not a measure on the likelihood to be able to implement a given mechanism which is more linked to acceptability and deliverability.
- 5.62 The deliverability of Business Rate Supplement, Council Tax Precept, Business Rate Retention, Business Rate Increment Retention, and Shadow Toll is seen as lower due to the need to either obtain approval across several stakeholder groups or due to the need for primary legislation. While Premium Fare has a low acceptability rating as passenger ridership is expected to be relatively elastic to fare changes.
- 5.63 The above qualitative assessment highlights some of the advantages and challenges with the funding mechanism options for CAM. This assessment suggests there is likely to be significant challenges associated with certain funding mechanisms relating to either the justification of the use of such a mechanism, the acceptability from stakeholders, or the practical aspects in terms of delivering such a mechanism. Moreover, some mechanisms have a lower degree of challenges but have a lower potential contribution leading to the reward of implementing certain mechanisms not outweighing the challenges of implementation.
- 5.64 Based on this assessment, a series of mechanisms are considered to have either too significant challenges to implement or to not provide a sufficient reward from implementation. These have been identified as Council Tax Precept, Council Tax Increment Retention, Stamp Duty Increment Retention, Premium Fare, Shadow Toll and as such at this stage it is unlikely these mechanisms will be considered as part of further work. The other funding mechanisms identified as part of this analysis are considered to have sufficient merits to be considered as part of future work.

Financing

- 5.65 The first ten years of the CAM project require up to £4bn of capital investment while many of the funding options outlined above will generate funding over a longer period e.g. 30 years. This disparity between the capital cost and the funding during the initial years of the project

can be met by financing where, for instance, debt is secured against future funding receipts in the same way that a mortgage is secured to finance the purchase of a home. An illustration of this is provided in Figure 5.3, which highlights a negative cashflow in the initial years.

Figure 5.3: Illustrative Example of Project Finances



5.66 Interest payments would be payable on finance where the interest rate for debt that the Combined Authority could achieve depends on the arrangement and source. For instance, potential sources include public finance from the Public Works Loan Board (PWLb) which provides debt financing options to public bodies from the central government National Loans Fund. Alternative private finance could be sourced such as commercial debt or bonds. For example, the Greater London Authority raised £200m through a bond to support the Northern Line Extension (NLE) which was effectively backed by the UK Guarantee scheme, lowering borrowing costs.

5.67 Servicing finance through interest ultimately reduces the capital costs a funding option could support where based on a loan term of 30 years and PWLB rates circa a one third of the funding potential from sources over time would be needed to meet debt service charges. Note, if private finance was to be used to cover the funding gap as opposed to the PWLB, the interest rate would be significantly higher and the extra interest payments would have to be accounted for.

5.68 Irrespective of the source it is important to note that any financing secured by a local authority (e.g. the Combined Authority), including commercial debt, is effectively underwritten by central government and so will impact the central public balance sheet.



Nottingham Workplace Parking Levy

Nottingham City Council introduced Workplace Parking Levy (WPL) in 2012. It is used as a demand management tool to reduce the levels of commuter parking, as commuters make up around 70% of the peak traffic congestion which costs the city £160m per year. Majority of this cost falls on the businesses, and therefore they are a direct beneficiary of any congestion reductions.

From April 2012, employers which provide 11 or more parking spaces to the employees are liable to pay the WPL charge. They can however choose to reclaim part of the cost from the employees who use the parking spaces provided. In the current licensing period the charge is £402 per year per a parking space provided.

The WPL scheme has raised £44m in the first five years of operation. This has allowed the council to contribute towards the financing of the new £580m city tram lines and contribute towards the £60m redevelopment of Nottingham Station.

The revenue collected from the scheme is also used as local match funding. It puts the City Council in a stronger position when bidding for external funds, such as funding from Department for Transport.



Summary

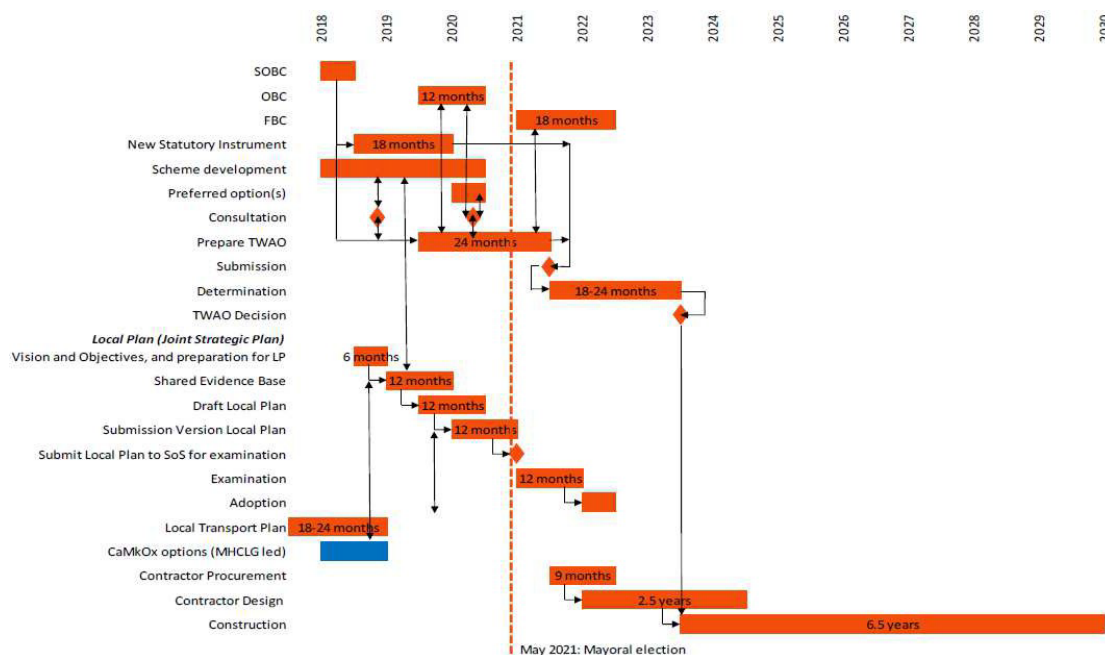
- 5.69 CAM will lead to a transformational change in the region. It will enable a number of benefits, including congestion relief, journey time savings, affordability improvements, productivity gains and sustainability benefits and support the Combined Authority and Greater Cambridge Partnership achieve their strategic goals. The benefits enabled by CAM will be felt by numerous beneficiaries across the region including business, developers, residents, land owners and transport users.
- 5.70 As such the funding strategy for CAM should look to capture a proportion of the benefits generated across the region to support the costs of delivering the project. This approach is aligned with several recent transport infrastructure investments in the UK including investments in Greater London, Greater Manchester, and Nottingham as well as transport investments overseas. These recent examples can be seen to set a benchmark where:
- A significant proportion of funding required to deliver a transport infrastructure project is from local sources;
 - That the project should be able to cover its longer run operating, maintenance and ideally renewal costs;
 - That a mix of local funding can be secured, supported by local businesses, developers and users; and
 - That the wider economic benefits of the project are significant and that increased taxes can help recover any central government outlay (particularly through increased productivity, generating additional and higher paying jobs).
- 5.71 A number of funding options have been identified based on the additionality driven by CAM which include: Direct Contributions, Cambridge City Access funding, local charges and levies (such as a Strategic Infrastructure Tariff or Business Rate Supplement), local tax retention (such as business rate increment retention), and a Land Value Capture Mechanism. Combined with existing funding already secured through the City Deal, there is the potential for the costs required to deliver CAM to be funded. Each of these options have challenges to implement and would be subject to support/agreement from several public or private bodies. It is therefore important to continue to consult with the various local public and private bodies to gauge views and work towards the most feasible and preferred funding strategy.
- 5.72 Next steps which should be considered include:
- Consulting with local stakeholders, local business groups and developers on the feasibility of the options outlined in the Financial Case;
 - Continuing the ongoing dialogue with UK Government to set out the additionality benefits of CAM at the UK-level and discuss the potential for securing the ability and powers to leverage local funding sources and / or the ability to secure funding from Government.
 - Further analysis of the practicality of introducing the funding options identified and the scale of funding that could be raised;
 - Consider in more detail how to bridge any remaining funding gap, including further assessment of Land Value Capture mechanisms; and
 - Assess financing issued, outline options and discuss with financing experts on requirements to establish a robust financing package (for example to mitigate risk).

6 Management Case

Introduction

- 6.1 This Chapter describes the Management Case for the Cambridgeshire Autonomous Metro (CAM) project. This document forms part of the Strategic Outline Business Case (SOBC) for the CAM and has been developed in line with HM Treasury Green Book guidelines.
- 6.2 The SOBC is the second of four stages of development of the CAM. It follows the delivery of a Metro Options Assessment Study, which was published in January 2018, and it will be followed by the development of an Outline Business Case in mid-2020 and, subject to approvals and funding, a Full Business Case in mid-2022. A high-level summary of the programme for the development of the CAM project is provided in Figure 6.1 below.

Figure 6.1: Indicative programme for the development and delivery of the CAM project (Source: Arup)



- 6.3 At the SOBC stage, the purpose of the Management Case is to describe:
- How the Sponsors will manage the risks in the design, build, funding and operational phases of the CAM and put in place contingency plans;
 - How the Sponsors will deal with inevitable business and service change in a controlled environment; and
 - How the Sponsor will ensure that the CAM's objectives will be met, how its anticipated outcomes will be delivered, and how its benefits will be evaluated.
- 6.4 Within this Management Case, for the avoidance of doubt, the CAM **project** refers solely to the 'core' infrastructure, primarily the city centre tunnel and underground stations, which

forms the critical enabler of the wider, 142km CAM **network**, which includes, in addition to the 'core' infrastructure:

- the '*inner corridors*': schemes which are currently being sponsored solely by the Greater Cambridge Partnership, from Cambridge to Cambourne, Granta Park and Waterbeach New Town;
- the '*outer corridors*': schemes which are expected to be sponsored by the Combined Authority, to expand the CAM network beyond Greater Cambridge, from:
 - St Ives to Alconbury, via Huntingdon;
 - Newmarket Road Park-and-Ride to Haverhill;
 - Granta Park to Haverhill; and
 - Cambourne to St Neots.

6.5 The geography of these schemes, which when operational will form part of the wider CAM **network**, is outlined within Figure 1.1 within the Strategic Case. These are expected to be delivered independently (but in parallel) to the 'core' infrastructure. This Management Case primarily focuses on delivery of the CAM project, but also considers the interfaces between this and 'inner' and 'outer' corridor **schemes**, which when completed will form part of the wider CAM **network**.

Purpose

6.6 The purpose of the Management Case is to demonstrate that a preferred option for the CAM project can be delivered successfully. It should include details about the resources the Sponsor expects will be required to deliver the proposal and arrangements for managing budgets. It identifies the organisation responsible for implementation, sets out when agreed milestones will be achieved, and identifies a date when the proposal will be completed. The Management Case should also include:

- A risk register and plans for risk management;
- A benefit schedule, delivery monitoring (including factors to be monitored) and management arrangements; and
- Details about the arrangements for monitoring and evaluation during and after implementation and any collection of data prior to implementation, including the provision of resources and who will be responsible.

6.7 The Management Case is completed more fully during the intermediate (Outline Business Case) and final stages of a proposal's development culminating with the Full Business Case. The implications of the Management Case should feed into the appraisal and must be reflected in the full versions of the economic, commercial and financial dimensions. As the CAM project is only at the SOBC stage of development, the Management Case has been designed to be high-level.

