Cambourne to Cambridge Better Bus Journeys

Cambourne - Potential Bus Priority

Greater Cambridge Partnership

July 2017

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Executive Summary

This report assesses the proposed bus priority measures that may need to be implemented through Cambourne in order to introduce the proposed Cambourne to Cambridge Scheme through the town. This report has concluded that with a series of bus priority measures and interventions for consideration to provide BRT through Cambourne. Ultimately, measures in Cambourne will be subject to future planning and consideration through the Section 106 process for Cambourne West. This report has considered potential measures that could be put forward as follows:

- **Cambourne West**:
  - Bus priority and a bus-only access from the A1198 between the Caxton Gibbet roundabout and the realigned roundabout to the south via a new junction;
  - A segregated route between the A1198 and the Primary Road through the development to the north east of the central lakes; and
  - Bus-only link from Cambourne West to Cambourne Business Park.
- **Western Gateway**:
  - Installation of a new access road extending west from the Cambourne Business Park to provide connectivity to Cambourne West including a bus priority measure in the form of an access control to only permit access by buses; and
  - Reconstruction of the existing raised tables to provide a more relaxed gradient on approaches in order to improve passenger ride comfort.
- **Internal Gateway**:
  - The installation of a bus priority measure in the form of access control at a point on High Street to allow access by buses only.
- **Eastern Gateway**:
  - The installation of a bus priority measure in the form of access control at the junction with Sterling Way;
  - A new highway corridor comprising of a bus-only access road and adjacent shared surface for pedestrians between Sterling Way and Broadway; and
  - The installation of a bus priority measure in the form of access control at the junction with Broadway to prioritise access of buses.

It is recommended that for the HQPT service through Cambourne to be provided with bus priority in order to achieve quick journey times through the existing streets. The interventions highlighted within the report best serve to facilitate the bus route through Cambourne connecting with the segregated infrastructure to the eastern edge of Cambourne.

The Eastern Gateway provides the best alignment for a bus priority connection between Cambourne and Bourn in terms of journey time, cost and impact on existing built environment of Cambourne.

Within the wider context of highway improvements and proposals, this report has assumed that the A428 between Cambourne and St Neots will be dualled over the coming years and will greatly increase access, reduce delay for existing A428 users.

The interventions discussed within the report would serve to provide an important bus priority element of the overall Cambourne to Cambridge scheme in accordance with the development of the outline business case and GCP Policy and aims. The bus priority measures noted within the report are currently being assessed by the local planning authority within the context of present allocated sites.

1. Introduction

1.1. Background

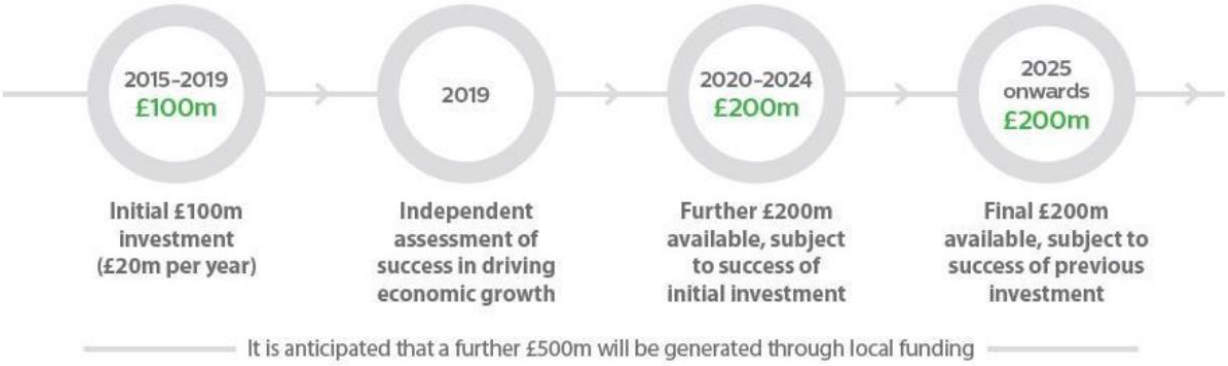
Atkins has been commissioned by the Greater Cambridge City Partnership (GCP) to provide engineering and transport planning support in relation to the Cambourne to Cambridge Better Bus Journeys Project, which is being pursued as part of GCP. In particular, Atkins has been asked to investigate options for the project to route through Cambourne.

The Greater Cambridge City Deal

The Greater Cambridge Partnership (GCP) is an agreement between local organisations and central government which aims to improve economic growth and quality of life in the Cambridge area. It aims to bring £1 billion worth of investment and streamline this into transport in order to facilitate the development of homes and employment. The transport vision includes reducing congestion and improving more sustainable transport options.

