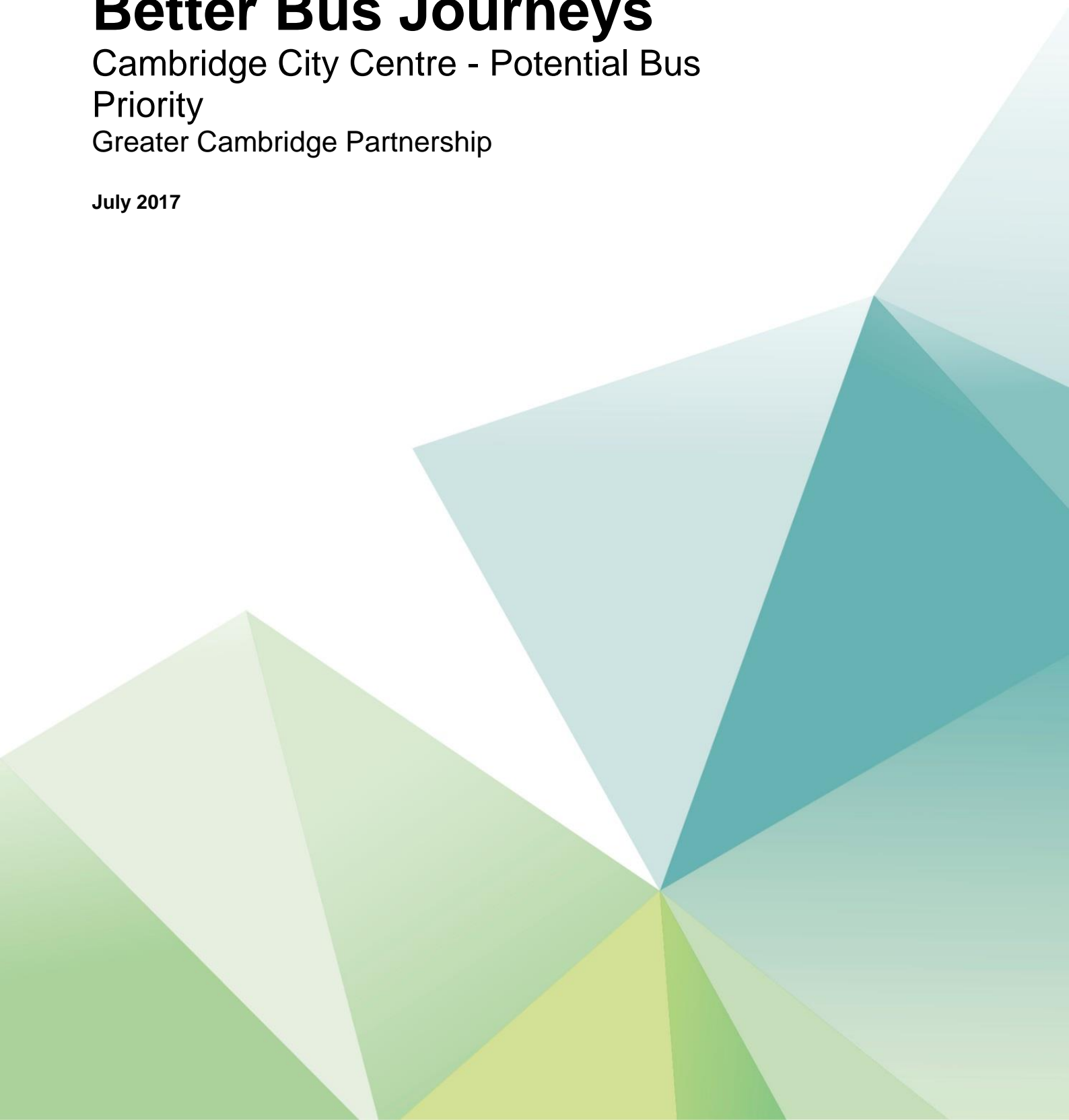


Cambourne to Cambridge Better Bus Journeys

Cambridge City Centre - Potential Bus
Priority
Greater Cambridge Partnership

July 2017



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This document has 27 pages including the cover.

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Executive Summary

This report provides a conceptual discussion of the potential on-street bus priority measures possible for improving bus access to the City Centre, summarising the benefits and drawbacks of the options in relation to the wider Cambourne to Cambridge Project. Measures considered have been developed through workshops and discussions with officers and are considered to contribute to delivering the scheme aims of providing fast, frequent and reliable journeys between Cambourne and Cambridge. Existing bus routes within the City experience congestion on key routes into Cambridge as discussed in the following sections. This report aims to identify on-street interventions that support the Cambourne to Cambridge Project within the context of the City Access Study.

The busway proposals aim to connect with Grange Road via four potential links, Adams Road, Herschel Road, Cambridge Rugby Club Access and Cranmer Road. These potential links are currently being assessed and will be included in a separate report which will include an assessment of specific alignments. Three of these four links are public highway and are where the busway services could join the local highway network. Alternatively, the low-cost comparator option 1 or option 6 could travel along Madingley Road on new bus lanes before accessing the city centre.

The “on-street” interventions discussed within this report contain a series of potential bus priority measures and changes to the highway in order to facilitate the bus through the highway network over the private motor car. Measures such as bus lanes, priority signals, removal of on street parking and minor changes to the lane usage have been suggested to assist with bus journey times into the city centre during peak periods.

Effectively the buses can access the city centre through a variety of routes similar to how the existing services do either via Northampton Street and Bridge Street or New Square or via Silver Street and Downing Street. This report has aimed to highlight certain areas which bus priority can be achieved which gives bus operators priority routes into the city centre.

The outputs of the report are deliberately high-level at this stage and intended to assist in the overall process of integrating City Deal proposals across different projects. The report does not conclude or make recommendations for decision but forms part of the overall development process for public transport improvements within the historic built environment of Cambridge. The concepts within it may not form any part of Cambourne to Cambridge TWA application.

Further combined project work will include analysis of potential interventions along with stakeholder engagement, journey time analysis, patronage calculations and accessibility assessments. Furthermore, any options taken forward at a later date will be within the strategic fit of the city access project.

1. Introduction

Atkins has been commissioned by The Greater Cambridge Partnership (GCP) to provide engineering and transport planning support in relation to the Cambourne to Cambridge Better Bus Journeys Scheme, which is being considered as part of the Greater Cambridge Partnership (GCP). In particular, Atkins has been asked to investigate potential interventions to facilitate improved public transport access to Cambridge City Centre within context of the interface of the recommended option 3 and City Access Study.

The City Access Study, part of the GCP Tranche One Transport Programme, aims to recommend “transformative improvements and interventions to considerably improve access, capacity and movement to and within the City”¹. In June 2016, the City Deal Executive Board agreed to pursue an ‘eight-point plan’ to help achieve the scheme objectives.