6.8 The Commercial Case outlines a spectrum of different ownership options, from a fully public model to a privately financed and delivered model. The approach to the management and delivery of the scheme will depend on which of these options are chosen. For the purposes of this SOBC, the Management Case will refer to a Delivery Agent, which is expected to take the form of a Special Purpose Vehicle (SPV). There may be more than one SPVs, for example, one to develop and deliver the project, and another to operate passenger services and maintain infrastructure. The SPV(s) may be fully owned by the public sector, be owned (or contracted to) the private sector, or involve a mixed model.

6.9 It should be further noted that local, regional and sub-national governance arrangements in the Cambridgeshire and Peterborough area are in a state of flux. The Management Case is therefore based on a set of assumptions about what transport governance arrangements will be in place over the life-cycle of the CAM project, which are:

- The Cambridgeshire and Peterborough Combined Authority and Greater Cambridge Partnership will jointly act as the Sponsor of the scheme;
- There will be no change in current local governance arrangements in Cambridgeshire and Peterborough;
- There will be no Sub-National Transport Body (other than “England’s Economic Heartland”, which is not expected to play a major role in the CAM project) in Cambridgeshire and Peterborough.

6.10 The remainder of this document describes assumptions for:

- Key roles;
- Project governance;
- Resources;
- Change management and cost control;
- Communications and stakeholder engagement;
- Benefits management; and
- Risk management.

Key roles

Project Sponsor

6.11 The Cambridgeshire and Peterborough Combined Authority (CPCA) and Greater Cambridge Partnership (GCP) will jointly act as the Client and Sponsor for the CAM project. CPCA and GCP will be accountable for the project’s Business Case and for ensuring that its benefits are realised. They will also ensure that the Delivery Agent (however defined) delivers the Sponsor’s Requirements.

6.12 The precise balance of Client and Sponsor responsibilities between the CPCA and the GCP will be determined at a later stage of project development. However, at this stage, it is envisaged that the CAM project will be led by a Director at the CPCA, who will be the Senior Responsible Owner (SRO) for the whole project. The SRO’s responsibilities will be to:

- Ensure that the project is set up for success and is on course to meet its objectives;
- Own the Business Case for the project and ensure it delivers its projected benefits;
- Develop the project organisation structure and plan;
- Monitor progress of the project;
- Chair the Project Board;
- Ensure an effective communication strategy is developed and put in place;
- Ensure that the project is subject to review at appropriate stages;
- Manage formal project closure (upon completion of a benefits review); and
- Represent the CPCA in overseeing the Development Agreement, which sets out the Sponsor’s Requirements for the project.

6.13 Corporately, both CPCA and GCP will also be responsible for:

- Securing funding to deliver the project;
- Promoting the scheme and leading consultation and stakeholder engagement activities;
- Defining and funding property compensation schemes;

- Setting out the expected way in which regulation of the CAM network will take place;
- Obtaining powers through the planning for the CAM project to be built;
- Defining the strategy for ownership, operation and maintenance of the CAM project when complete;
- Operating within the funding envelope established for the scheme, save for changes made to the scope, which will be managed through the Change process; and
- Managing the interdependencies with wider economic and transport policy across the region.

6.14 If a larger transport authority, such as a Strategic Transport Board, emerges in the Cambridgeshire and Peterborough area in the next few years, there may be a case for this body acting as the Client to and potentially owner of the SPV. Alternatively, CPCA and/or GCP may elect to run the project “in house” and manage all aspects of the project directly. For the purposes of the SOBC, it is assumed the project will be delivered through a single Delivery Agent.

The Delivery Agent

6.15 For the purposes of this SOBC, it is assumed that the CPCA and GCP will create a Special Purpose Vehicle (SPV) to act as the Delivery Agent for the scheme. This SPV would be a separate legal entity to both organisations, and will have the appropriate powers to enter into contracts and employ its own staff (although it is expected some staff will second from partner organisations into the SPV). The SPV will be accountable to the CPCA and GCP, who will act as its “Client”. The ownership of the SPV will depend on the commercial model that is adopted for the scheme (see Commercial Case).

6.16 The Delivery Agent will be responsible for:

- Delivering the CAM project to the Sponsor’s Requirements, including the development of the detailed scope and functionality of the CAM project and its subsequent construction to meet the operational requirements and compliance with the appropriate environmental, construction and safety standards;
- Assisting and supporting the CPCA and GCP in the preparation of planning consents;
- Procuring and overseeing the design services, surveys and other work needed to achieve these tasks and project manage them; and
- Supporting consultation and stakeholder engagement activities as required.

Partner Organisations

6.17 The ultimate success of the CAM project will depend on strong collaboration and communication between the representatives from the seven local authorities and the CPCA ‘Business Board’. These partners are:

- Cambridgeshire County Council;
- Cambridge City Council;
- CPCA Business Board;
- East Cambridgeshire District Council;
- Fenland District Council;
- Huntingdonshire District Council;
- Peterborough City Council; and
- South Cambridgeshire District Council.

6.18 In particular, there will be important interfaces with Cambridgeshire County Council (which manages Cambridgeshire’s highways) and Cambridge City Council (which manages

environmental and planning services in Cambridge), together with the relevant project teams within the Greater Cambridge Partnership responsible for development of the 'inner corridor' schemes from Cambridge to Cambourne, Granta Park and Waterbeach New Town.

- 6.19 These schemes, which will form part of the CAM network when operational, are currently being directly sponsored by the GCP, and will require specific engagement surrounding the precise nature of their interfaces with the CAM project. There will also be a similar interface with the organisation or agent responsible for delivering the 'outer corridor' Combined Authority schemes to Mildenhall, Alconbury, Haverhill and St Neots.
- 6.20 These relationships will be formalised in the governance of the CAM project and in the communication channels and risk management mechanisms that will be established to support it. There may also be a role for major non-Governmental organisations in the development, delivery and governance of the CAM (or parts thereof), such as the University of Cambridge, major businesses and developers/ landowners.

Key governing documents

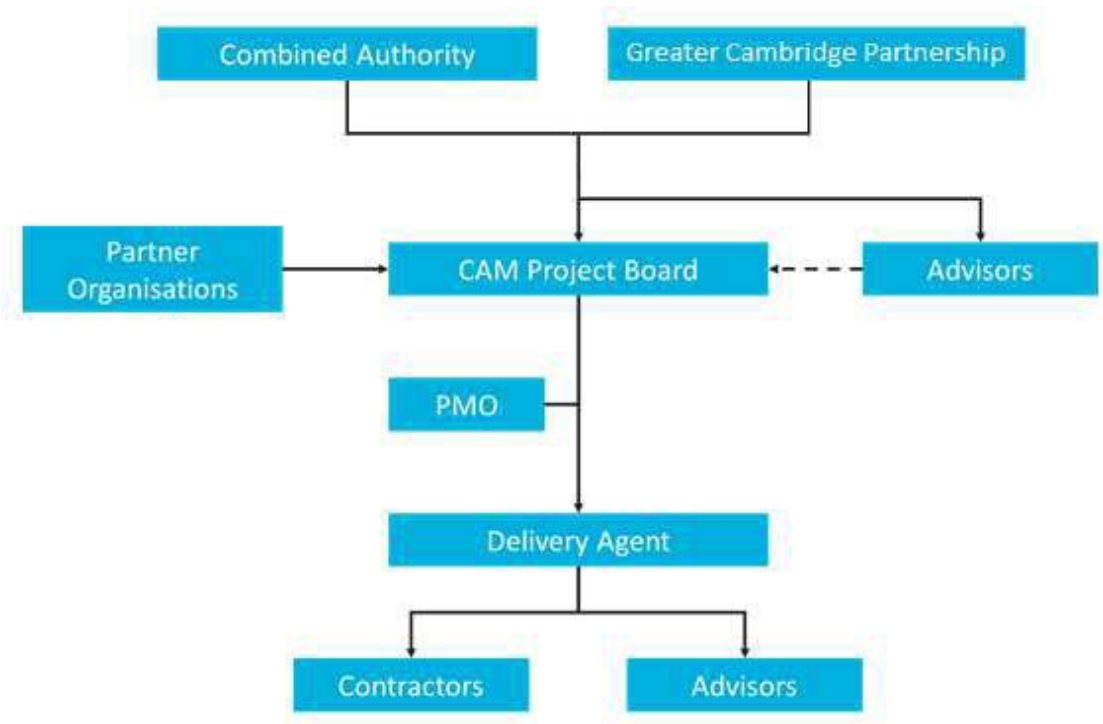
- 6.21 The relationship between the CPCA, the GCP and the Delivery Agent will be formalised by a Development Agreement. This document will set out the high-level output specification and objectives for the CAM project. As a minimum, this document will describe:
- The defined Opening Date for the scheme;
 - The defined Final Completion Date for the scheme;
 - Shared values and objectives of the organisations;
 - Governance arrangements for the delivery of the scheme;
 - Cost control procedures; and
 - Respective roles and responsibilities.
- 6.22 The Development Agreement will be supported by a Framework Document. This document will describe the rules and guidelines relevant to the exercise of the functions, duties and powers of the Delivery Agent and the conditions under which funds are paid to it by CPCA and GCP.
- 6.23 In response to the Development Agreement and Framework Agreement, the Delivery Agent will prepare a Corporate Plan that describes how the Delivery Agent will deliver the Sponsor's specification and measure its progress and performance.
- 6.24 The Sponsor's Requirements will be stipulated by the CPCA and GCP. These will set out the parameters of the scheme which the Delivery Agent is tasked to deliver. These parameters should include a statement of outputs that incorporating the scope and functionality of the CAM system.
- 6.25 The Delivery Agent will respond to the Sponsor's Requirements by developing a Delivery Plan, which is then formally developed into a detailed project specification, project cost estimate (and schedule) and project risk assessment for approval by the CPCA and GCP.
- 6.26 The Delivery Plan will be supported by a Corporate Strategy, which will set out the internal governance arrangements, organisation and resources the Delivery Agent has put in place to ensure it is able to meet the commitments stipulated in the Delivery Plan.

Project governance

Overview

- 6.27 The scale and complexity of the CAM project will necessitate a strong governance structure, which will be designed to enable it to adapt as the project evolves and progresses. An indicative diagram illustrating the envisaged governance arrangements (subject to the commercial model that is ultimately chosen for the project) is provided in Figure 6.2.

Figure 6.2: Proposed governance arrangements



- 6.28 The detailed governance arrangements for the project will be further developed as the scheme develops and will ultimately be described in the Development Agreement. These governance arrangements will be kept under regular review throughout the project life cycle. This will ensure decision making is timely, efficient and effective, and that the overall governance structure is appropriate to, and proportionate for, each phase of the project.
- 6.29 As described above, the Development Agreement will describe the formal relationship between the CPCA, the GCP and the Delivery Agent. Within the structure outlined above, it is expected there will be interfacing arrangements with the CPCA and its Partner Organisations. The Delivery Agent will also establish its own internal governance arrangements, which will be set out in its Corporate Strategy.

The Project Board

- 6.30 The CAM project will be governed by a Project Board. This Board will support the SRO overseeing the delivery of the CAM project. It will facilitate the strategic management of the project while retaining oversight of interfaces with other relevant projects and policies. Its functions will include providing:
- Strategic oversight of all aspects of the CAM Project, including the development and delivery the project, and progress against cost and programme;

- Oversight of the integration of the CAM project into the wider CAM network;
- Oversight of, and challenge to, the development of strategy and policy proposals;
- Oversight of the development of investment proposals to identify any integration risks or issues;
- Integration, communications and stakeholder engagement across all aspects of the CAM Project;
- Risk and issue management, including taking account of assurance outcomes;
- Project and benefits assurance;
- Any other matters on which the SRO seeks guidance.