A number of schemes are proposed to be funded through the GCP. Tranche 1 schemes, of which the Cambourne to Cambridge Better Bus Journeys scheme is one, have funding available between 2015 and 2020. Tranche 2 schemes have funding available between 2020 and 2025. Figure 1-1 shows the GCP timeline.

Figure 1-1 Greater Cambridge Partnership Timeline

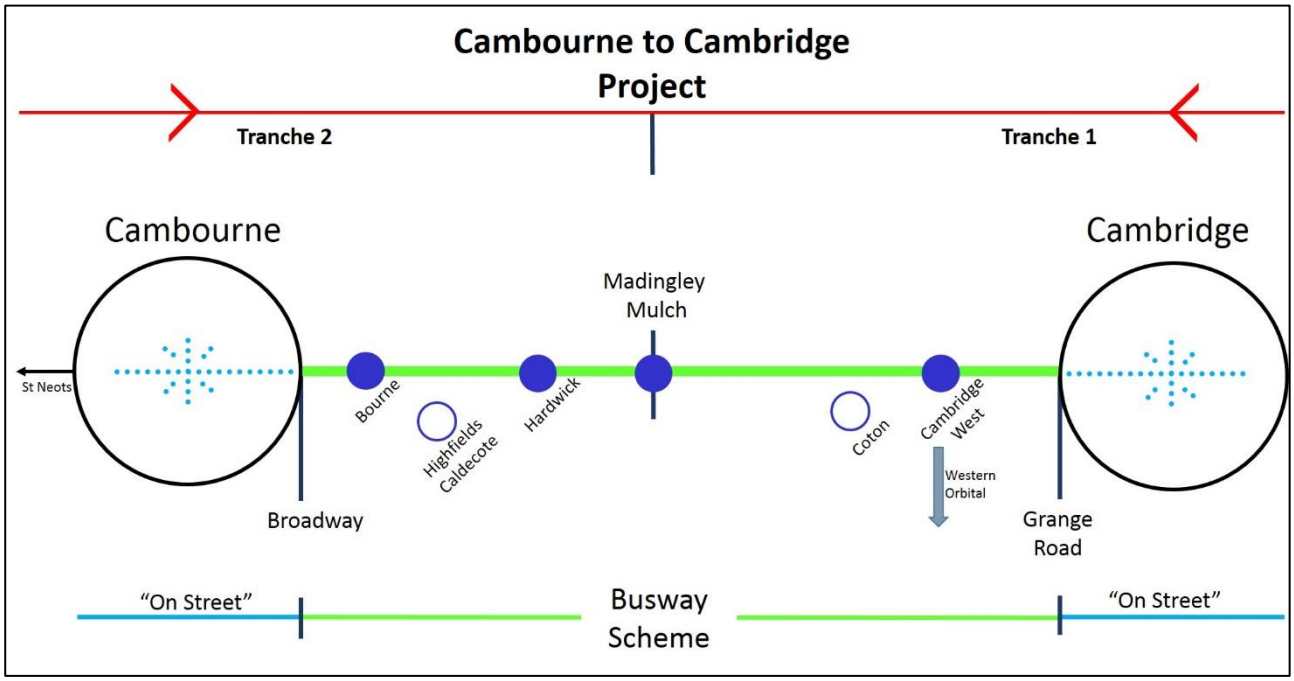


The Project and The Scheme

The Cambourne to Cambridge Better Bus Journeys proposals include a busway which will route between Cambourne to Cambridge from the eastern edge of Cambourne (Broadway) to Grange Road, Cambridge linking with Cambridge West.
It will include a new park and ride site providing interchange facilities within the vicinity of Madingley Mulch roundabout. The guided elements and the works and operations associated with them (including the park and ride site) form what is termed "the Project".

On sections of the route where a segregated is not provided, vehicles will run on street. To improve journey times and reliability a series of highway improvements and bus priority measures have been identified within this report. It is expected these interventions could be delivered through Traffic Regulation Orders (TROs). The elements of the guideway and these additional bus priority and other measures constitute '**the Scheme'**. Whilst these on street measures will benefit scheme buses, they are not for their exclusive use and will benefit all bus services in the corridor. Since they do not form an essential element in allowing scheme buses to gain access to and from the segregated sections, 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 below shows the extent of the proposed project and scheme.