The Project and The Scheme

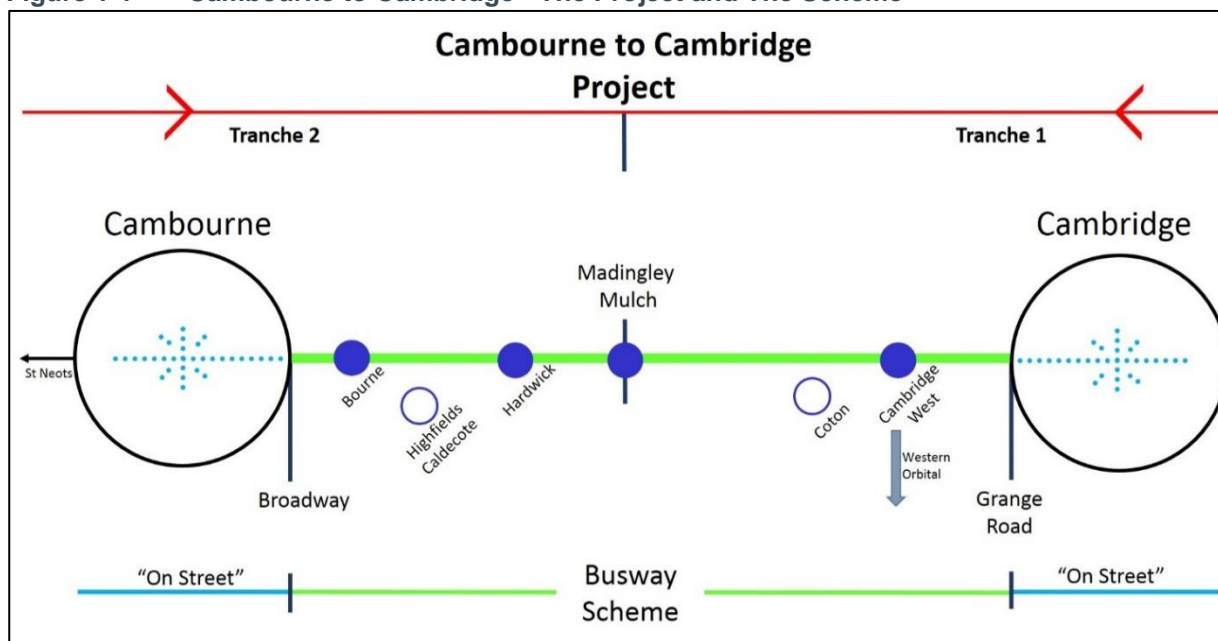
The Cambourne to Cambridge Better Bus Journeys proposals include a busway which would run from Cambourne to Cambridge and could consist primarily of a Busway from the eastern edge of Cambourne (Broadway) to Grange Road, Cambridge linking with Cambridge West, providing BRT by means of Bus Rapid Transit (BRT).

It could include a new park and ride site providing interchange facilities within the proximity of Madingley Mulch roundabout. The Busway elements and the works and operations associated with them (including the Park & Ride site) form what is termed “the Project”.

On sections of the route where BRT cannot be provided, vehicles would run on the established highway. To improve journey times and reliability a series of highway improvements and bus priority measures have been identified within this report. These measures are considered within this report as possible interventions to increase bus priority. It is expected these interventions could be delivered through Traffic Regulation Orders (TROs). The elements of the busway and these additional bus priority and other measures constitute ‘**the Scheme**’. Whilst these on street measures would benefit scheme buses, they are not for their exclusive use and would benefit all bus services in the corridor. Since they do not form an essential element in allowing busway buses to gain access to and from the busway, they are to be brought forward separately and do not form part of the Project which is expected to be the subject of a Transport and Works Act Order. Figure 1-1 below shows the extent of the proposed project and scheme.

¹ http://www.gccitydeal.co.uk/citydeal/info/2/transport/1/transport_projects_and_consultations/7

Figure 1-1 Cambourne to Cambridge - The Project and The Scheme



1.1. Purpose

The perspective of this report focuses on the October Board decision to undertake further appraisal on the:

“possible specific route alignments within catchment area 3a, with catchment area 3 as an alternative if Option 3a proves unviable”

As well as considering measures to provide access to the City Centre via route 3a, this report also considers measures to facilitate an on-road, low cost alternative along Madingley Road, whether that be Option 1 or Option 6 as put forward by the Cambourne to Cambridge Local Liaison Forum. For the purposes of this report it is assumed that buses travelling onto the City Centre from the scheme would originate from Grange Road or Madingley Road.

This report is intended to provide a prioritised list of defined options for improving bus access to the City Centre, summarising the benefits and drawbacks of the options in relation to the wider Cambourne to Cambridge Project. Measures considered have been developed through discussions with officers and are considered to contribute to delivering the scheme aims of providing fast, frequent and reliable journeys between Cambourne and Cambridge whilst *“recognising the importance of major developments being supported by HQPT, linking Cambridge City Centre and major centres of employment”* (Cambridge Local Plan (2014): Proposed Submission (July 2013) Policy 80).

1.2. Background

In September 2016, Atkins produced an Outline Business Case (OBC) for the Cambourne to Cambridge Project, which detailed work undertaken on the study to date and set out the Strategic, Economic, Financial, Commercial, and Management Case. Assessments to inform the OBC included the provision of a bus route between Cambourne and Cambridge. The OBC was presented to the GCP Board on 13th October 2013 by officers. The Board also considered representations and comments from stakeholders and members of the public received during consultation in October and November 2015.

The October 2016 GCP Board decision instructed officers, as part of further work on the Scheme, to investigate a further route option (Option 3a) in addition to those presented in the OBC. In order to support this outline work further study is required to understand the feasibility of various routes into the City Centre. This report provides a review of potential interventions from the west of the City that could support the effectiveness of all options being considered for the Cambourne to Cambridge Project.

1.2.1. City Centre Access – Bus Network Review

Cambridgeshire County Council are currently undertaking a review of the Cambridge Bus Network to be presented in the 'Bus Network Review'. The review introduces the concept of a strategic north-south and east-west public transport corridors including bus priority measures and busway routes). The east-west route runs along the Cambourne to Cambridge Busway and out onto Newmarket Road. The north-south route runs between the northern and southern busway routes via Hills Road, St Andrews Street and Milton Road.

The bus stops within Cambridge City Centre are also under review which will identify options for additional central hubs and a redistribution of routes into and across the central area. This has the potential to change the nature of queuing traffic in the City Centre and provide additional bus reliability as buses can be routed along less congested streets.

The Bus Network Review suggests that the Cambourne to Cambridge Busway could form the western part of the east-west route across the City. This report provides options for the western route for consideration in the context of the wider network.

1.2.2. City Centre - The Destination

There are numerous destinations within Cambridge City centre and existing buses serve these different areas calling at stops located on Bridge Street, Drummer Street, New Square, Parkers Piece, Emmanuel Street, East Street, the Grafton Centre and Downing Street. Bus users can then access city centre destinations by foot from these bus stops which can take up to 7 to 10 minute trip. The city centre is spread out across a large area and can be defined as being between the River Cam, Bridge Street, New Square, Parkers Piece/Downing Street.