- 6.31 The Project Board will meet monthly, or more regularly as required, and will include representatives representing the Client, Delivery Agent and Partner Organisations. This is designed to enable the Board to provide oversight of the CAM project and facilitate strong challenge and assurance of its decisions.

The Project Management Office

- 6.32 A Project Management Office (PMO) will be established to co-ordinate the management of interfaces between the CPCA, the GCP, the Delivery Agent and Partner Organisations.
- 6.33 The role of the PMO will be to provide the SRO, the senior leadership team and other government stakeholders with a cohesive view of the whole project. It will facilitate information sharing between the Project Board and its members to ensure there is a clear line of sight for decision making across these organisations. Where dependencies relate to the core programme, the PMO will establish appropriate governance arrangements to facilitate co-ordination of plans.
- 6.34 The key dependencies and relationships that will be managed by the PMO will include Cambridgeshire County Council (the relevant highways authority) and Cambridge City Council (the relevant planning authority), and the interfaces with project teams within the CPCA and the GCP responsible for delivery of the 'inner' and 'outer' corridor schemes.
- 6.35 The PMO will also bring together the risks from the CPCA, the GCP, the Delivery Agent and Partner Organisations and report these to the Project Board.

Delivery Agent Governance

- 6.36 It is envisaged that the Delivery Agent will be a company owned (in part, at least) by the CPCA and the GCP. The chair of the company is envisaged to be appointed by the Mayor of Cambridgeshire and Peterborough. The chair will be responsible for advising the Mayor on matters relating to the CAM project, and for advice on, and development and delivery of the scheme.
- 6.37 The Delivery Agent is expected to be managed by its own Board, which will meet monthly. The Board is envisaged to be formed of a non-executive chair and other non-executive directors, also appointed by the Mayor of Cambridgeshire and Peterborough, and the Board of the Greater Cambridge Partnership. The Delivery Agent's Chief Executive, Chief Financial Officer and Chief Operations Officer will be board members. The Board would have corporate responsibility for ensuring that the Delivery Agent fulfils the remit, aims and objectives set by the CPCA and GCP, and for ensuring the organisation is fit for purpose. The Board's Non-Executive directors should have extensive senior-level experience of different aspects of delivering large infrastructure projects to provide valuable strategic guidance to the Delivery Agent on effective project delivery.

6.38 The CPCA and GCP will uphold the principles of Corporate Governance in Central Government Departments: Code of Good Practice 2016 as follows:

- The composition of the Board is expected to be balanced between the Executive and Non-Executive members, who have a range of appropriate skills and experience. The Mayor and GCP Board are envisaged to be responsible for the appointment of board members, and as the Delivery Agent grows in size and complexity, will seek to widen the skills and experience appropriate to the phase of development.
- The remit of the Board and the roles and responsibilities of its members will be clearly defined in Standing Orders approved by the Delivery Agent, including the role and responsibilities of the Accounting Officer.
- Procedures will be put in place to ensure the effectiveness of the Board, including the appointment and induction process, the organisation of board meetings supported by suitable information and reports, a dedicated and skilled secretariat function and a formal annual evaluation process to assess and improve performance.
- The Board would be expected to be supported by the Audit and Risk, Commercial and Investment, Health, Safety and Environment and Remuneration Committees, each chaired by a suitably experienced non-executive director.

6.39 The Delivery Agent would also be expected to have an Executive Committee, chaired by a Chief Executive. This would manage the company's day-to-day business, meeting monthly to review and take decisions, where appropriate, on both the CAM project and internal company management issues. The Executive Committee will have the authority to establish sub-committees to focus on specialist matters.

Resources

6.40 The CPCA has undertaken an assessment of future resource needs to bring the CAM project from concept to delivery. A summary of the resources likely to be required at each stage of the project cycle is provided in Figure 6.3 below.

Figure 6.3: Indicative resource requirements during the CAM project lifecycle (Source: Arup)

| | Concept | Definition | | | Delivery | Operation & benefits |
|---------------------|--|--|--|---|----------------------------------|---|
| CAM stage | 0/1: Options definition and development (est. 2018/19) | 1/2/3: Options development, consultation and preferred option (est. 2019/20) | 4: Preferred option consultation (est. 2020) | 5: Powers (and procurement) (est. 2020/21 - 2024) | 6: Construction (est. 2024-2030) | 7: Operation with Potential Modification (2030 onwards) |
| Functions | Planning and options | Single option | Consents | Procurement | Build | Operations |
| | Business Case Development | OBC | Funding agreed | Final business case | Oversight | Commissioning? |
| | Funding approach | Timeframes | Legals | Legal agreements | Health and safety | Maintenance? |
| | | | Powers | Contract award | Prepare for operation | |
| | | | Consultation | | | |
| Indicative FTEs | 2 FTE | 5 FTE | 10 FTE | 10 FTE | 15 FTE | 15 FTE |
| Consultancy support | Medium | High | High | High | Medium | Low |
| Total Budget | £500k | £2m | £5m | £15-20m | £20m | Ongoing & subject to approach |

6.41 In addition to resourcing its own staff, the CPCA and/or GCP would be expected to procure Professional Services Contractors (PSCs) to:

- Co-ordinate the deliverables from the Delivery Agent and other partners in preparation for the planning and consents process;
- Put in place robust project management processes to manage the scope, costs, schedule and benefits of the project;
- Ensure the project meets relevant health, safety, environment and quality requirements;
- Review and assure the Delivery Agent deliverables;
- Support stakeholder engagement and interface with key stakeholders;
- Support the management of annual business planning and reporting; and
- Support the transition of activities to the Delivery Agent and ultimate operator of the CAM network (timing and arrangements will be determined by the commercial model for the scheme).

6.42 The CPCA and GCP would also expect that the PSCs would support the Project Team in delivering value management activities, including:

- Optimising the route alignment and the associated mitigations;
- Challenging design standards and specifications; and
- Identifying opportunities to improve construction efficiency.

6.43 Once mobilised, it is expected that the Delivery Agent will procure its own PSCs to design, build and potentially operate the scheme. The timing and arrangements for this will be determined by the commercial model for the scheme.

Change management and cost control

6.44 A formal Change process would be described under the Development Agreement. It is envisaged that any significant change to the Sponsors Requirements will be reviewed and agreed by the Project Board when the full implications of the change (including impact on time, costs, quality and benefits) is understood. The Development Agreement would also set out tolerances for variations in the Sponsor's Requirements, and describe when and how variances should be reported to the Project Board by the Delivery Agent.

6.45 The CPCA and GCP would be expected to put in place an oversight regime for the CAM project to manage its costs. This would be codified and delivered by:

- The Development Agreement, which will set out the cost control procedures and respective roles and responsibilities;
- Management reporting and controls, which will ensure the SRO has visibility of project costs and exposure against risk limits (along with agreed trigger points where intervention or escalation is needed); and
- Project Board oversight of the plan against the cost programme, the budget envelope and levels of risk exposure, which could be formalised through the creation of a Cost and Risk Group or Sub-Committee.

6.46 The Delivery Agent would also be expected to establish a cost management process, which would set the format and standards by which the project costs will be measured, reported and controlled. This process will:

- Identify who will be responsible for managing costs;
- Identify who will have the authority to approve changes to the project or its budget;
- Describe how cost performance will be quantitatively measured and reported; and
- How cost and related controls will be assured.

- 6.47 The Delivery Partner would be expected to prepare cost plans for each major component (work package) of the CAM project (which will be defined later). These cost plans will be accompanied by a Basis of Estimate report, which will demonstrate that the cost management is robust, integrated, consistent, clear and appropriate.
- 6.48 The end-to-end cost management process would cover the full process from the setting of initial requirements at the project level through to the monthly performance management and payment cycle at contract level. This would ensure that every opportunity to optimise costs is taken at the appropriate time throughout the project lifecycle.
- 6.49 The cost management processes would be expected to use a consistent approach to the use of coding to provide visibility and accountability of work packages. This would be achieved through use of Cost Breakdown and Work Breakdown structures.

Communications and stakeholder engagement

- 6.50 The transformational nature of the CAM project is expected to require careful management of regional and local stakeholders to ensure that all perspectives are listened to, understood, and where appropriate and feasible, actioned. The overall engagement strategy is expected to be based on a clear explanation of, and rationale for, the CAM project, and its role as the critical enabler of the wider CAM network.
- 6.51 The CPCA and GCP are expected to collectively play the leading role in engaging with Partner Organisations, national government and other public bodies. Both bodies would lead on engaging with communities and stakeholders affected by the scheme in the early stages of its development, informing the development of the scheme, both through formal consultation activity and ongoing engagement. This is envisaged to include outreach programmes to educational institutions and the supply chain.
- 6.52 During the construction of the CAM project, it is envisaged that the Delivery Agent will lead on engaging with communities and stakeholders who are directly affected by the scheme, using a wide range of different media to ensure effective communication and to reach a diverse audience. This would build on best practice and lessons learnt from similar schemes
- 6.53 Key stakeholders – excluding the Partner Organisations outlined above – include, but are not limited to:
- Local communities affected by the CAM project;
 - Local councillors;
 - MPs and Peers;
 - Businesses;
 - Supply chain industry;
 - Academia, including the University of Cambridge and colleges;
 - Transport stakeholders and operators, such as Network Rail and bus and train operators;
 - Campaign groups;
 - Environmental groups;
 - Statutory consultees, such as English Heritage; and
 - Other Non-Government Organisations.
- 6.54 The CPCA and GCP's engagement strategy would be informed and facilitated by a communications delivery plan, in addition to statutory consultation, which is expected to involve:

- Planned regular opinion research to inform ongoing policy and delivery of the CAM project, enabling awareness and support to be measured over time;
- Statutory and non-statutory consultation, including with respect to different route options, a preferred scheme, and with local stakeholders and landowners;
- A proactive media strategy that gives prominent attention to significant milestones in the delivery programme and which is designed to ensure a constant flow of news and information to demonstrate momentum and respond to criticisms and ideas;
- Developing a social media strategy that makes full use of digital communication tools; and
- Developing a strong brand for the CAM project (and overall CAM network).

Benefits management

- 6.55 CAM will provide a high-quality, fast and reliable transport network that will transform transport connectivity across the Greater Cambridge region. The vision for the wider CAM network is an expansive transit network that connects Central Cambridge, Cambridge Rail stations (Central, North and South), major city fringe employment sites, satellite centres that are a focus for future housing growth, and market towns in Greater Cambridge.
- 6.56 The objectives of CAM, as described in the Strategic Case, are to:
- To Promote Economic Growth & Opportunity:
 - Support Acceleration of Housing Delivery
 - Promote Equity
 - Promote sustainable growth and development
- 6.57 The overall CAM network has been developed to:
- Overcome the key constraints imposed by the historic city core, enabling better access to and across the city centre, and to Cambridge rail stations (Central, North and, in the future, South)
 - Improve accessibility to and connectivity between 'city fringe' employment hubs (such as the Science Park), many of which lack good regional and orbital public transport connectivity;
 - Support new housing development outside the City, together with a wider labour market catchment extending across to the satellite developments and towards market towns on the radial corridors from Cambridge; and
 - Provide sufficient capacity to cater for increased travel demand, and support a modal shift away from private car.
- 6.58 Benefits management is intended to ensure that the CAM Project Board remains focussed on delivering the benefits identified in the business cases. The proposed approach is designed to support the realisation of the benefits of both the CAM project (the 'core', predominately tunnelled, infrastructure) and the wider CAM network (including the 'inner' and 'outer corridors').
- 6.59 To ensure that the intended benefits of the CAM project are fully delivered, lessons learnt from similar projects (such as the Northern Line extension, Edinburgh Trams and Cambridgeshire Guided Busway) will be used to inform the project. They are also being used to inform the way in which the project should be structured.
- 6.60 The CPCA and GCP would be expected to develop a strategy for benefits management, which, in keeping with best practice, would be based on the five following principles:

- Accountability follows funding - those funding the benefits will be accountable for their realisation;
- Benefits-led decisions - decision making will be expected to optimise overall benefits from the CAM project;
- Continuous improvement - CAM project teams will continuously strive to find additional benefits;
- Benefits-led performance - the realisation of benefits will be at the heart of performance management; and
- Monitored regularly - best in class integrated benefits reporting will help accountable and responsible parties realise benefits.