Figure 1-2 Cambourne to Cambridge - The Project and The Scheme



Scheme Objectives

High-level objectives for the Cambourne to Cambridge Better Bus Journeys Scheme are based on a review of policy documents including the Submitted South Cambridgeshire Local Plan, Draft Cambridge City Local Plan, Draft Transport Strategy for Cambridge and South Cambridgeshire, Huntingdon Draft Local Plan and the National Planning Policy Framework. High-level planning objectives are set out as follows:

- To maximise potential for journeys to be undertaken by sustainable modes of transport including walking, cycling and bus;
- To support growth, help create jobs and housing, locate growth in locations that minimise the need to travel and maximise the use of sustainable modes;
- To provide a bus-based HQPT corridor along the A428 connecting Cambridge and St Neots;
- To provide high quality segregated bus priority measures on the A1303 between its junction with the A428 and Queens Road, Cambridge; and
- To provide improved PT links and access along the A428 and A14, in order to enhance economic growth opportunities and connectivity with Milton Keynes, Oxford, Luton / Bedford and the East Coast ports.

Ultimately, the planning objectives are to provide HQPT which:

- Serves key current / future trip generators in the A428 corridor (west of the M11), including Cambourne and Bourn;
- Serves key current / future trip attractors in Cambridge – Cambridge City Centre and other employment sites;
- Intercepts trips from new developments from the outset;
- Provides additional capacity for at least 500 passengers per AM peak hour;
- Attracts a mode share equivalent to 100% of growth in trips due to development and background growth, which may require:
    - A peak service frequency of no less than six buses per hour;
    - Quality of waiting and in-vehicle environments comparable to the existing Guided Busway;
    - Peak journey times no more than the equivalent journey time by car (and preferably less);
    - End to end journey time reliability better than the car alternative; and
    - Results in no growth in delays on the A428 corridor for highway trips.

Work to date

In September 2016, Atkins produced a Strategic Outline Business Case (OBC) which detailed work undertaken on the project to date and set out the Strategic, Economic, Financial, Commercial, and Management Case for the project. Assessments to inform the OBC included the provision of a bus route between Cambourne and Cambridge which served the residents and businesses within Cambourne. Due to the early stage of project development, a preferred route through Cambourne was not presented. The OBC was presented to the GCP Board on 13th October 2013. The Board also considered representations and comments from stakeholders and members of the public received at consultation.

As part of ongoing work the GCP Board have instructed investigation of route option (Option 3a). This work is requires understanding of the feasibility of routes through Cambourne. This report provides a review of potential design considerations within Cambourne that would facilitate the delivery of the Cambourne to Cambridge Better Bus Journeys Project.

1.2. Purpose

The purpose of this report is to inform the work being undertaken, based upon instruction from the GCP Executive Board 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'.*

In addition to those of Option 1 and Option 6, this report is intended to provide a prioritised list of defined options for improving bus access through Cambourne, summarising the benefits and drawbacks of the options in relation to the wider Cambourne to Cambridge Better Bus Journeys project, whilst also identifying locations for potential bus stops. Measures considered below have been developed through discussions with South Cambridgeshire District Council and Cambridgeshire County Council and are considered to contribute to delivering the scheme aims of providing fast, frequent and reliable journeys between Cambourne and Cambridge.

1.3. Policy

National, Regional and Local Policy has been analysed to highlight guidance relevant to the provision of improved bus provision in Cambourne. Table 1-1 summarises the findings.

Table 1-1 Policy Guidance relevant to bus interventions in Cambourne

Policy	Guidance relevant to bus interventions in Cambourne
National Planning Policy Framework (NPPF, March 2012)	Section 4 of *Delivering sustainable development* is focussed on *promoting sustainable transport*. It recognises that transport policies have an important role to play in facilitating sustainable development, but also in contributing to wider sustainability and health objectives. It states that the transport system needs to be balanced in favour of sustainable transport modes, giving people a real choice in how they travel. It also recognises the importance of giving priority to pedestrian and cycle movements, and **to ensure developments have access to high quality public transport facilities.**
South Cambridgeshire Local Plan (2014): Proposed Submission (2013)	Chapter 10, *Promoting and Delivering Sustainable Transport and Infrastructure* recognises that the transport choices made by individuals mare a key factor in achieving sustainable development, and can have a direct impact, through congestion and vehicle emissions, on quality of life and the environment. It states that the transport system should be balanced in favour of sustainable modes; namely walking cycling and public transport. *Policy SS/6: New Village at Bourn Airfield* - Included within the measures to deliver *Significant improvements to Public Transport*, is reference to **a segregated bus link from Cambourne to the new village of Bourn Airfield, across the Broadway.**