The City Centre, in the Local Plan, is defined as an area within the inner ring road. There has been a shift in City Centre activity south such that the new central area could be defined as extending beyond the Local Plan defined City Centre to also include the rail station and the adjacent central business district at the CB1 development. With this updated, the definition of the central area bus hubs should also include Station Place at the train station.

In that respect, and being cognisant of the historic centre of Cambridge which is sensitive to buses travelling through it, it is considered that Silver Street and Downing Street offer viable city centre bus stop locations.

In considering Silver Street within the City Centre, a bus stop could be located on Silver Street south of the bridge for incoming services. The following bullet points give the potential benefits of siting a bus stop on Silver Street:

A potential Silver Street bus stop has the following potential benefits:

- Removal of bus movements from the core of Cambridge City Centre leading to environmental benefits in terms of air quality;
- Removing buses from the congestion of Cambridge City Centre releases resource that can be invested back into the bus service, potentially leading to an increase in frequency; and
- Saving up to 10 minutes per 1-way journey would equate to a saving of 20 minutes per bus hour – so at a frequency of 6 buses per hour 2 vehicles can be saved with a reduction in operating cost in the region of £400,000.

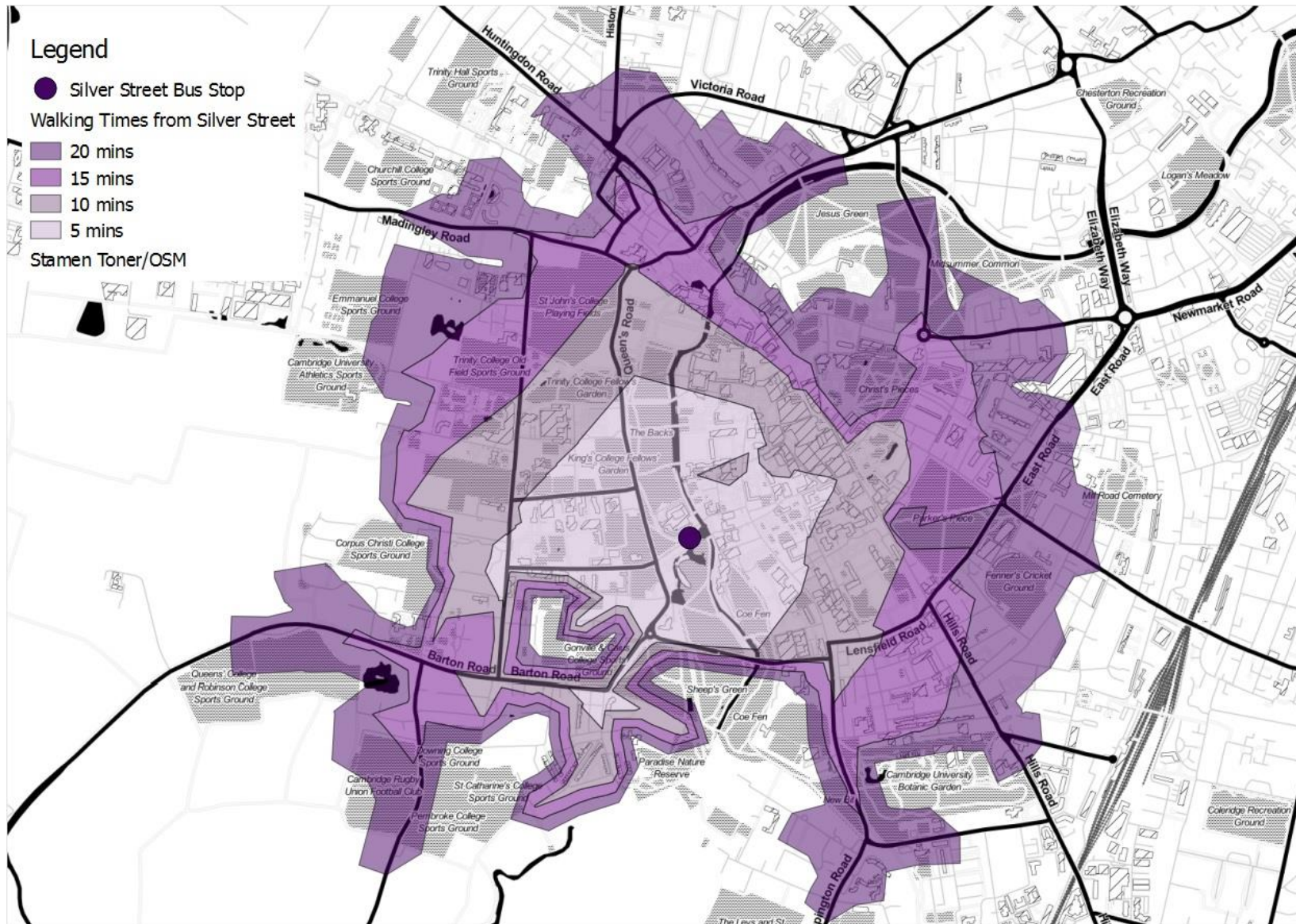
The dis-benefits of a potential Silver Street bus stop are as follows:

- Greater walk distances to access the City Centre, and other locations on the fringe of the Centre. For instance, the Grafton Centre is around 1.4km from Queens College, but only 700 metres from Drummer Street. The acceptability of walking to a range of major trip attractors surrounding the city centre diminishes significantly especially to the north, thus reducing the appeal of the bus service; and
- Remoteness of services from interchange. Whilst Universal provides a potential link to the rail station, the bus / coach interchange at Drummer Street / Parkside is remote from the stops at Queen Street, and the walk route is likely to be challenging for anyone carrying luggage or with a disability.

In terms of City Centre access, a potential bus stop in Silver Street may be no less acceptable than those for some other local bus services accessing Cambridge for example Bridge Street. Figure 1-2 overleaf shows the catchment for walking trips from the Bridge Street and a potential Silver Street Bus Stop. It shows that locations within the City Centre, such as King's Parade and Bennett Street can be accessed within a 6-7 minute walk from both locations. It also shows how the location of the river and limited crossing points has an impact on the walking catchment.

Figure 1-2 Walking distances from existing bus stops on Bridge Street and Silver Street

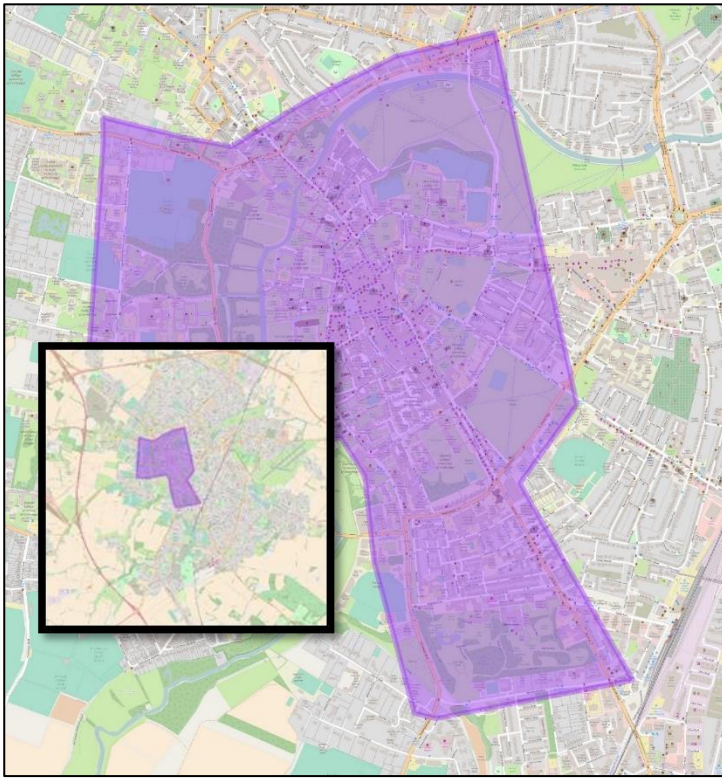




1.2.3. Study Area

Figure 1-3 shows the study area for this assessment which encompasses the routes used by existing bus services from the west of Cambridge to access the City Centre.