6.61 The CPCA and GCP would also be expected to develop individual profiles for each benefit outlined above, and in the Sponsor's Requirements. These profiles would include details regarding how each benefit will be measured, and which targets would be used to determine if the benefit has been realised. These profiles would identify who has responsibility for delivering, measuring and evaluating these benefits.

6.62 There is a considerable overlap between benefits and evaluation. It will therefore be important to ensure work on benefits and evaluation is aligned. Further details about the approach to benefits management will be provided in the OBC.

Risk management

6.63 Project risk will be managed in line with the risk management strategies developed by the organisations involved in the development and delivery of the CAM. The diagram below illustrates the escalation process for risk within the governance arrangements described above.

6.64 Risks will be clearly articulated with timescales attached to them and an accountable officer assigned to manage them. In practice, risks would be expected to be managed by the CPCA, the GCP and Delivery Agent. Parties will maintain a risk register, which will be reviewed on an on-going basis by the Project Board and maintained by the PMO.

6.65 As part of the project cost estimating process, the Delivery Agent would be expected to adopt a process of using optimism bias in line with the Treasury's Green Book guidance, including estimating tolerances and contingencies.

6.66 It is assumed that the Delivery Agent will establish a process for deriving contingency, which will evolve over time and would ultimately use Quantified Risk Analysis (QRA) to derive the contingencies that will replace optimism bias.

6.67 It is assumed that the Delivery Agent will be able to develop a more comprehensive design between the OBC and the FBC milestones in the project. This is also the stage where QRA can be used to inform the final budget for delivery of the project.

6.68 The Development Agreement would also be expected to establish a risk allocation framework between the CPCA and Delivery Agent. This would require the Delivery Agent to deliver the Sponsor's Requirements in accordance with the Development Agent.

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**CAMBRIDGESHIRE
& PETERBOROUGH**
COMBINED AUTHORITY

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| CAMBRIDGESHIRE AND PETERBOROUGH COMBINED AUTHORITY BOARD | <u>AGENDA ITEM No: 2.4</u> |
| 31 OCTOBER 2018 | PUBLIC REPORT |

CAMBRIDGE AUTONOMOUS METRO UPDATE

1.0 PURPOSE

- 1.1. The Cambridgeshire and Peterborough Combined Authority Order 2017 transferred the local transport planning powers to the Combined Authority and created the Cambridgeshire and Peterborough Combined Authority as the local transport authority for the area.
- 1.2. The Combined Authority at its meeting in January 2018 approved £600,000 to develop a Strategic Outline Business Case and an Options Appraisal Report for the Cambridgeshire Autonomous Metro (CAM). It agreed to liaise with the Greater Cambridge Partnership (GCP) to ensure GCP's current and future plans for high quality public transport corridors were consistent and readily adaptable to the emerging proposition for a CAM Metro network.
- 1.3. The Combined Authority at its meeting in July 2018 agreed to a number of points related to the CAM as follows:
 - (a) measures and protocols are developed to ensure all CAM projects are integrated and coordinated, including the set-up of a CAM officer programme board.
 - (b) that the GCP schemes, A10, A1307 and M11 Junction 11, support the early delivery of the CAM project and should be progressed
 - (c) that the continuing review of the A428 project be agreed and will conclude by the end of September
 - (d) that officers assess the potential delivery models to ensure opportunities to accelerate delivery can be taken and they report back to the Board in September.
- 1.4. This report provides an update on CAM project and specifically on the decisions taken at the July Board.

| <u>DECISION REQUIRED</u> | |
|--|--|
| Lead Member: | James Palmer, Mayor |
| Lead Officer: | Chris Twigg, Transport Director |
| Forward Plan Ref: Not applicable | Key Decision: No |
| <p>The Combined Authority Board is recommended to:</p> <ol style="list-style-type: none"> 1. Note the progress of the CAM project towards the production of the Strategic Outline Business Case by December 2018. 2. Agree the outcomes of the review of the A428 Cambourne to Cambridge project, following the pause agreed at the July Combined Authority Board meeting. 3. Note the progress of the work to assess the potential delivery models to ensure the priority transport projects (including the CAM) can be delivered at pace. | <p>Voting arrangements</p> <p>All members are required to be present for this item.</p> <p>Two thirds of the constituent council members must vote in favour to include Cambridgeshire County Council and Peterborough City Council</p> |

2.0 BACKGROUND

Transport Responsibilities

- 2.1 The Cambridgeshire and Peterborough Combined Authority was formed on 28th March 2017, and from this date certain transport functions transferred to it by operation of law. These functions primarily relate to transport planning, bus services and transport operations as contained within Parts 3 and 4 of the Transport Act 1985, and Part 2 of the Transport Act 2000. They can be summarised as:
- (a) Duty to produce a Local Transport Plan;
 - (b) Production of a Bus Strategy;
 - (c) Rights to franchise local bus services within its area, subject to the completion of the process set out in the Bus Services Act 2017;
 - (d) Powers to enter into quality bus partnerships and enhanced partnerships;
 - (e) Responsibility for the provision of bus information and the production of a bus information strategy;
 - (f) Role of Travel Concession Authority;
 - (g) Financial powers to enable the funding of community transport;
 - (h) Powers to support bus services

CAM Strategic Outline Business Case

- 2.2 Consultant Steer Davies Gleave were appointed by the Combined Authority in May 2018 to produce a Strategic Outline Business Case. This is in accordance with the Combined Authority monitoring and evaluation framework.
- 2.3 Consultant Arup were appointed in August 2018 to provide the Combined Authority with the appropriate capability and capacity to client Steer Davies Gleave. Arup was also asked to ensure that work on the CAM is integrated with the work of the GCP.
- 2.4 Work undertaken to date by Steer and Arup has confirmed that the mode of transport for the CAM will be a rubber tyred, electrically powered vehicle that can provide the required capacity and level of service, while also being the most economical and efficient solution for the network.
- 2.5 The production of the Strategic Outline Business Case remains on track for delivery in December 2018. Key elements that this document will cover include:
 - (a) The strategic and economic case for the CAM that will build upon the findings of the Cambridgeshire and Peterborough Independent Economic Review (CPIER).
 - (b) The integration of the GCP corridors into the CAM network
 - (c) The extent and reach of the CAM network with proposed transport nodes
 - (d) The frequency that the network could achieve at full operational capacity
 - (e) The projected capital and operational cost and the sources of funding that could be leveraged from the public and private sectors to deliver it
 - (f) The scale and capability of the client side organisation required to deliver the CAM during design, construction and operation phases

A428 Cambourne to Cambridge project review

- 2.6 The review of the A428 Cambridge to Cambourne was launched by the Combined Authority in May in order to ensure that it aligned with the ambitions set-out in the Mayoral Interim Transport Strategy Statement published in May 2018.
- 2.7 At the time of the Combined Authority Board in July the review had concluded that in order to ensure that the A428 Cambourne to Cambridge project fully supports the delivery of the Cambridge Autonomous Metro (CAM), the scope of the technical work to define the route of the CAM should be agreed jointly by the Combined Authority and GCP by September 18. This alignment would ensure that the project can proceed at pace while also fully supporting the delivery of the CAM and the critical connections between Bourne, Cambourne and St Neots.

2.8 Officers of the Combined Authority and GCP, assisted by consultants Steer and Arup, have worked closely through the CAM officer programme board to review the proposed route and Arup produced a report capturing the findings of the review. A copy of the report is included as Appendix 1; in summary the review identified the following key findings/ points:

- (a) That the process undertaken to date to determine the route is robust and identified the optimal solution for the corridor
- (b) That the route is reclassified as a CAM route not a guided busway.
- (c) That the vehicle operating along the route will comply with the principles of the CAM being a rubber tyred, electrically powered vehicle.
- (d) That the route must be continue to be designed to align and integrate with the overarching CAM network
- (e) That the route be connected into the tunnelled CAM network thereby providing a high frequency, pollution free public transport option into and across Cambridge centre and the entire CAM network

Delivery models

2.9 Following the decision at the July Combined Authority Board to ask officers to assess the potential delivery models to ensure the opportunities to accelerate delivery were taken, the consultant Arup were commissioned to:

- (a) Produce a strategic programme that brings together current priority transport projects across the Combined Authority area for the various local partners. This programme excludes maintenance of existing assets; the focus is therefore around priority projects and strategic oversight roles.
- (b) Review existing legislation and government policy to understand the current mandates, powers and capacities of the different existing local partners in the Combined Authority area.
- (c) Understand (using case studies) governance and delivery approaches adopted elsewhere in the UK and their applicability to Combined Authority context.
- (d) Analyse and evaluate different transport governance and delivery models for the Cambridgeshire and Peterborough Combined Authority area. This ranges from no changes needed through to a new overarching transport body covering the Combined Authority area.

2.10 This work also included an assessment of the capacity and capability of the client-side team that would be required to deliver the priority transport projects and the cost of that team. This information will allow the Combined Authority and partners to positively plan how to build the team as the projects progress.

2.11 The key findings of the work so far are:

- (a) That the size of client-side team required to deliver the priority transport projects (excluding the CAM) is far greater than currently exists within the Combined Authority, GCP, CCC and PCC
- (b) That the CAM will require a range of skills and capabilities beyond that that exists within the CA, GCP, Cambridgeshire County Council (CCC) and Peterborough City Council (PCC).
- (c) That assembly of a larger core team should begin immediately in order to maintain momentum beyond the end of the production of the strategic outline business cases in 2018.
- (d) That delivery of the programme is likely to require a substantial and flexible pot from which you can draw down specialist and technical work (perhaps from consultancy services) to supplement the core team as the volume and complexity of the work changes throughout the programme.
- (e) That an alternative delivery model to the existing organisations may be appropriate for the scale of the programme being considered.