Policy	Guidance relevant to bus interventions in Cambourne
	Policy SS/8: Cambourne West - It is stated that together with development at Bourn Airfield, **extensive off-site transport infrastructure provision** will be required to mitigate transport impacts, particularly between the new village and Cambridge.
Cambridge Local Plan (2014): Proposed Submission (July 2013)	*Policy 80*: (a) recognises the importance of major developments being supported by high quality public transport, linking to Cambridge City Centre and major centres of employment.
Long Term Transport Strategy (July 2015)	The vision of the Long Term Transport Strategy is that *'more traffic will access rural hubs or P&R sites for efficient reliable onward travel to key destinations'*. A number of transport schemes are highlighted as being required in order to achieve the vision, including segregated bus links through West Cambourne and Bourn Airfield. '***Segregated bus link from the A428 at Caxton Gibbet through the West Cambridge site, linking to Great Cambourne by the Cambourne Business Park and School Lane Lower Cambourne'*** is identified as a scheme '*required to directly support the delivery of major development allocations in current and emerging local plans'*.
Transport Strategy for Cambridge and South Cambridgeshire (March 2014)	*Policy TSCSC 8: Improving bus services* of the TSCSC states that the County Council will work with partners and passenger transport operators to develop an improved and integrated network of High Quality Passenger Transport, and specifically references an intervention on the St Neots and Cambourne to Cambridge corridor. It states that with no railway line along this corridor the focus for HQPT will be by bus and, pertinent to Cambourne, lists an *Eastbound bus priority through the A428 / A1198 Caxton Gibbet roundabout* and *A1303 busway* / ***HQPT infrastructure to serve Bourn Airfield / Cambourne as interventions to create a HQPT corridor***. The interventions on the St Neots/ Cambourne to Cambridge corridor are also referenced in the Action Plan, which identifies among other interventions *'segregated bus links from the A428 at Caxton Gibbet to Bourn Airfield through the West Cambourne site*, and a '*segregated bus link from Cambourne to Bourn Airfield'*. *Policy TSCSC 21: Planning Obligations for Bourn Airfield and West Cambourne* states that a **comprehensive approach will be used to secure provision of infrastructure and improvements in a timely manner to ensure that accessibility is maintained. It highlights that in addition to mitigation of site specific and network impacts, developers will be expected to make provision for interventions including a busway between West Cambourne and the junction of the A1303/ A428**.
The Greater Cambridge City Deal (GCP)	Tranche One of the City Deal, from 2015 to 2020, identifies the Cambourne to Cambridge Better Bus Journeys Scheme, among others, as major transport interventions with a view to increasing travel capacity at these interchanges. A backbone to the strategy is a transport network to link areas of population and employment within the GCP area.

The review of current policy in Table 1-1 provides a clear steer on considerations for a HQPT network which incorporates the area of Cambourne including references within the South Cambridgeshire Local Plan (2014), The Local Transport Plan 3 (2011 – 2031), The Long Term Transport Strategy (LTTS; July 2015) and the Transport Strategy for Cambridge and South Cambridgeshire (March 2014).

1.4. Study Area

Cambourne is a relatively new settlement which has been developed on former agricultural land over the last 20-30 years, with the civil parish of Cambourne being in existence since 2004. The settlement is bordered to the north by the A428, with open land currently bordering the east, south and west (with the A1198 beyond). Three areas currently make up the parish of Cambourne, namely Great Cambourne, Lower Cambourne and Upper Cambourne, with further proposed residential development at the western gateway (Cambourne West).

Cambourne is a residential led development including amenities such as a supermarket, petrol filling station, schools, sports centre, retail units and other facilities. Cambourne Business Park, situated close to the Cambourne Road / St Neots roundabout provides key employment sites within the settlement. Many of the streets have been designed to minimise vehicular speeds though use of traffic calming, narrow carriageways and varying alignments. The principle vehicular route through Cambourne connects the A428 (at the Cambourne Road/ St Neots junction) to the A1198 via Cambourne Road, Broad Street, and School Lane.

There are existing bus routes that serve Cambourne and the level of provision at each stop differs between a simple flag attached to a nearby lamppost to an individual flag and bus shelter, with road markings only being provided at some bus stops. In addition, a clear and direct access path and waiting area for passengers is not always present, with a few stops having no direct access as they are bounded by the carriageway and a deep drainage ditch, meaning users are required to walk across or along the road to access the bus.

Six key areas were identified for consideration and are summarised below.

- **Cambourne West Development (proposed)** – to provide connectivity to Cambourne for services originating from Caxton Gibbet roundabout, Papworth Everard and St Neots further afield;
- **Western Gateway** – to provide improved connectivity between Cambourne and Cambourne West;
- **Internal Gateway** – to provide improved service and passenger experience within Cambourne;
- **Eastern Gateway** – to reduce bus journeys times by providing access to the external highway network at the eastern extent of Cambourne;
- **Greater Cambourne** – potential access from Greater Cambourne to the south of the town to Bourn Airfield; and
- **Bus infrastructure** – to provide better levels of provision and amenity for bus passengers.

The existing layout of Cambourne, in the context of the areas identified above, is presented in Figure 1-3.

Figure 1-3 Location Plan

Source: Cambourne West Masterplan: http://www.cambournewest.com/masterplan.html

1.5. Report Structure

The remainder of this report summarises the considerations used to determine the feasibility of these interventions. Each chapter identifies the existing arrangement, existing constraints and design options for each location.