Figure 1-3 Study Area



1.3. Report Structure

Following this introduction, the remainder of the report is structured as follows:

- Chapter 2 identifies the baseline conditions in the west of the City in terms of bus routes;
- Chapter 3 presents options for potential interventions for interface with the Cambourne to Cambridge Better Bus Journeys Scheme to the City Centre as well as an alternative to accessing the City Centre, before identifying recommended options for further study; and
- Chapter 4 summarises the options for future study.

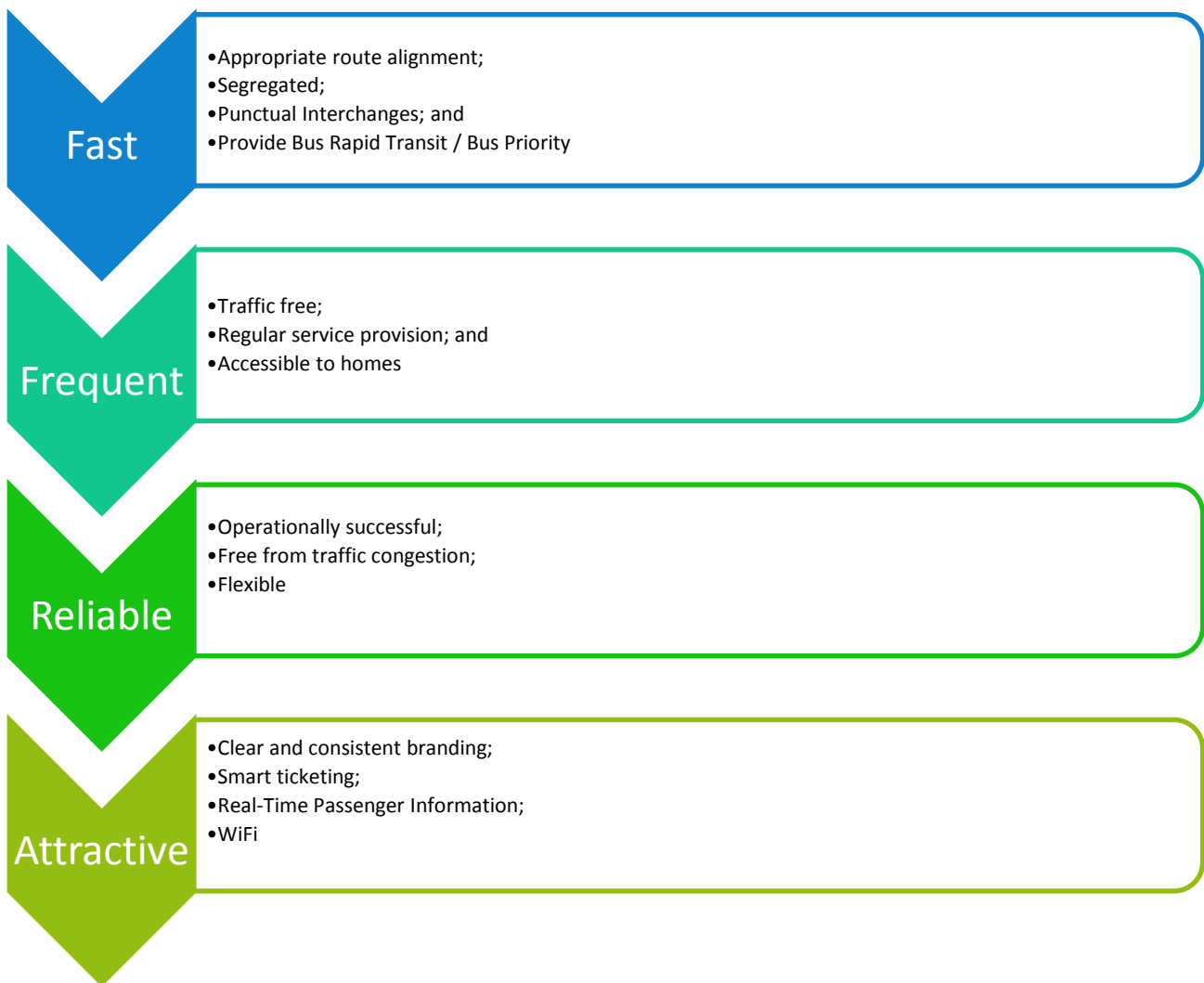
Mitigation measures presented in this report have been the subject of workshops with:

- Cambridgeshire County Council City Access Team;
- Cambridge City Council;
- Bus operators.

2. Characteristics of High Quality Public Transport and Bus Rapid Transit

A key consideration in developing interventions from Grange Road to the City Centre should adhere to the definition of High Quality Public Transport (HQPT), which is the key focus of the Cambourne to Cambridge Better Bus Journeys Project. HQPT is considered to provide dedicated passenger transport routes with fast and frequent links to and from key destinations. As referenced in the TSCSC, in the case of the A428 / A1303 corridor, a HQPT intervention could be by bus rapid transit (BRT). Figure 2-1 outlines the high-level characteristics of BRT developed following a review of HQPT and BRT policy guidance, the aims of the GCP and discussions with CCC.

Figure 2-1 Characteristics of the proposed Cambourne to Cambridge Better Bus Journeys Project



The design considerations and interventions in the following sections are considered to, in so far as possible 'on-street', support the characteristics presented in Figure 2-1 and are assessed in terms of engineering feasibility and transport considerations. The proposed scheme aims to deliver a HQPT corridor utilising BRT to gain access to Cambridge and through 'on street' priority measures the facets listed above can be achieved to some extent. Ultimately, BRT services are required to serve existing developments therefore a successful HQPT scheme needs to strike a balance between fast and direct and providing service that can be utilised by the population and is accessible by all.

2.1. Technical Specification

A Technical Specification has been produced which identifies a standard that the Cambourne to Cambridge scheme should attain and provide in order to achieve the policy objectives as well as provide a BRT service that is accessible to all.

Table 2-1 below shows the Target Standards (BRT) that the project aims to achieve versus the 'Minimum Standards' (Bus priority).