2.12 The full report and accompanying recommendations will be brought before the Combined Authority Board in November.

3 FINANCIAL IMPLICATIONS

3.1 There are no financial implications to this report

4 LEGAL IMPLICATIONS

4.1 There are no legal implications to this report.

5 SIGNIFICANT IMPLICATIONS

5.1 There are no other statutory matters to bring to the Board's attention.

6 APPENDICES

6.1 Report by Arup on review of A428 route.

| <u>Source Documents</u> | <u>Location</u> |
|---|---|
| Report and decisions of the Board dated 31 January 2018 | http://cambridgeshirepeterborough-ca.gov.uk/meetings/show/2018-01-31 |
| Report and decisions of the Board dated 25 July 2018 | http://cambridgeshirepeterborough-ca.gov.uk/meetings/show/2018-07-25 |



| | |
|---|----------------------------|
| CAMBRIDGESHIRE AND PETERBOROUGH COMBINED AUTHORITY BOARD | AGENDA ITEM No: 4.3 |
| 29 JANUARY 2020 | PUBLIC REPORT |

CAMBRIDGE AUTONOMOUS METRO (CAM) PROGRAMME: REGIONAL ARMS STRATEGIC OUTLINE BUSINESS CASE TENDER DOCUMENT PREPARATION

1.0 PURPOSE

- 1.1. To seek approval and funding to commence with the development of the strategic outline business case (SOBC) brief and tender documents for the regional arms of the network, earlier than planned, with the intention of commencing the production the SOBC for the Alconbury regional extension in Summer 2020. To progress this, the CPCA CAM programme team are requesting approval for £100,000 drawn from uncommitted contingency within the CAM OBC project budget to fund the early development of the CAM Regional Arms SOBC tender documents.
- 1.2. This proposal was discussed at the Transport and Infrastructure Committee meeting on 9 January 2020 where it was unanimously endorsed by those present.
- 1.3. The report to the Transport and Infrastructure Committee is attached at Appendix 1.

| <u>DECISION REQUIRED</u> | |
|--|--|
| Lead Member: | Mayor James Palmer |
| Lead Officer: | Paul Raynes, Director of Delivery and Strategy |
| Forward Plan Ref: n/a | Key Decision: No |
| The Combined Authority Board is recommended to: (a) approve early development of the CAM regional arms SOBC tender documents as part of the wider CAM programme and for | Voting arrangements Simple majority of all Members |

| | |
|--|--|
| £100,000 to be utilised from uncommitted contingency within the current 19/20 CAM OBC budget to fund the early development of these documents. | |
|--|--|

2.0 APPENDICES

2.1 **Appendix 1:** Report to the Transport and Infrastructure Committee 9 January 2020.

| <u>Background Papers</u> | <u>Location</u> |
|--------------------------|-----------------|
| None | |



| | |
|---|----------------------------|
| TRANSPORT & INFRASTRUCTURE COMMITTEE | AGENDA ITEM No: 2.2 |
| 4 NOVEMBER 2020 | PUBLIC REPORT |

LOCAL TRANSPORT PLAN CAM SUB-STRATEGY

1.0 PURPOSE

- 1.1. To review and agree the amendments to the Local Transport Plan (LTP) draft sub-strategy setting out the vision for the Cambridgeshire Autonomous Metro (CAM) following consultation, to allow for its adoption by the Combined Authority Board.

| <u>DECISION REQUIRED</u> | |
|--|--|
| Lead Member: | James Palmer, Mayor of Cambridgeshire and Peterborough |
| Lead Officer: | Paul Raynes, Director of Delivery and Strategy |
| Forward Plan Ref: N/A | Key Decision: No |
| <p>The Transport and Infrastructure Committee is recommended to:</p> <ul style="list-style-type: none">(a) Note the consultation responses to the Cambridgeshire Autonomous Metro (CAM): Local Transport Plan (LTP) sub-strategy;(b) Agree the amendments made to the CAM: LTP sub-strategy in light of the consultation responses;(c) Note that the CAM LTP sub-strategy sets out the vision for CAM, against which, schemes contributing to the CAM will be considered; and(d) Recommend the approval of the CAM: LTP sub-strategy by the Combined Authority Board. | <p>Voting arrangements</p> <ul style="list-style-type: none">(a) N/A(b) Simple Majority(c) N/A(d) A vote in favour by at least two thirds of all Members (or their Substitutes) appointed by the Constituent Councils to include the Members appointed by Cambridgeshire |

| | |
|--|---|
| | County Council and Peterborough City Council. |
|--|---|

2.0 BACKGROUND

- 2.1. The Combined Authority's first Local Transport Plan (LTP) for Cambridgeshire and Peterborough was approved by the Board in January 2020. The LTP said that it would be supported by specific sub-strategies and policies that would continue to be developed and reviewed over the course of the LTP.
- 2.2. At the March meeting of the Transport and Infrastructure Committee it was agreed that a LTP sub-strategy should be developed setting out in more detail the LTP policy foundation for the CAM as a whole network.
- 2.3. The CAM sub-strategy, which is consistent with the LTP, will ensure that individual components of the CAM network, are fully compliant with a coherent and consistent overall vision for the transport network for Cambridgeshire and Peterborough.
- 2.4. CAM is an essential component of the overarching LTP vision and the Authority's overarching transport strategy as it will provide high quality, high frequency metro services, delivering a step change in connectivity and helps to deliver agglomeration benefits.
- 2.5. Individual schemes which are intended to form part of the CAM, other public transport proposals within the CA area, and CA positions on partners' schemes such as East-West Rail, will be evaluated against the strategy.

Consultation

- 2.6. Following Board approval, the draft sub-strategy was subject to public consultation ahead of its final adoption by the Board. This is required by the Transport Act 2000. The consultation lasted for 12 weeks between 4th May and 17th July 2020 and was conducted with regard to the constraints imposed due to COVID 19. This consultation enabled the Combined Authority to better understand the views of key stakeholders on the overarching strategic vision, aims and objectives of the CAM strategy.
- 2.7. A total of 88 responses were received by the advertised feedback deadline, including 65 survey responses and 23 freeform submissions. Following the submission of comments, the officers of the Combined Authority have reviewed and considered all the comments provided. This paper details how the officers of the Combined Authority have amended the sub-strategy in light of the comments received.
- 2.8. A review of the feedback received found that:
 - 67% strongly agreed or agreed with the objectives of the sub-strategy;
 - Only 18% strongly disagreed or disagreed that the aims of the LTP and sub-strategy strongly aligned;

- Just 10% of respondents disagreed with the objectives and sub-objectives of the sub-strategy;
- 62% strongly support or support the wording of the economic sub-objectives;
- 62% strongly support or support the wording of the societal sub-objectives; and
- 68% strongly support or support the wording of the environmental sub-objectives.

2.9. Freeform responses to the request for additional information noted that respondents supported the sub-strategy, and many felt that the timelines for CAM should be accelerated if possible. There were several suggested improvements to the document, including the provision of more detail within the sub-objectives, and proposed minor re-wording and clarification of various aspects of the document.

2.10. The principle updates to the sub-strategy included:

- Additional clarification of CAM Policy E1, E2, E15 and E17;
- Removal of the programme section. The overarching CAM programme should be further developed in line with CAM Policy E17;
- Minor verbal alterations to the narrative; and
- An update to the network map.

2.11. Respondents saw affordable fares and good first and last mile links from CAM stations as essential to the success of the network, and said that infrastructure such as CAM should be delivered prior to the delivery of additional housing. Stakeholders also shared the views of survey respondents that strong integration with existing and proposed public transport links (including East-West Rail) and the provision of good first and last mile links are crucial to ensuring modal shift and enabling multi-modal journeys.

2.12. Feedback was received from the Greater Cambridge Partnership specifically in relation to the delivery of the Cambourne to Cambridge route component of the CAM. This part of the CAM network will be assessed against this sub-strategy, including at later stages when statutory consents are being sought.

2.13. In addition to the feedback provided via the survey, freeform responses received from various stakeholders were also largely positive, with the majority supporting the objectives and sub-objectives, and agreeing that the sub-strategy aligns with the LTP.

Geographical spread of respondents

2.14. Respondents were concentrated in and around the city of Cambridge, with a small number of individuals located in/close to regional settlements such as Huntingdon, Peterborough, and Ely. Notably, stakeholder respondents were distributed over a wider area, with only two located in Cambridge – this is likely to be a result of organisations' registered offices being located further afield. Three stakeholder responses did not provide an address.

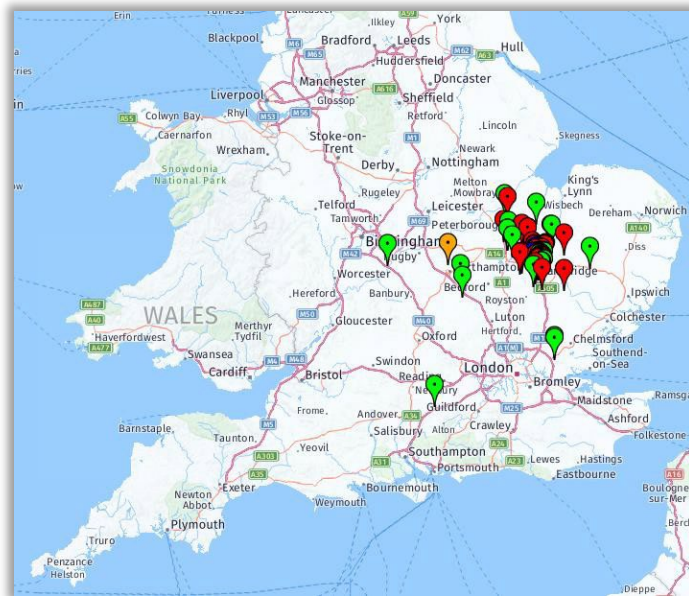


Figure 1: Respondents by given address (National view)

(green = stakeholder; red = resident; blue = resident & business; orange = visitor to the region)

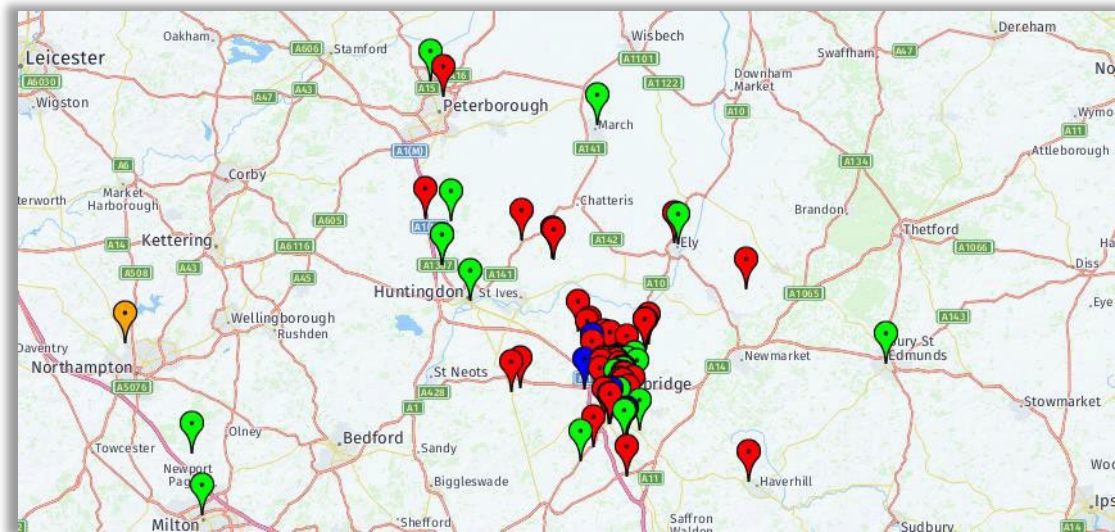


Figure 2: Respondents by given address (Regional view)

(green = stakeholder; red = resident; blue = resident & business; orange = visitor to the region)

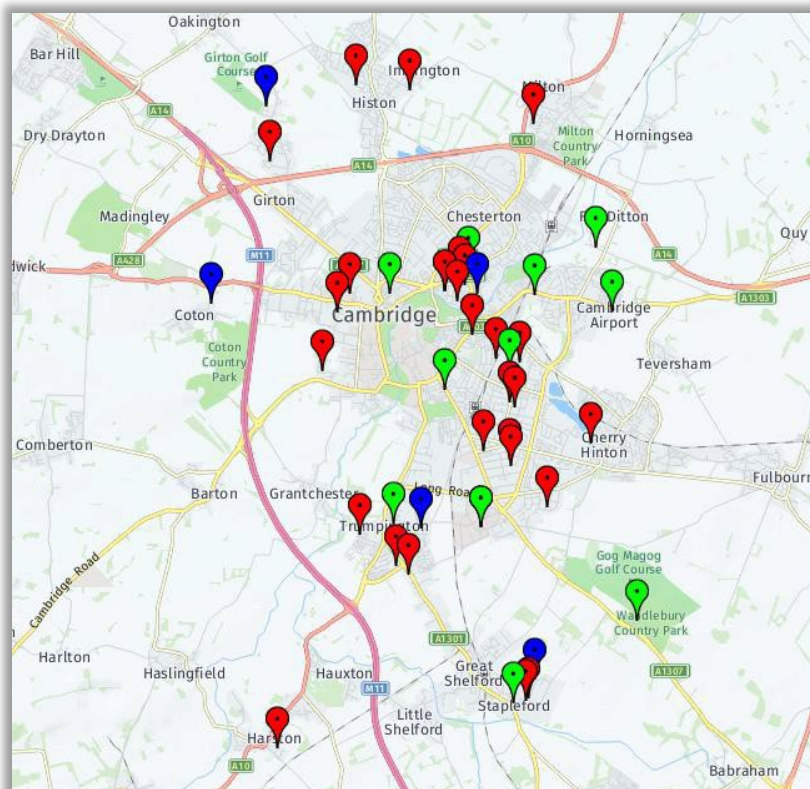


Figure 3: Respondents by given address (City Centre view)

(green = stakeholder; red = resident; blue = resident & business; orange = visitor to the region)

Nature of Respondents

2.15. Approximately half of responses were received from members of the public – 46 in total. Thirty-four of the remaining responses were received from a variety of stakeholders, including businesses, voluntary/community organisations, and public sector bodies. Seven responses were received from individuals classified as both residents and having a business interest, whilst one response was provided by a visitor to the region.