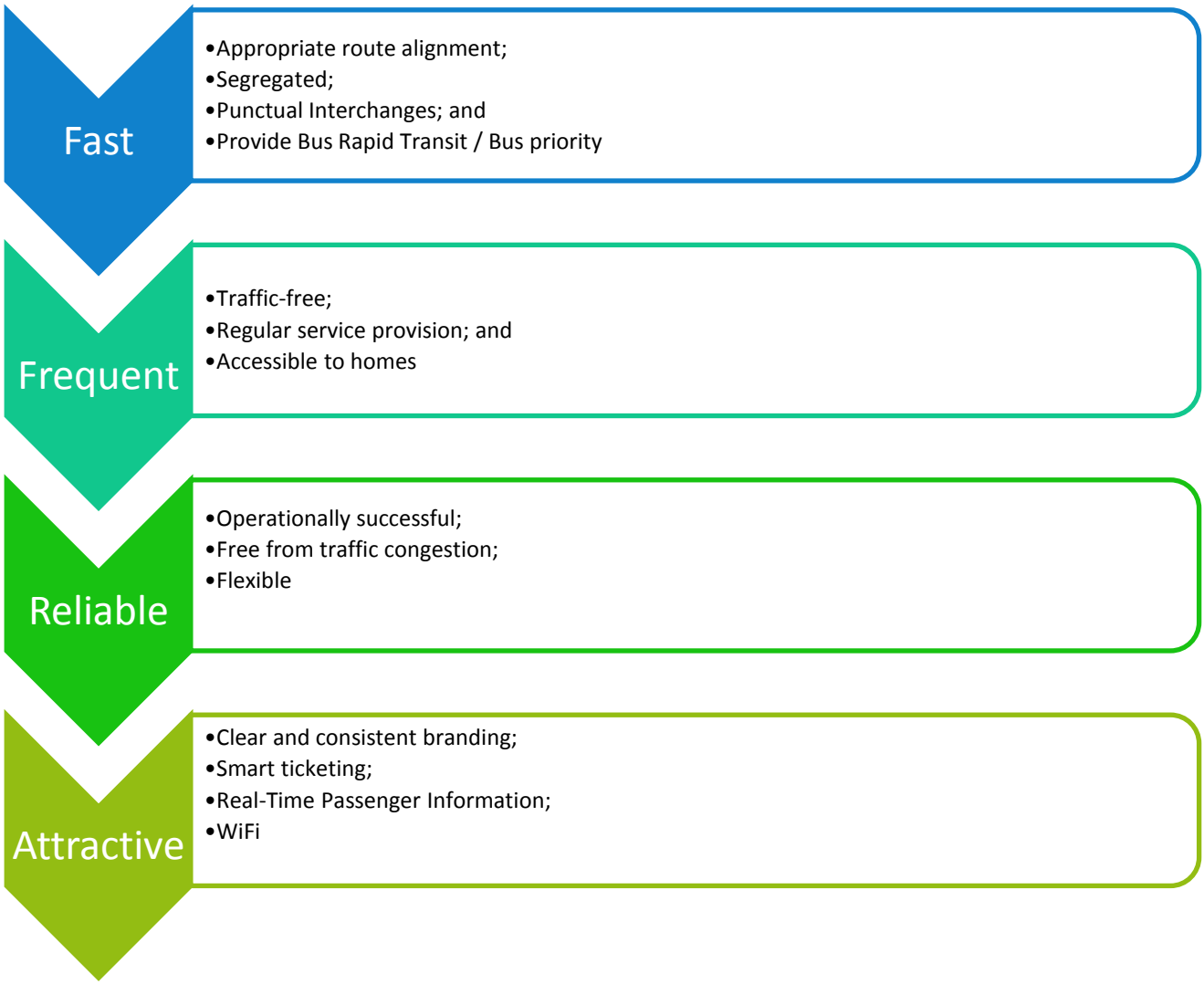
The remainder of this report is structured as follows:

- Chapter 2 identifies the key characteristics of High Quality Public Transport and Bus Rapid Transit (BRT);
- Chapter 3 outlines the proposals for the Cambourne West Development and explores possible design considerations for providing BRT through the development;
- Chapter 4 outlines the existing situation and constraints in the Western Gateway along with possible design interventions for providing BRT;
- Chapter 5 outlines the existing situation and constraints in the Internal Gateway along with possible design interventions for providing BRT;
- Chapter 6 outlines the existing situation and constraints in the Eastern Gateway along with possible design interventions for providing BRT;
- Chapter 7 outlines the existing situation and constraints in Great Cambourne along with possible design interventions for providing BRT;
- Chapter 8 provides a summary of recommended design considerations and interventions;
- Chapter 9 summarises improvements and design considerations concerning bus infrastructure; and
- Chapter 10 provides a summary and conclusion of design considerations and interventions in Cambourne.