Table 2-1 Cambourne to Cambridge Better Bus Journeys Standards

| FACTORS | <i>Target standard – required for HQPT with BRT</i> | <i>Minimum standard – required for HQPT with BUS PRIORITY</i> |
|--|--|--|
| | TARGET STANDARD | MINIMUM STANDARD |
| Operation | | |
| Punctuality | 95% - achieve headway of less than 10 minutes for high frequency services; 95% for off-peak services between 1 minute early and 5 minutes late | Achieve greater punctuality than existing services (eg, citi 4) |
| Reliability | Achieve 99% reliability | Achieve greater reliability than existing services (eg, citi 4) |
| Flexibility | Services able to utilise the Busway as part of a longer journey | All services able to utilise bus priority measures |
| Vehicles | | |
| Identity | Distinguishable from on road services to promote the BRT as a HQPT which offers the best service between Cambourne and Cambridge | Distinguishable from other services promoting HQPT which offers the best service between Cambourne and Cambridge |
| Features | Free Wi-Fi, on board CCTV, on board real time information, and next stop audio-visual announcements, USB charging points | Free Wi-Fi, on board CCTV, on board real time information, and next stop announcements |
| Accessibility | Access for all | Access for all |
| Operational Control | Agile route in case of road closure or congestion | Information given to driver regarding traffic on route |
| Real Time Passenger Information (RTPI) | Real time information to be integrated with Cambridgeshire Highways; introduction of new 'smart technologies' | Real Time information given to passengers |
| Stops | | |
| Stop location | Greatest catchment with respect to route (typically 15min walk to stop) | Greatest catchment with respect to route (typically 10min walk to stop) |
| On Route Shelters | High quality shelters, real-time information, CCTV, wayfinding and clearly marked walking routes | High quality shelters, real-time information, CCTV, wayfinding and clearly marked walking routes |
| Interchanges | Park and Ride and Kiss and Ride on route | Park and Ride on route |
| Level Boarding | Level boarding at all Busway stops with Equality Act compliance elsewhere | Equality Act compliance at all stops |
| Cycle Facilities | Storage provided at interchanges and major bus stops | Wayfinding to cycle facilities provided |
| Fares and Ticketing | | |
| Fares | Cashless payments that are no more expensive than local bus | Cashless payments that are aligned with local bus fares and |

| | | |
|---------------------------------------|--|---|
| | fares and full ticket inter-availability between service providers | full ticket inter-availability between service providers |
| Ticketing | Ticket medium to reduce dwell times at stop which may include ticket vending machines, Smart and contactless payments | Ticket medium to reduce dwell times at stop which may include ticket vending machines, Smart and contactless payments |
| Highways and Priority | | |
| Segregated/Carriageway separation | Busway for majority of route, bus lanes where achievable | Bus lanes/bus priority where achievable |
| Signalling | 56mph for Busway wherever achievable | Within road speed limits where achievable |
| Stop approaches | Full signal priority at junctions | Full signal priority at junctions to front of the queue |
| Local bus interaction | Clear approach to facilitate docking, easy barding and marked boarding positions | Clear approach to facilitate docking, easy barding and marked boarding positions |
| Journey times | Joint bus stops with priority given to busway service | Joint bus stops |
| Enforcement | More punctual journey times than car and more than bus priority | Equal to more punctual journey times than car |
| Segregated | | |
| Traffic free (Cambourne to Cambridge) | Route substantially segregated | Route integrated with existing highway |
| Resilience | Busway route to be guided between Cambridge and Cambourne subject to TWA order; Statutory utility; By Law governance; Protected. | Route facilitated with bus priority on road; Non statutory utility; No By Law governance; unprotected. |
| Intelligent Transport System | | |
| Systems | Vehicles with automatic vehicle location for signal controlled junctions and real-time information | Vehicles with automatic vehicle location for signal controlled junctions and real-time information |
| Future-proofing | Infrastructure accommodating BRT lends itself to future alternative technological systems | Possibility of alternative technological systems running through bus priority |
| Vehicle Standard | | |
| Emissions | Better than Euro VI technology – 0 tailpipe emissions; Hybrid electric | Euro V technology |
| Branding and Marketing | | |
| Brand | Distinct brand to be used in all marketing as standard | Distinct brand to be used in all marketing subject to |
| Customer Satisfaction | Regular customer satisfaction surveys, continuous specialised training programmes, sustained customer engagement. | Regular customer satisfaction surveys, continuous specialised training programmes |

2.2. BRT / Bus Priority in Cambridge

Existing bus services in Cambridge use the existing highway network including Grange Road, Chesterton Road, Bridge Street and Queens Road. These routes are subject to delay from road traffic and parked cars which can affect the reliability of those services. The existing highway layout in the Newnham area of Cambridge are well established network of streets with properties close to the highway and therefore does not allow for the introduction of BRT.

As identified in the 'Highways and Priority' section of the Technical Specification, bus priority can be provided without full segregation through a variety of measures including priority signalling and reprioritisation of junctions to favour the route that the buses are likely to take. Bus stop infrastructure including level boarding, readily available information and paperless fares can also facilitate a successful BRT service. The remainder

of this report explores interventions which could facilitate bus priority in Cambridge including the identification of potential measures to provide bus priority and improve passenger experience and ride comfort.