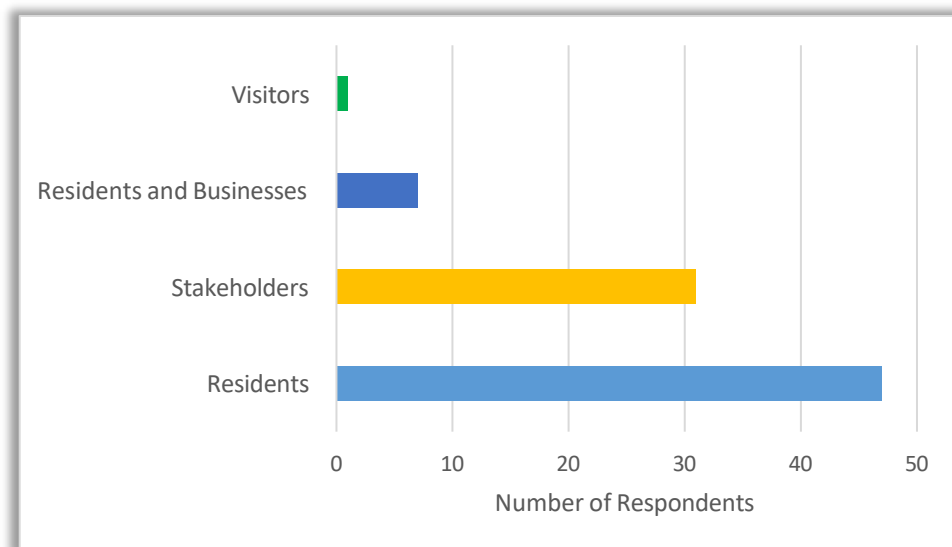


Figure 4: Respondents by nature

Amendments made to the CAM sub-strategy

2.16. Following the feedback received from the consultation, a number of minor changes have been made to the sub-strategy. These are not significant or material enough to require re-consultation. All the comments received and how the Combined Authority has responded to them can be found in Appendix 3. In the main the changes are around providing greater detail within the sub-objectives and updating the document to ensure that all active modes align with local and central government policy. The list below summarises the key amendments:

- Changed reference to cycling and walking to read active travel to align with government policy and ensure the project consider impacts on horse riders;
- The overarching positioning of the objectives and sub-objectives has remained as there was support following consultation; however, the objectives themselves have been amended to ensure they are SMART;
- The map of the network has been updated to correct an error; and
- Greater emphasis within the document illustrating the alignment with the Local Transport Plan and emerging Local Plans.

Adoption of sub-strategy

2.17. Once agreed by the Committee, approval from the Board will be sought for the sub-strategy. Following approval, the CAM: LTP sub-strategy will have a statutory grounding and the document will be a benchmark against which schemes forming part of the CAM will be considered. More detail on this is in the Legal Implications section of this paper.

3.0 FINANCIAL IMPLICATIONS

- 3.1. None at this stage directly in relation to the development and agreement of the sub-strategy.

4.0 LEGAL IMPLICATIONS

- 4.1. The Peterborough and Cambridgeshire Combined Authority Order 2017 (SI 2017/251) confirmed the Cambridgeshire and Peterborough Combined Authority as the Local Transport Authority for its area. The Combined Authority by way of Part 3 Article 8 of the 2017 Order assumed powers and duties contained within Parts 4 (Local Passenger Transport Services) and 5 [Financial Provisions] of the Transport Act 1985, and Part 2 [Local Transport] of the Transport Act 2000 (as amended), which included the duty to produce a Local Transport Plan as set out at section 108(3) of the Transport Act 2000.
- 4.2. Since the making of the 2017 Order the Combined Authority has delegated some of its transport functions to Cambridgeshire County Council and Peterborough City Council, which previously had responsibility for transport functions in the Combined Authority's area. At its meeting on 29th January 2020 the Combined Authority Board made further delegation of some of its transport functions to those authorities for the 2020/21 municipal year. The power to exercise the transport functions currently being exercised by the County Council and Peterborough City Council derive solely from the statutory transport powers of the Combined Authority as detailed above. The Greater Cambridge Partnership, as a joint committee of the County Council, Cambridge City Council and South Cambridgeshire District Council, derives its authority to exercise transport functions from the transport delegation granted to the County Council by the Combined Authority. The Combined Authority would have to authorise any sub-delegation from the County Council to the Greater Cambridge Partnership for the 2020/21 municipal year.
- 4.3. The Local Transport Plan adopted by the Combined Authority Board at its meeting on 29th January 2020 met the statutory requirement to set out its policies for the promotion and encouragement of safe, integrated, efficient and economic transport and its proposals for the implementation of those policies.
- 4.4. Section 109 (1) of The Transport Act 2000 requires the Combined Authority to keep its Local Transport Plan under review and to alter it if it considers it appropriate to do so. As the policies in the Plan are developed it will become necessary to review the Plan and to consider whether the Plan should be expanded to provide more detailed proposals for the implementation of the policies. Any proposed alteration to the Plan would be subject to statutory consultation.
- 4.5. Section 108 (1) of The Transport Act 2000 also requires the Combined Authority's functions to be carried out so as to implement the policies set out in its Local Transport Plan.

- 4.6. Further to paragraph [2.15], there will be a number of key impacts following adoption of the LTP sub-strategy from a planning and consenting perspective. First, relevant local planning authorities will need to have regard to this sub-strategy, and the LTP itself, when preparing development plan documents. This applies, for instance, to the preparation of the emerging Greater Cambridge Local Plan.
- 4.7. In addition, from a consenting perspective CAM is expected to be authorised by one or more orders (statutory instruments) made by the Secretary of State for Transport under the Transport and Works Act 1992 or the Planning Act 2008. Irrespective of which consenting route is pursued for this sub-strategy, and the LTP itself, will have an important role to play when authorisation is sought for CAM. Any application for the authorisation of CAM will be scrutinised to determine the extent to which the application is compatible with the LTP and with this sub-strategy.
- 4.8. The recommendations accord with CPCA's powers under Parts 3 of the Cambridgeshire and Peterborough Combined Authority Order 2017 (SI 2017/251).
- 4.9. The meeting shall be conducted in accordance with Parts 2 and 3 of the Local Authorities and Police and Crime Panels (Coronavirus) (Flexibility of Local Authority and Police and Crime Panel Meetings) (England and Wales) Regulations 2020.

5.0 APPENDICES

Appendix 1 – Revised LTP sub-strategy

Appendix 2 – CAM Sub-strategy Consultation Feedback Report

Appendix 3 – Summary of Authority's position regarding each comment received

| <u>Background Papers</u> | <u>Location</u> |
|---|---|
| Transport and Infrastructure Committee reports 6 March 2020 | <u>Transport and Infrastructure Committee papers 6 March 2020</u> |

Cambridgeshire and Peterborough Local Transport Plan: Cambridgeshire Autonomous Metro (CAM) sub-strategy

Local Transport Plan

Background

The Local Transport Plan (LTP) was published in March 2020 and was the first for Cambridgeshire and Peterborough. The Plan describes how transport interventions will help to address current and future challenges and opportunities for Cambridgeshire and Peterborough. It sets out the overarching policies and strategies needed to secure growth and ensure that planned large-scale development can take place in the county in a sustainable way.

The LTP provides a robust platform for the planning and delivery of the Authority's ambitious programme of priority transport schemes. The Authority continues to work closely with its partners in spatial planning and the delivery of transport priorities to identify the most appropriate time to refresh the LTP and/or its supporting daughter documents.

This document outlines the CAM draft sub-strategy, which is a daughter document of the LTP. It provides the policy framework for the CAM and contributes to the wider policy platform for the delivery of growth in the CPCA region. Schemes which form part of the CAM will be expected to be compliant with the policies in this document.

Vision, Goals and Objectives

The overarching vision for the Local Transport Plan is:

To deliver a world-class transport network for Cambridgeshire and Peterborough that supports sustainable growth and opportunity for all











This vision guides the Authority's overall direction of this sub-strategy and the underpinning sub-strategies. From the vision the Authority developed a number of key goals. These three goals are intended to outline what wider outcomes we want the transport network in Cambridgeshire and Peterborough to achieve.

- **Economy:** Deliver economic growth and opportunity for all our communities.
- **Society:** Provide an accessible transport system to ensure everyone can thrive and be healthy.
- **Environment:** Protect and enhance our environment and implement measures to achieve net zero carbon.

The LTP's overarching vision to deliver a world-class transport network for Cambridgeshire and Peterborough that supports sustainable growth and opportunity for all can only be realised if a public transport system that offers a genuine alternative to the car is implemented.

The LTP's ten objectives are strongly aligned to the goals outlined above. These form the basis against which transport schemes (such as CAM) should be and are assessed.

Local Transport Plan objectives

| Goal | Objective | |
|--------------------|---|---|
| Economy |  | Support new housing and development to accommodate a growing population and workforce, and address housing affordability issues |
| |  | Connect all new and existing communities sustainably so residents can easily access a good job within 30 minutes, spreading the region's prosperity |
| |  | Ensure all of our region's businesses and tourist attractions are connected sustainably to our main transport hubs, ports and airports |
| |  | Build a transport network that is resilient and adaptive to human and environmental disruption, improving journey time reliability |
| Society |  | Embed a safe systems approach into all planning and transport operations to achieve Vision Zero – zero fatalities or serious injuries |
| |  | Promote social inclusion through the provision of a sustainable transport network that is affordable and accessible for all |
| |  | Provide 'healthy streets' and high-quality public realm that puts people first and promotes active lifestyles |
| |  | Ensure transport initiatives improve air quality across the region to meet good practice standards |
| Environment |  | Deliver a transport network that protects and enhances our natural, historic and built environments |
| |  | Reduce emissions to 'net zero' by 2050 to minimise the impact of transport and travel on climate change |

Supporting sub-strategies

The LTP sets out a plan to tackle Cambridgeshire and Peterborough's transport challenges. The Authority's overarching vision is to create a transport system in which active travel modes and public transport (including CAM) are natural choices for the majority of journeys because they are affordable, healthy, convenient and safe alternatives to the private car.