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

A key consideration in developing interventions through Cambourne 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, an HQPT intervention would be by bus rapid transit (BRT) only, owing to the lack of a parallel railway service. 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 assessed with regard to the characteristics presented in Figure 2-1, engineering feasibility and high-level environmental impact in the following sections of the report. It is important to note that characteristics of HQPT and BRT are not limited to speed and segregation and that HQPT can be integrated within existing infrastructure and services through providing bus priority and an attractive service. 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 set out in Table 1-1 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	*Target standard – required for HQPT with **BRT***	*Minimum standard – required for HQPT with **BUS PRIORITY***
	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, HQPT and Bus Priority in Cambourne

Existing bus services in Cambourne use the existing highway network including Broad Street, High Street, School Lane and Jeavons Lane. The buses that use these routes are subjected to delay from local traffic, parked cars, alignment of residential streets which can affect the reliability of those services. The existing highway layout in Cambourne does not lend itself to providing solely for BRT through the whole conurbation due to the high housing density and existing highway alignments. It is therefore more pertinent to concentrate on bus priority measures to achieve attaining a level of HQPT through Cambourne.

HQPT can be provided for through Cambourne 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 HQPT service. The remainder of this report explores interventions which could facilitate HQPT in Cambourne including the identification of potential measures to provide bus priority and improve passenger experience and ride comfort.

3. Cambourne West

3.1. Proposed Development

On the 11th January 2017 outline permission was granted for the development of 2,350 homes and associated facilities at Cambourne West, to the south of the A428, east of the A1198 and west of Lower Cambourne. The approved masterplan is shown in Figure 3-1.

Figure 3-1 Cambourne West Masterplan

Source: http://www.cambournewest.com/masterplan.html

Figure 3-1 shows that vehicle access to the new Cambourne West Development will be via Sheepfold Lane and a realigned roundabout on the A1198, north of Caxton. A separate access for the north western employment area will be provided from the A1198 south of Caxton Gibbet Roundabout. Pedestrian links will be created at a number of locations between Cambourne West and Lower Cambourne.

Within the development a Primary Route is proposed to run between the realigned roundabout on the A1198 and Sheepfold Lane. Two secondary routes, to the north and south of the Primary Route provide access to residential areas. These routes will also serve local bus services to ensure that routes and bus stops are within 400 metres of all residential properties.

3.2. South Cambridgeshire Local Plan: Proposed Submission (July 2013)

Access and transport requirements for the Cambourne West development are outlined within the South Cambridgeshire Local Plan (July 2013) under Policy SS/8 (Cambourne West). With regards to access by bus, the Local Plan states that the development will need to address:

- *"any measures necessary to ensure that a bus journey between Cambourne West and the junction of the A428 and the A1303 is direct and unaffected by any congestion suffered by general traffic;*
- *Direct, segregated, high quality pedestrian and cycle links to West Cambridge, Papworth Everard, Caxton and Bourn; and*
- *Bus prioritisation measures, including a bus link from one of the roundabouts on the Caxton bypass through the Cambourne West site, linking through to Great Cambourne by the Cambourne Business Park".*

It is considered that the aims of the Cambourne to Cambridge Better Bus Journeys Project to provide a fast, frequent and reliable bus service between Cambourne and Cambridge, including the proposed development of Cambourne West, adhere to the requirements of the South Cambridgeshire Local Plan.

With these polices in mind, this assessment considers three route alignment options through Cambourne West which are presented and analysed in the following sections.

3.3. Existing Arrangements

The following describes the existing arrangements on the site of the proposed Cambourne West Development. Photographs are included in Appendix A1.

The Cambourne West Development site is currently open farmland and is bordered by the A428 to the north, A1198 to the east and south and Lower Cambourne to the east. Cambourne Business Park and Cambourne Village College are located to the north east of the site and are accessed by separate access routes from Cambourne Road. Sheepfold Lane currently provides vehicular access to the college only and has been identified as the future main access to the Cambourne West development from the east. The route through Cambourne Business Park has good pedestrian and cycle infrastructure in place. At the present time it is not intended to provide access to the new development but has potential to become a future access, whether for vehicles or non-motorised modes.

Within the northern section of the proposed site lies the old A428 alignment which is accessed via the A1198 to the south of Caxton Gibbet Roundabout. At present the route is accessible for 1.4km along the northern boundary of the site and provides access to industrial uses and Swansley Wood Farm. Close to its junction with the A1198 the route is two-way single carriageway. Approximately 300 metres from the A1198 the route begins to narrow to the extent that two vehicles would be required to slow to pass one-another.