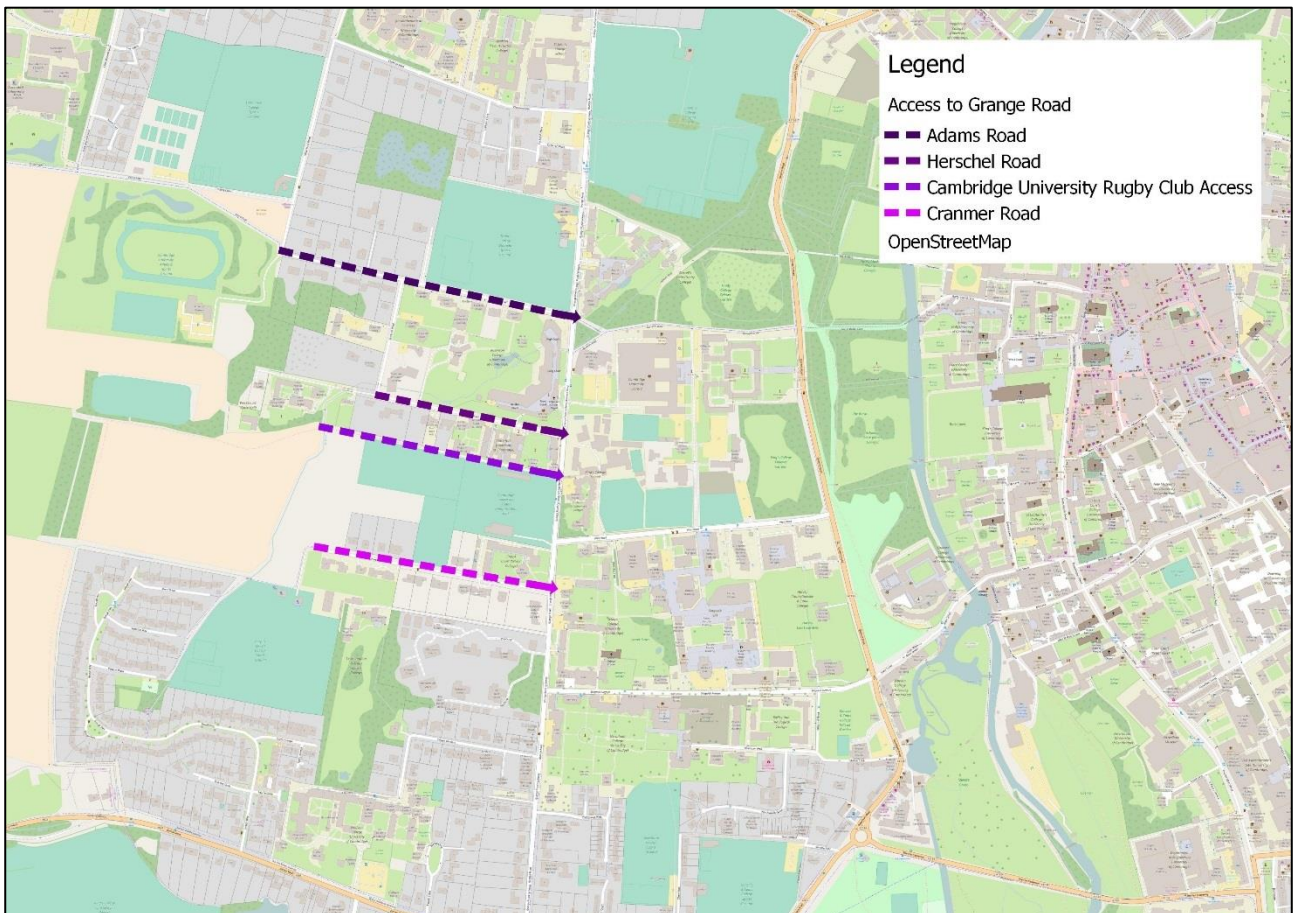
3. Connections to Grange Road

This Chapter reviews the current likely options for the proposed Cambourne to Cambridge busway to connect with Grange Road. The connections for the low-cost comparator of Option 1 are also considered. This is currently subject to ongoing assessment.

3.1. Cambourne to Cambridge Option 3a

The busway route could approach Cambridge to the south of the Cambridge West development and transfer to on street at one of four points on Grange Road as shown in Figure 3-1. This is where the busway scheme interfaces with the Cambourne to Cambridge project.

Figure 3-1 Considered Busway connections to Grange Road



Diversion of the utilities may be required if the proposed highway alignment is amended or increased in construction depth are necessary of enable operation. A priority junction (signalised) could be provided to facilitate bus priority onto Grange Road.

The following summarises the baseline conditions on each of the access routes into Grange Road.

3.1.1. Adams Road

Adams Road is the northern most option for connection of the busway with the public highway and is predominantly bounded by large residential properties, each of which has a private access. Access to Cambridge University playing fields to the north is provided by a single gated access. Adams Road also forms part of the strategic cycle network in Cambridge, providing connectivity between the City Centre and the village of Coton. This is in the form of an on-street provision, but no road markings or designated lanes

are provided. There are no waiting and loading restrictions within Adams Road other than double yellow road markings on approaches to junctions, as such the road has a high level of on-street parking.

3.1.2. Herschel Road

Herschel Road is part private, part public highway and is predominantly bordered by University of Cambridge buildings, each of which has a private access. At its western extent, Herschel Road becomes a private access to University of Cambridge Clare Hall. There are no waiting and loading restrictions within Herschel Road other than double yellow road markings on approaches to junctions, as such the road has a high level of on-street parking. There are a number of mature trees located on either side of Herschel Road, which extend over the carriageway reducing available headroom.

3.1.3. Cambridge University Rugby Club Access

The Cambridge University Rugby Club access is a private access located to the south of Herschel Road and runs along the northern edge of the Rugby Club. The existing surface is narrow and visibility is slightly restricted at the junction with Grange Road by the presence of a 3rd party high fence to the north and to the south a mature tree. Beyond the Rugby Ground the available corridor width reduces from 11 metres to 7.2 metres. At the western end the private access crosses Bin Brook before entering gated private land.

3.1.4. Cranmer Road

Cranmer Road is a public highway and is bounded by University of Cambridge buildings and residential properties, each of which has a private access. There are no waiting and loading restrictions within Cranmer Road other than double yellow road markings on approaches to junctions, as such the road has a high level of on-street parking. At its western extent, Cranmer Road becomes a gated private access to the University of Cambridge Corpus Christi Sports Centre. There are a number of mature trees located on either side of Cranmer Road, which extend over the carriageway reducing available headroom.

3.1.5. Madingley Road

The low-cost comparator option 1 could travel on a bus lane along Madingley Road which is a public highway and is bounded by residential properties and educational institutions along its length. Madingley Road is subject to double yellow road markings along its length and has several junctions between the M11 and its junction with Grange Road. There is provision for cyclists adjacent to the carriageway and there are a number of trees located on either side of Madingley Road in certain locations.

4. Potential Interventions On-street

This report is intended to provide a prioritised list of defined options for improving bus access to the City Centre, summarising the benefits and drawbacks of the options in relation to the wider Cambourne to Cambridge Project. Measures considered have been developed through discussions with officers and are considered to contribute to delivering the scheme aims of providing fast, frequent and reliable journeys between Cambourne and Cambridge. Existing bus routes within the City experience congestion on key routes into Cambridge as discussed in the following sections. This report aims to identify on-street interventions that support the Cambourne to Cambridge Project within the context of the City Access Study.

Inbound buses using the Cambourne to Cambridge busway could join Grange Road and have the choice of turning left or right. It is assumed that if a service turns left it is likely to route via Northampton Street and Drummer Street and if it turns right it would route towards Silver Street. Potential route options for the Cambourne to Cambridge project are shown in Figure 4-1.