The Authority continues to develop and iterate the supporting strategies for each specific area of transport planning that complement the LTP and will ensure its delivery. In addition, locational transport plans and strategies will evolve that focus

on the transport improvements within a specific area and therefore will be updated in a timely manner.

One of the strategies underpinning the LTP is this sub-strategy for CAM.

The Cambridgeshire Autonomous Metro – Policy Alignment

The need for CAM

To date, economic growth in the region has not been matched by basic infrastructure, particularly transport. To nurture and sustain this growth, new infrastructure is needed to support the delivery of new jobs and new homes and enable existing communities to benefit from greater access to transport options, jobs and opportunities.

CAM will connect key regional centres of employment, existing settlements, key railway stations, new homes and planned growth, to create a platform for sustainable and inclusive growth. CAM will transform people's day-to-day lives, by connecting communities and creating new jobs and widening access to opportunities across the region.

Introduction to CAM

One of the LTP's key objectives is to connect all new and existing communities sustainably so residents can easily access a good job within 30 minutes, spreading the region's prosperity. In order to achieve this objective, the LTP outlines how large-scale investment in public transport must provide extra capacity for people to travel sustainably across the region.

The vision is intended to capture the aspirations for Cambridgeshire and Peterborough's transport network, reflecting future ambition to provide:

'A world-class transport network' – Cambridgeshire and Peterborough aspire toward a transport system of the highest quality on a global stage, which meets the needs of residents, businesses, and visitors.

The Cambridgeshire Autonomous Metro (CAM) forms part of these enhanced infrastructure plans. The vision of the CAM is to 'act locally, impact nationally, and attract globally'. The CAM will act locally by delivering a fast, reliable, convenient, integrated transport network made world-class by deploying the latest technologies. It will support the sustainable growth of the local economy, unlocking new homes, creating new jobs and opportunities for more people, while protecting and enhancing the environment.

The benefits of CAM extend far beyond the region – it will have national and global impact. Through connecting employment sites and increasing the region's attractiveness to highly skilled experts, tech companies and international investor capital, the CAM will make the region's tech cluster larger and more concentrated.

Additionally, the first-mover benefits from the development of the CAM, including the accumulation of skills and intellectual property, could birth a new growth industry, complementing existing sectors, and offering commercial opportunities if applied to

small and medium-sized cities across the globe. These factors will enable future growth of knowledge-intensive sectors, stimulate entrepreneurship activity, and help Cambridgeshire and Peterborough compete with tech hubs globally, supporting greater economic growth across the UK as a whole.

Alignment to Local Transport Plan (LTP)

Better connecting people, markets and businesses, and future transport provision will help to improve regional productivity and this is set out in the LTP. This will help the Authority to deliver its economic vision and improve quality of life for all. Public transport such as CAM will play a key part in achieving those outcomes.

CAM is an essential component of the overarching LTP vision and transport strategy as it will deliver a step change in connectivity, helping to deliver agglomeration benefits, and encouraging modal shift to low-carbon modes.

Alignment with Cambridgeshire and Peterborough Independent Economic Review

The Cambridgeshire and Peterborough Independent Economic Review (CPIER) published its final report in September 2018. The report was developed by the Cambridgeshire and Peterborough Independent Economic Commission, chaired by Dame Kate Barker. The findings from the review form the basis of a number of key regional policies and strategies, including the Local Transport Plan and the Local Industrial Strategy to name a couple.

The report evidences the fast rate of economic and employment growth in the region and highlights the importance of planning now to ensure that strong growth will be sustainable and more inclusive. The report highlighted the potential transformation benefits of CAM stating *“in areas of more dense population, ambitious new projects such as the introduction of a form of rapid transit through the Cambridge Autonomous Metro (CAM) could transform the economy and many people’s day-to-day lives. These can provide for continued sustainable growth”*.


The CPIER report demonstrated that economic growth in the region has not been matched by investment in basic infrastructure, particularly transport. It recommended that:



“A package of transport, and other infrastructure projects to alleviate the growing pains of Greater Cambridge, should be considered the single most important infrastructure priority facing the Combined Authority in the short to medium term.”


A key conclusion to the report is that closer alignment between spatial and transport planning can allow economic growth without driving increased travel. Therefore, it is essential that CAM schemes are considered when new developments and plans for future growth.



Alignment between CAM objectives and the Local Transport Plan objectives


The table below sets out the Authority’s objectives for the CAM and how they support its overall aims and objectives.




| Goal | Objective | CAM Objective | CAM sub-objective | Desirable |
|---------|--|--|---|---|
| Economy |  <p>Support new housing and development to accommodate a growing population and workforce, and address housing affordability issues</p> | <p>CAM 1: Promote economic growth and opportunity</p> <p>CAM 2: Support the acceleration of housing delivery as set out in existing and emerging Local Plans</p> | <ul style="list-style-type: none"> • CAM-E1: CAM will facilitate greater productivity in Greater Cambridge and the wider region (including Garden Villages) through enhanced efficiencies in travel • CAM-E2: Support new employment by enhancing sustainable access to and attractiveness of key existing and planned employment zones and major areas of housing growth: <ul style="list-style-type: none"> - New settlements and enterprise zones already included in existing adopted Local Plans - Future growth as identified in Local Plans - New Garden Village settlements - Existing settlements with anticipated employment growth (including growth of offices, research and laboratories facilities) <p>Supporting the development of</p> <ul style="list-style-type: none"> - New settlements being brought forward by any future development corporations created in the Oxford-Cambridge corridor. <ul style="list-style-type: none"> • CAM-E3: Increase labour market catchment through linking jobs with | <ul style="list-style-type: none"> • 24/7 operation • Utilisation of smart infrastructure |

| Goal | Objective | CAM Objective | CAM sub-objective | Desirable |
|------|--|---------------|--|-----------|
| | | | <p>homes and better connecting more people and places to underpin a wider transport network for Cambridgeshire and Peterborough that is grounded in active travel and frequent, reliable and convenient public transport</p> <ul style="list-style-type: none"> • CAM-E4: Serve and support new areas for sustainable housing development contained within emerging and future Local Plans • CAM-E5: Provide overall transport capacity to enable and accommodate future employment and housing growth | |
| |  <p>Connect all new and existing communities sustainably so residents can easily access a good job within 30 minutes, spreading the region's prosperity</p> | | <ul style="list-style-type: none"> • CAM-E6: Improve transport connectivity to/with existing and new settlements • CAM-E7: Improve journey time reliability • CAM-E8: Direct high-quality public transport access to key housing sites (short and longer term) | |
| |  <p>Ensure all of our region's businesses and tourist attractions are connected sustainably to our main transport hubs, ports and airports</p> | | <ul style="list-style-type: none"> • CAM-E9: Directly serve and link into transport hubs (where appropriate) including existing and planned rail stations (to facilitate the necessary outward and inward commuting to/from Cambridge) | |

| Goal | Objective | CAM Objective | CAM sub-objective | Desirable |
|------|---|---------------|--|-----------|
| | | | <ul style="list-style-type: none"> • CAM-E10; At transport hubs, support easy and rapid mode changes and transfers • CAM-E11: Integrate with active travel and other transport initiatives that provide safe first and last mile connectivity to CAM • CAM-E12: CAM will be fully integrated with the public transport network, including support the development of and connection to demand response modes • CAM-E13: Integration with other modes, including active travel, rail, bus and coaches | |
| |  <p>Build a transport network that is resilient and adaptive to human and environmental disruption, improving journey time reliability</p> | | <ul style="list-style-type: none"> • 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: CAM is anticipated to be segregated as a default assumption; subject to full demand and transport planning analysis to justify the need for segregation • CAM-E16: CAM will use future ready technology, infrastructure and concepts of operations that delivery safe, reliable, regular, resilient and inclusive transport | |

| Goal | Objective | CAM Objective | CAM sub-objective | Desirable |
|----------------|---|-----------------------|---|-----------|
| | | | <ul style="list-style-type: none"> • CAM-E17: CAM will commence delivery in late 2024 and will be delivered in next decade • CAM-E18: CAM will be designed to ensure that it is future proofed and flexible in terms of capacity and technology so that any advances in technology do not unduly delay the programme • 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 |  Embed a safe systems approach into all planning and transport operations to achieve Vision Zero – zero fatalities or serious injuries | CAM 3: Promote Equity | <ul style="list-style-type: none"> • CAM-S1: The CAM network will be safe and secure – 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 | |
| |  Promote social inclusion through the provision of a sustainable transport network that is | | <ul style="list-style-type: none"> • CAM-S3: CAM will ensure an affordable and fair fare structure is in place that is comparable to any public transport service offered within the UK | |

| Goal | Objective | CAM Objective | CAM sub-objective | Desirable |
|------|---|---------------|--|-----------|
| | affordable and accessible for all | | <ul style="list-style-type: none"> • CAM-S4: CAM will be fully compatible with a county-wide future integrated ticketing regime • CAM-S5: CAM will promote 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: CAM will improve opportunities for all residents and communities • CAM-S8: CAM will promote high quality public realm at stations • CAM-S9: Reduces adverse impacts of public transport provision on city, urban and village centres | |
| |  Provide 'healthy streets' and high-quality public realm that puts people first and promotes active lifestyles | | <ul style="list-style-type: none"> • CAM-S10: CAM will support and be complementary to active travel modes | |

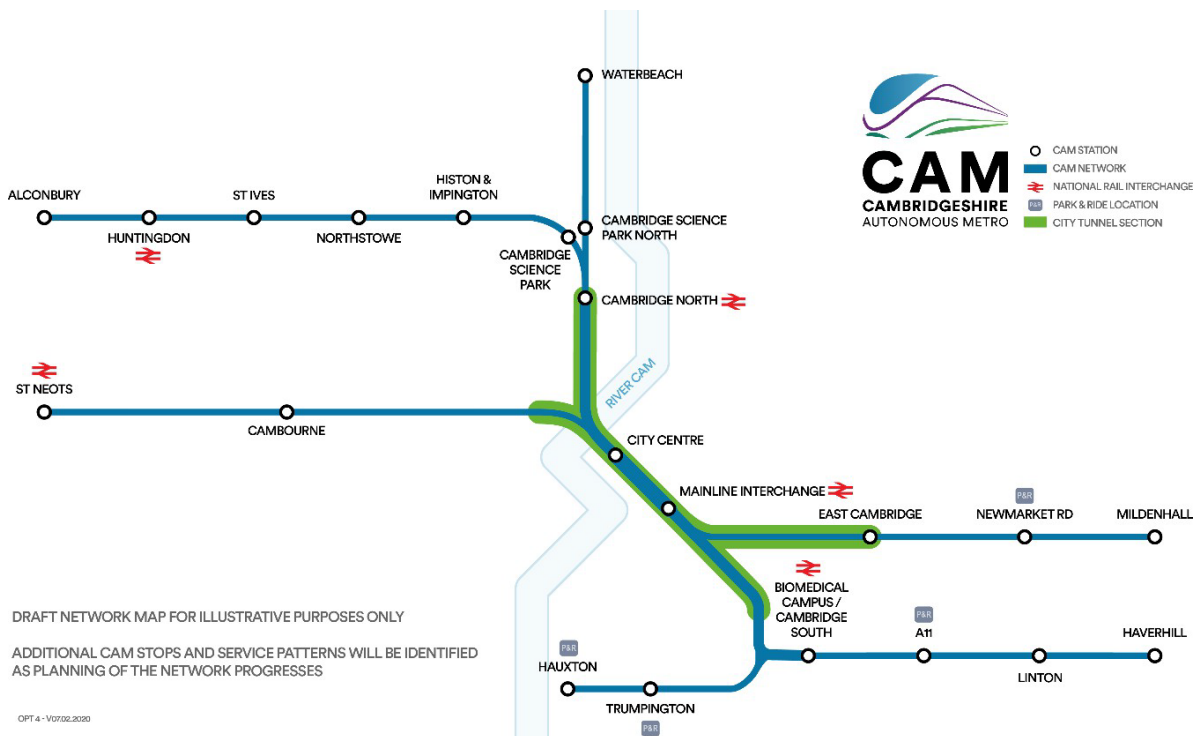
| Goal | Objective | CAM Objective | CAM sub-objective | Desirable |
|-------------|--|---|--|-----------|
| |  <p>Ensure transport initiatives improve air quality across the region to meet good practice standards</p> | | <ul style="list-style-type: none"> • CAM-S11: CAM will support measures that will result in an improvement in air quality • CAM-S12: CAM will derive its power primarily from 'cleaner' or less carbon-intensive energy sources, such as wind, solar and hydroelectric power rather than carbon-intensive sources such as fossil fuels | |
| Environment |  <p>Deliver a transport network that protects and enhances our natural, historic and built environments</p> | CAM 4: Promote sustainable growth and development (including factors effecting environment, heritage, biodiversity and community) | <ul style="list-style-type: none"> • CAM-EV1: CAM will support and enhance environmental sustainability (delivering biodiversity net gains. <ul style="list-style-type: none"> - Minimise adverse impacts on conservation areas, heritage and natural community assets, including protecting the character of towns and villages and the city of Cambridge, whilst avoiding encouraging unsustainable village fringe development. - Meets net gain requirements and where possible offers additional visual and environmental enhancements | |
| |  <p>Reduce emissions to 'net zero' by 2050 to minimise the impact of</p> | | <ul style="list-style-type: none"> • CAM-EV2: CAM infrastructure will utilise zero emissions vehicles; other public transport zero | |