The A1198 is a two-way single carriageway road that bypasses the village of Caxton to the west and south of the development site. A roundabout is located to the south west of the site and provides access to Caxton to the south and Lower Cambourne to the east. The Cambourne West Development proposals include the realignment of this roundabout to provide primary access to the development from the south.

The existing site layout is shown in Figure 3-2.

Figure 3-2 Cambourne West Existing Site

(Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation)

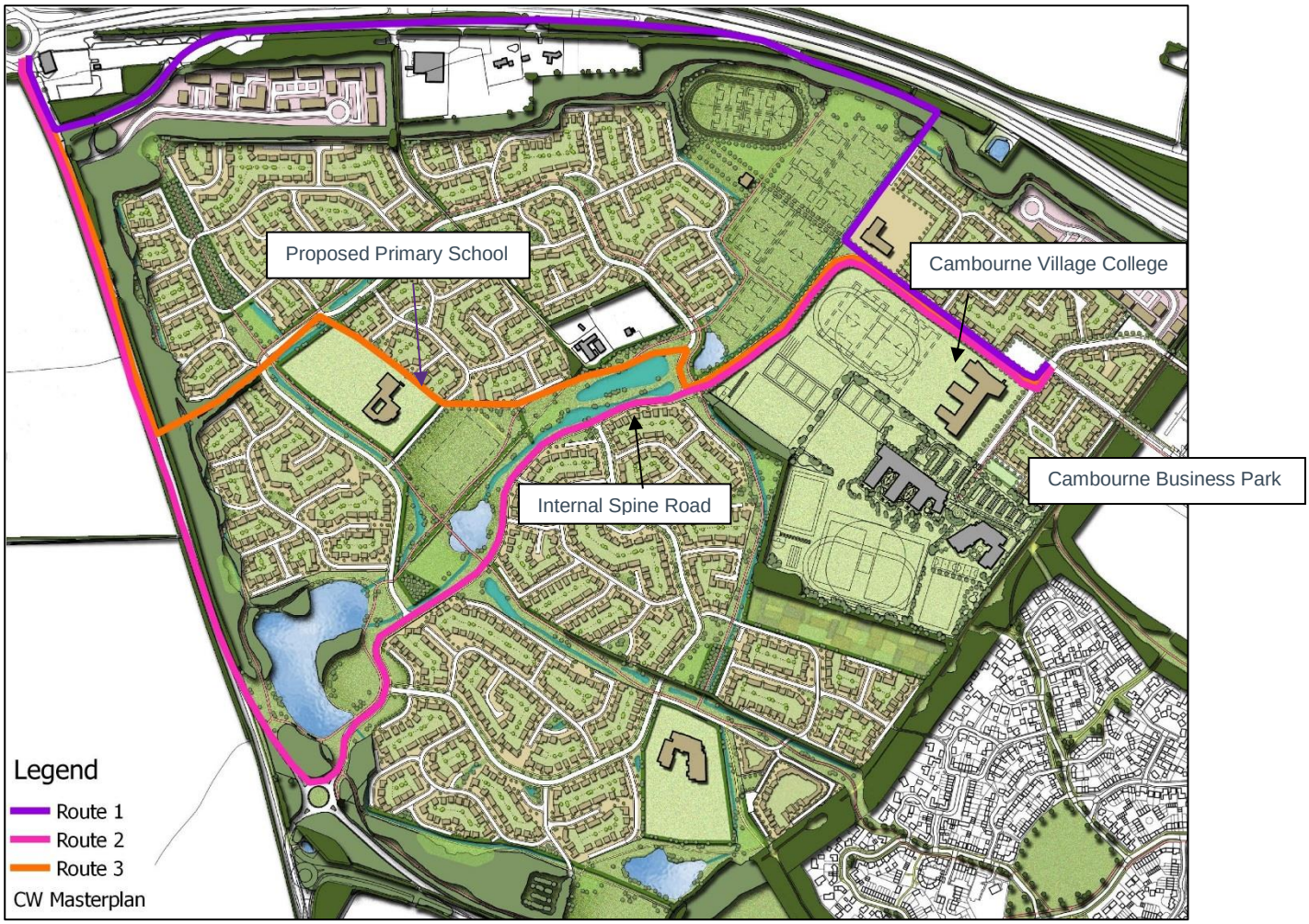
3.4. Design Considerations

The following design options have been considered within Cambourne West:

- **Option 1:** The old A428 alignment to the north of the development site;
- **Option 2:** The A1198 to access the development site from the southern roundabout; and
- **Option 3:** The A1198 to access the development site via a new junction.

The following paragraphs will explore these options in further detail. Potential route alignments are shown on Figure 3.3 overleaf: and contained in Appendix C.