Figure 4-1 Potential Routings from Grange Road

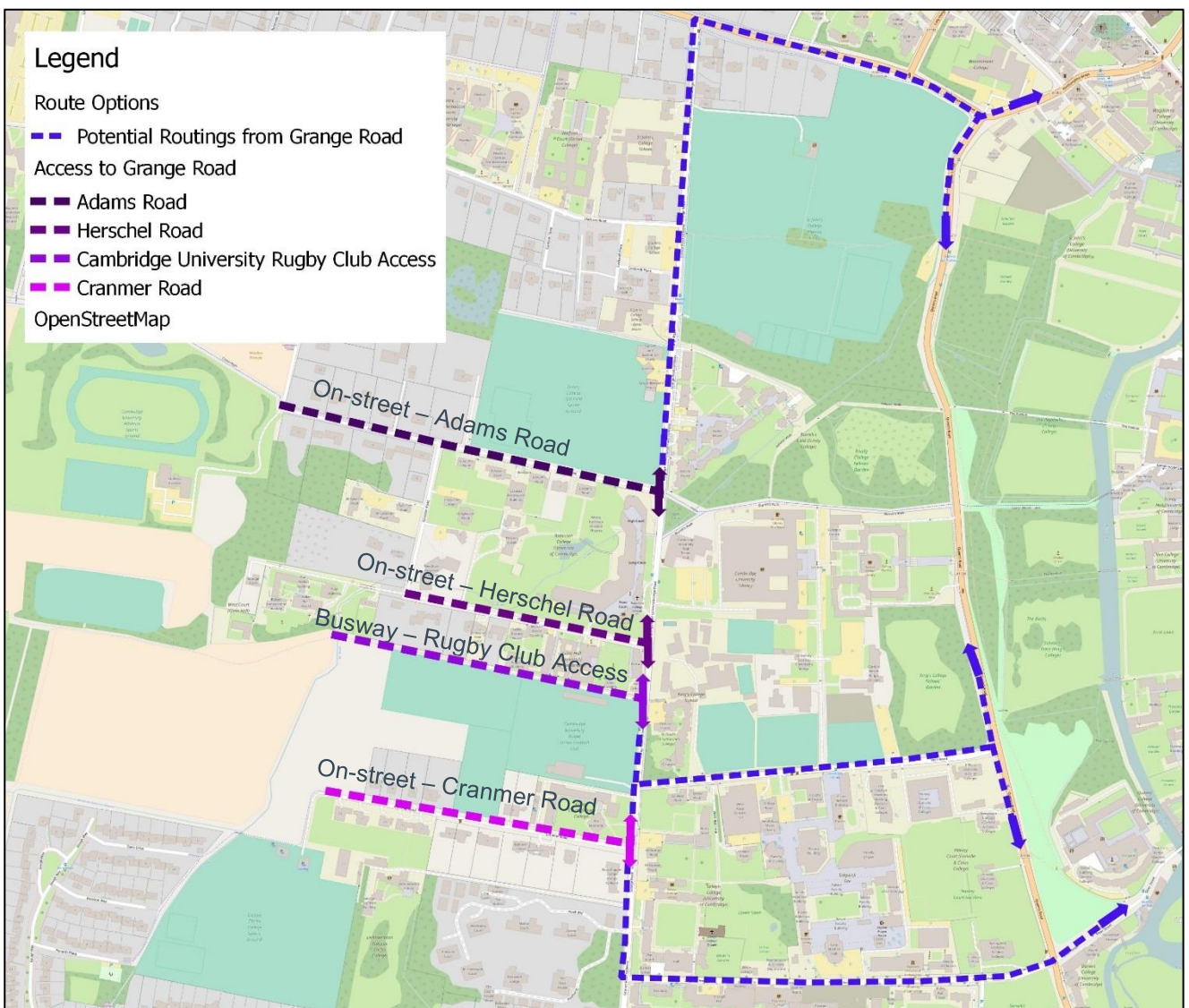
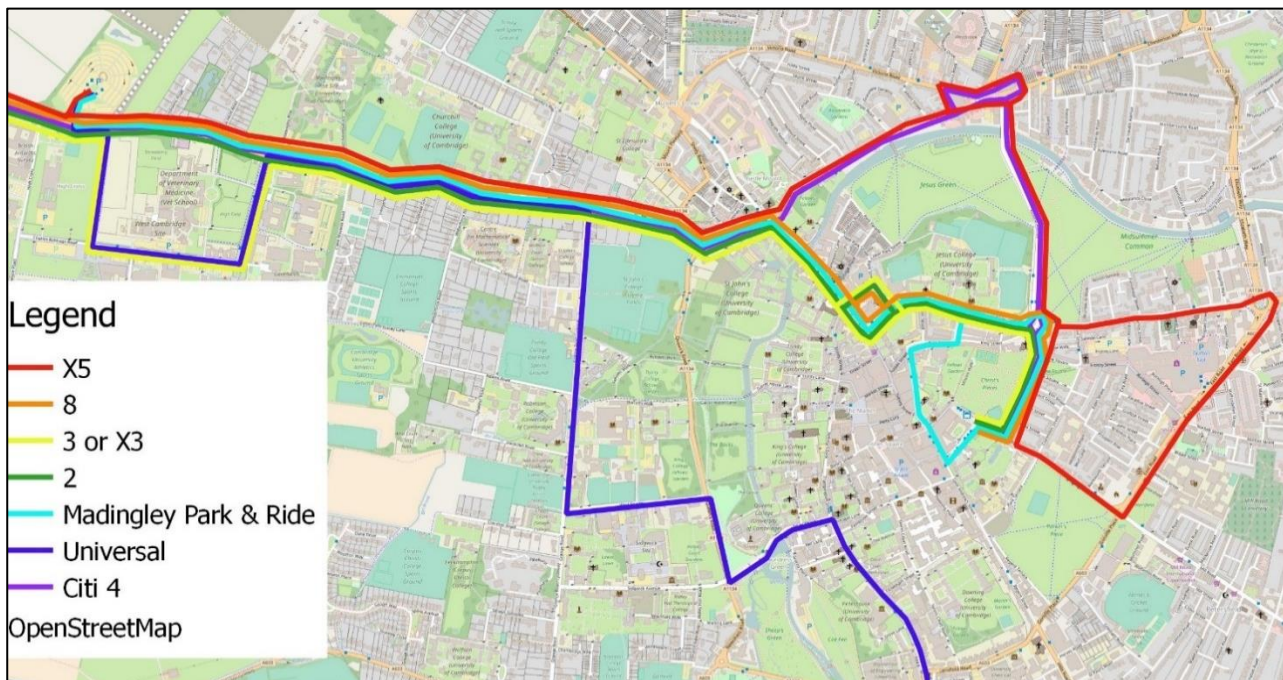


Figure 4-2 shows the existing bus services within the study area to illustrate potential routings based on current conditions.

Figure 4-2 Existing Bus Services



ter Cambridge city

Table 4-1 overleaf identifies potential interventions to facilitate buses travelling between the City Centre and Grange Road at existing pinch points on the highway network. It is considered that these interventions would not just support access for the Cambourne to Cambridge project but also improved access for existing services. Interventions are shown on the plan in Appendix A.