| Goal | Objective | CAM Objective | CAM sub-objective | Desirable |
|------|--|---------------|---|-----------|
| | transport and travel on climate change | | <p>emissions vehicles should be able to use sections of the CAM infrastructure if they are CAM compatible</p> <ul style="list-style-type: none"> • CAM-S11: Improve air quality • CAM-S12: Promote low carbon economy | |

CAM Network

The CAM programme is comprised of several main elements to be delivered over time:

- The City Tunnel Section, including underground tunnels and planned major interchange hubs at the city centre and at the mainline railway station, under the city of Cambridge;
- Inner Corridors, often referred to as the ‘GCP Corridors’; and
- Regional Routes to extend the system to reach Garden Villages, employment sites and other major housing and employment locations.



Maximise opportunities to link with other transport initiatives and expand the CAM network beyond the currently planned network will continue to be explored by the Authority, and as such, all planned network components must be designed to properly link with one another and not preclude future linkages.

In line with CAM Policies E9 and E14, these projected routes will need to complement and be integrated with other major transport infrastructure developments along the corridors they serve. National government's commitment to an East-West Rail route and proposed new heavy rail improvements and/or station developments at St Neots, West of Cambourne, Cambridge South, and Waterbeach will need to be taken into account in developing business cases.

Subject to receipt of the necessary powers and consents and funding, the Regional Routes are planned to become operational from late 2024 onwards.

CAM is designed to provide a best-in-class passenger experience in terms of journey time reliability, smoothness of ride, vehicle and stop quality, level boarding, fully

electric operation and off-vehicle ticketing. CAM is currently anticipated to be segregated as a default assumption.

To enhance safety and reduce operating costs it is expected CAM will eventually become driverless once autonomous vehicles have been approved for use in the UK and the appropriate safety regulations have been established.

The CAM scheme is scalable and has the potential to further increase carrying capacity in line with the future demands as it is encouraged and support a modal shift away from the private car following the scheme's introduction.

The LTP ambition

The Authority's core transport strategies aim to encourage the shift to active travel and public transport: from providing sustainable connectivity to and within new developments, to delivering world-class active travel infrastructure, and a new, more integrated and accessible, public transport network. Major projects, such as CAM and East West Rail (EWR), will provide new journey opportunities, with fast, frequent services and competitive journey times, designed to act as a genuine alternative to the private car.

The Combined Authority will continue to encourage developments in those places where transport can be provided through schemes such as the CAM, including along existing transport corridors and new garden villages.

Complementing CAM will be a comprehensive, better integrated network of local bus services, connecting the suburbs of the urban areas and smaller towns and villages to employment centres across the area and the CAM network. Existing and new transport hubs, interchanges and Park & Ride sites will provide sustainable travel options. These will be better integrated into surrounding local transport networks, acting as travel hubs with high-quality interchange between CAM and local bus and demand-responsive services, together with the active travel network. Local buses – and demand-responsive transport – will be designed to ensure that no one is outside of the reach of safe, reliable public transport, and hence helping to maximise social inclusion for those who lack access to a car.

For CAM to be successful, high-quality interchanges will be needed. This means they will be attractive, safe, inclusive and secure with excellent information and integrated feeder transport arrangements – active travel, rail, bus, taxi and other modes.

To ensure that the CAM system is accessible to our customers and communities, we propose involving our communities, including older people, disabled people and young people in the design and delivery of the CAM system.

CAM 1: Promote economic growth and opportunity

The CPIER highlighted the incredible economic success story of the Greater Cambridge-focused science and tech industries over the last 50 years, underpinned by the presence of the Universities and science parks in and around Cambridge. The area is a global leader in innovation and commercialisation of ideas, and a

magnet for companies across the globe. In the last few years this has delivered employment and business growth far above average. However, CPIER also found that this growth was uneven, with surrounding parts of Cambridgeshire not necessarily sharing in that same level of success. The CPIER also noted the clusters of activity in other towns, for example advanced materials (composites) in Huntingdon.

The Local Industrial Strategy has a priority to improve the long-term capacity of the area by supporting the foundations of productivity. It also has a priority to broaden the base of economic growth, including by spreading the benefits of high growth beyond the Cambridge area. There are, however, signs that constraints on growth are starting to bite. In particular, transport issues will significantly reduce this success if not dealt with.

The CAM, in providing an integrated network through its Regional Routes, will connect many towns and key locations, including science parks. This will help deliver the Local Industrial Strategy priorities. Firstly, the CAM will improve employment opportunities as more residents will have 30 minutes or better access by high quality sustainable travel to key employment locations. Secondly, it will increase the attractiveness of surrounding towns to businesses to establish and expand their operations, thus spreading the growth benefits of the science and tech economy across the wider region.

CAM 2: Support the acceleration of housing delivery

As a result of its strong economy, the world-class education offer and good living environment, this part of Cambridgeshire has seen rapid growth in both employment and households (but also increases in house prices as supply has not kept up with demand). To cater for that growth, local councils in the area have plans in place for an additional 61,000 homes by 2031. The CAM is critical to delivering sustainable transport to support the anticipated growth up to 2031 and beyond.

Much of the new development is on the edge or outside of Cambridge in large-scale developments. These include new settlements on proposed CAM routes at places such as Northstowe, Bourn Airfield, north of Waterbeach, and Alconbury Weald, Huntingdon. Some of these locations will continue to provide housing beyond 2031. The plans for the Greater Cambridge area are also under review to extend them to cover the period to 2040.

As highlighted in the Combined Authority's Growth Ambition Statement, the CAM enables the development of new sustainable settlements along its route. New developments can be designed from the ground-up to be integral with the CAM, including access by active travel, maximising the sustainable travel benefits. As Garden Villages these communities will be exemplars in sustainable ways of living and working, with local community infrastructure, job opportunities and attractive green space and public realm areas. Long-term stewardship of community assets is a feature of Garden Villages. Locations of Garden Villages will be examined through the planning process.

In the March 2020 budget, the government announced that it was going to examine and develop the case for new Development Corporations in the Oxford-Cambridge Arc with a focus on St Neots/Sandy, Cambourne and Cambridge. This included plans to explore the case for a New Town at Cambridge. It is therefore important that the CAM scheme is adaptable and helps to meet the travel demands emerging from these new developments through its integration into the fabric of the development with appropriate interchange and services.

CAM 3: Promote Equity

Integration with the wider passenger transport network

The public transport strategies for Cambridge and Peterborough (previously developed by the County and City Councils) set out the long-term strategy and short-term delivery plan for public transport. As with the other underpinning daughter documents to the LTP, these strategies will be reviewed and refreshed in a timely manner. It is essential that the CAM scheme is fully integrated with the wider public transport network to enhance the opportunities for all. Therefore, it is imperative that CAM delivers the following:

- CAM will be fully integrated and embedded within the public transport provision to ensure a high-quality network with appropriate interchange opportunities are provided;
- The scheme provides services and develop infrastructure that meets the needs of customers; the residents of, employees based within, and visitors to Cambridgeshire and Peterborough, whilst at the same time having regard to economy, efficiency, and effectiveness; and
- CAM will provide a high-quality, integrated passenger transport network to provide people, in both the urban and rural areas, with access to the opportunities and benefits that contribute to the enjoyment of a better quality of life.

Alignment to the Bus Reform Task Force

The Bus Reform Task Force (BRTF) was launched in early 2019 and is exploring the best operating and delivery model for our public transport network. It has three main workstreams: to establish an integrated framework to assess subsidy requirements, to identify and implement tangible short-term improvements to bus services, and to develop and examine the business case for a number of alternative delivery options for bus services in Cambridgeshire and Peterborough. CAM will be aligned with the conclusions from the BRTF that are due to be published in late 2020.

Alignment to emerging public transport schemes (such as East-West Rail and Cambridge South Station)

The Authority continues to explore opportunities to enhance strategic public transport accessibility and support growth through new infrastructure and the connectivity between the CAM and other public transport schemes and networks. The developments in the transport network need to be successfully planned to integrate with the CAM network and the EWR proposals. The interchange and connectivity

between the two networks and the traditional bus network needs to be seamless to maximise the benefits of these complementary modes to reduce the dependency on the private car by offering a real alternative and opportunity to the people of the region. This integration of modes will significantly reduce journey times to major cities elsewhere, creating new opportunities for work and leisure for our residents while supporting expanding the labour market and Cambridgeshire and Peterborough's productivity.

East-West Rail

CAM should complement the new EWR link, serving the smaller communities that the heavy rail line will pass without stopping. It is important to consider how the EWR route relates to the CAM network, to maximise integration between modes and how they will interact. This interaction needs to be understood to ensure that the schemes genuinely complement each other thereby maximising the benefits for all. Providing appropriate and effective interchanges between CAM and EWR that are safe, accessible, sustainable and seamless to provide a fully integrated public transport network that maximises the "offer" between St Neots and Cambridge.

Cambridge South Station

A key element in the development of Cambridge South Station as a multi-modal interchange is understanding the requirements of the users, both existing and potential travellers and how this scheme will seamlessly interact with CAM.

Integration with emerging highways schemes (A428, A10, A505)

The Authority is currently developing schemes within the A428, A10 and A505 corridors and examining how connectivity can be improved along and through the corridor, with a particular focus on improving the "offer" to the people of Cambridgeshire and Peterborough. Any developments and/or improvements to the highway network needs to fully integrate with CAM to ensure a truly seamless network is delivered with adverse impacts minimised wherever possible. Therefore, as and when these schemes and others being developed by the Authority and the Greater Cambridge Partnership, it is essential that due consideration is given to CAM's requirements.

CAM 4: Promote sustainable growth and development

Integration with active travel

- CAM interchanges with easy step free access will ideally located at either major attractors or generators of passengers and within 10 to 15 minutes' walk to key locations ensuring ease of access to major attractors;
- Access should be designed to radiate from CAM stops; and
- Locating the CAM stops at the optimum location for accessibility helps to reinforce the sustainable transport message.