Table 4-1 Potential Interventions

| Access to Grange Road | | | | | | |
|------------------------------|--|--|---|-------------|-------------------------|-----------------------|
| Location | Cause | Effect | Potential Intervention | Cost | Benefit to buses | Ref (Figure X) |
| Madingley Road | Madingley Road/JJ Thompson/Wilberforce Rd/Clerk Maxwell Road/Storeys Way/Grange Road | Widening of carriageway | Introduction of an inbound bus lane on Madingley Road between JJ Thompson and Grange Road | | | |
| Adams Road | On-street parking and property access | Narrowing of carriageway to include for cycle lane | Removal of on-street parking; construction of cycle lane | | | 4.1 |
| Herschel Road | On-street parking and property access | Narrowing of carriageway to include for cycle lane | Removal of on-street parking; introduction of signal junction with Grange Road | | | 4.1 |
| Rugby Club Access | Access to rugby training pitches | Construction of busway | Construction of busway and signal junction with Grange Road | | | 4.1 |

| | | | | | | |
|--|---|---|---|--|--|-----|
| Cranmer Road | On-street parking and property access | Narrowing of carriageway to include for cycle lane | Removal of on-street parking; introduction of signal junction with Grange Road | | | 4.1 |
| Between Grange Road and City Centre | | | | | | |
| Grange Road | Constrained to buses due to the level of traffic calming on the route | Increased journey times northbound and southbound | Removal/redesign of traffic calming from Herschel Road northbound to Madingley Road | | | 1 |
| Madingley Road | Madingley Road / Queens Road / Northampton Street Junction | Congestion on the Madingley Road approach to the junction | Introduction of an inbound bus lane on Madingley Road between Grange Road and Lady Margaret Road | | | 2 |
| Northampton Street | Madingley Road / Queens Road / Northampton Street Junction | Congestion on the Northampton Street approach to the junction especially in the PM peak | Lane widths in part are quite generous and there may be limited scope to introduce a bus lane on the approach to Queen's Road | | | 3 |
| Chesterton Lane and Chesterton Road | Traffic signals at junction with Magdalene Street | Congestion on the approach to the Magdalene Street Junction | Narrowing of lanes and introduction of a westbound bus lane on the approach | | | 4 |

| | | | | | | |
|---|---|---|---|--|--|---|
| Drummer Street and Emmanuel Street | One-way nature of the route and the volume of buses accessing the stops | Increased journey times for buses and congestion of buses and pedestrians crossing to access a service. | Location of bus stops on St Andrews Road / Regent Street to avoid routing via Park Terrace and Parker Street to access Drummer Street and Emmanuel Street. | | | 5 |
| Queen's Road | Volume of traffic, on-street parking | Experiences congestion in both directions | Traffic signals at West Road / Queen's Road, incorporating the current pedestrian crossing, and revisions to the kerblines at the entrance to Queen's Road | | | 6 |
| | | | Creation of a bus lane in the space currently occupied by short-term car and coach parking. If it is confirmed that delays occur only in the AM peak, then it is conceivable that this space could be shared between AM peak bus lane / off-peak coach parking, subject to strict enforcement | | | 7 |
| | | | Introduction of bus lanes commencing in the area of The Avenue; one northbound towards Madingley Road and one southbound to West Road | | | 8 |
| Queen's Road / Silver Street / Sidgwick Avenue | Short-stay parking exists on the southbound carriageway from West Road to approximately 80m north of the junction. This restricts the traffic turning left from moving into the | In the AM and PM peak, congestion occurs on the southbound approach to the junction from Queen's Road | Removal of all parking on Queen's Road southbound to allow for a southbound bus lane. Left turn traffic to remain as existing with carriageway widening and footway realignment close to the junction with Silver Street to accommodate the bus lane. Buses would receive | | | 7 |

| | | | | | | |
|----------------------|---|---|--|--|--|----|
| | dedicated left turn lane until after the parking. | | priority at the junction to turn left into Silver Street | | | |
| | | | Conversion of Sidgwick Avenue to one-way eastbound to avoid the need for buses to turn right from West Road to Queen's Road whilst avoiding congestion on the Queen's Road approach to the junction | | | 9 |
| | | | Bus priority incorporated on approaches to the signals at the Queen's Road / Silver Street junction | | | 10 |
| Silver Street | Narrow carriageway | Informal shuttle working (give-way movements) over a short distance to the eastern end of the street. | Formalisation of the shuttle working to the east of the river by signal control or priority control between Queen's Lane and Trumpington Street to prevent the possibility of buses meeting on the narrow sections | | | 11 |
| | | | Carriageway narrowing to the west of the river to enable the very narrow footways to be widened and provide opportunities for the introduction of public realm enhancements improving pedestrian access and permeability. Similarly, the area around the River Cam Bridge could be upgraded to | | | 12 |

| | | | | | | |
|---|---|---|--|--|--|----|
| | | | provide improved bus stops and pedestrian environment | | | |
| | | | Allow buses to route one-way inbound only on Silver Street to avoid two buses meeting at the narrowest point. Outbound buses could then be routed via Fen Causeway | | | 12 |
| Pembroke Street and Downing Street | Congestion on approach to St Andrew's Street | congestion caused by traffic waiting to access the Grand Arcade Car Park via Corn Exchange Street. | Improved variable messaging signage to inform car park users of capacity | | | 13 |
| | | | Footway crossing at Corn Exchange Street | | | 13 |
| Lensfield Road | Inadequate link capacity, delays at the Trumpington Street / Fen Causeway Junction, and the narrow right-turn pocket into Tennis Court Road | Congestion and delay at the Catholic Church Junction. Vehicles occupying the right turn pocket into Tennis Court Road prevent larger westbound vehicles from passing. | Conversion of the short-term on-street parking on Lensfield Road (westbound) to a bus lane as far as the Panton Street Junction. It could remain available for parking between the peaks with appropriate enforcement, with bus lanes operational only in the AM and PM peaks. | | | 14 |
| | | | Closure of the right-turn lane into Tennis Court Road would eliminate one source of delay | | | 15 |
| | | | Measures to improve the operation of the junction between Trumpington Street and Fen Causeway could be considered – in particular, rationalisation of | | | 16 |

| | | | | | | |
|-------------------------|--|---|--|--|--|-----|
| | | | pedestrian crossings on Fen Causeway | | | |
| Magdalene Street | Magdalene Street narrows outside Magdalene College necessitating shuttle working. This is provided by giving southbound movements priority. Site observations show that this arrangement is effective under existing conditions. | It is likely that any increase in bus service frequency could increase delays | The proposed Cambourne to Cambridge service may replace the existing service from Madingley Park & Ride should the site close in the future. This would reduce bus movements each way per hour which in turn could be re-allocated to the Cambourne service. | | | N/A |
| | | | Signal control could be considered to increase the throughput of buses, but care would need to be taken to phase these with the Northampton Street / Chesterton Lane / Castle Hill junction. | | | 17 |

5. Summary

This report provides a list of options for improving bus access to the City Centre, summarising the benefits and drawbacks of the options in relation to the wider Cambourne to Cambridge Project. Measures considered have been developed through and are considered to contribute to delivering the scheme aims of providing fast, frequent and reliable journeys between Cambourne and Cambridge. It is considered that the interventions presented in this report have the potential to provide improved access to the City Centre for existing bus services and could be considered in the context of the City Centre Access Study.

The outputs of this report are deliberately high-level at this stage and intended to shape subsequent work by the City Access Study Team and Cambourne to Cambridge Better Bus Journeys Scheme in identifying a combination of interventions that could facilitate a fast, frequent and reliable bus service between Cambourne and Cambridge.

It is recommended that ongoing work for the Study actively considers all interventions presented in this report and explores varying combinations to provide the fastest and most reliable bus journeys into and out of Cambridge. Further work will include analysis of the identified interventions along with stakeholder engagement, journey time analysis, patronage calculations and accessibility assessments. Furthermore, all options taken forward are dependent on a strategic fit with the City Centre Access Programme and a holistic approach underlies the interdependency of the projects as part of an overall bus network approach.

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