Figure 3-3 Cambourne West – Proposed Options for BRT route



Source: Cambourne West Masterplan

Option 1: Old A428

The old alignment of the A428 runs adjacent to the current A428 and is accessible from the A1198 in the form of a T-junction. It provides access to commercial and residential properties. The first option for the Cambourne to Cambridge Better Bus Journeys Project through Cambourne West utilises this junction and existing road to access the development and Cambourne Business Park. Design considerations have the potential to facilitate bus services in the following ways:

- Bus priority at the A1198 / old A428 junction;
- Parking restrictions along old A428 close to the junction with A1198 where vehicles currently park to access the service station;
- Widening of existing route to allow for comfortable two-way movements along with cycle and pedestrian infrastructure;
- Bus-only link with pedestrian and cycle infrastructure to provide access to the primary route through the development site via a bus-priority junction; and
- Bus-only link with pedestrian and cycle infrastructure from Cambourne West to Cambourne Business Park.

It is considered that this route option would provide fast and reliable journey times between Caxton Gibbet Roundabout and Cambourne Business Park with the potential to provide a stop in the proposed Cambourne West square located adjacent to Cambourne Village College.

Option 2: A1198

Under the development proposals for Cambourne West the A1198 roundabout, north of Caxton Gibbet is to be realigned to provide access to the development. Route option 2 would seek to run buses from the Caxton Gibbet roundabout along the A1198 and into the Cambourne West development via the realigned roundabout. Buses would navigate along the Primary Road within the development to Cambourne Business Park. Design considerations have the potential to facilitate bus services in the following ways:

- Bus-only link from Cambourne West to Cambourne Business Park.

It is considered that this route option would provide maximum patronage potential within the new development. The route has the potential to serve a number of bus stops within the development. Due to the longer length of the route alignment it is likely that journey times, and to some extent passenger ride comfort, would be compromised to achieve the higher level of patronage.

Option 3: Hybrid

Option 3 consists of providing a bus-only access into Cambourne West from the A1198 between Caxton Gibbet roundabout and the realigned roundabout to the south. The segregated route would align adjacent to the proposed school within the development and through the central green corridor before accessing Cambourne Business Park via the Primary Road. Design considerations have the potential to facilitate bus services in the following ways:

- Bus priority and a bus-only access from the A1198 between the Caxton Gibbet roundabout and the realigned roundabout to the south;
- A segregated route between the A1198 and the Primary Road through the development to the north east of the central lakes; and
- Bus-only link with pedestrian and cycle infrastructure from Cambourne West to Cambourne Business Park.

Catchment

Catchment areas are related to patronage of a scheme and how likely individuals are willing to travel to a bus route. The minimum desirable distance for a bus stop from a resident's property is 400m according to guidelines developed by the Institute of Highways and Transportation (IHT[1]). However, observed evidence from the Cambridgeshire Guided Busway[2] indicates that users are willing to walk further to access a BRT facility. For the Cambridgeshire Guided Busway there is evidence that people will walk upwards of 800m to reach the service. As bus stop locations are yet to be determined the catchment areas have been calculated using option routes and associated buffer zones which may mean the amount of properties within the 800m catchment area may be less depending on the locations of the bus stops.

Table 3-1 outlines the approximate catchment area of residential properties within 800m of each of the three options. Option 1 has the smallest catchment due to the BRT nature of the route to the north of Cambourne West. Options 2 and 3 have a similar catchment area of approximately 80% (1,900 residential properties) which suggests the two options will gain larger amounts of patronage.

Table 3-1 Route Catchment Area

Route	Percentage of Houses within 800m Catchment	Total amount of Houses within 800m Catchment
Option 1	40%	950
Option 2	79%	1850
Option 3	80%	1900

[1] "Guidelines for Providing for Journeys on Foot" – The Institution of Highways and Transportation (2000)
[2] "Cambridgeshire Guided Busway Post-Opening User Research" – September 12th 2012

Summary

It is considered that although the Option 1 outlined above adheres to the scheme aims to be fast, frequent and reliable, it is unlikely to attract a large catchment from Cambourne West. Option 2 has the potential to capture a larger proportion of the development however at the expense of fast journey times. For this reason, it is recommended that interventions associated with Option 3 are the most favourable to provide bus services via the Cambourne West Development in the first instance as it offers a balance between provision of a fast, frequent and reliable service and the potential to capture a large proportion of the population. Suitable location of bus stops along this route will help keep journey times to a minimum.

4. Western Gateway

The Western Gateway area covers the west of the existing area of Cambourne, including the existing Business Park and Lower Cambourne to the south. The Business Park is accessed from the Cambourne Road roundabout. Cambourne Village College and Fifth Primary School are located within the Western Gateway area, vehicle access for these two schools is currently via Sheepfold Lane with pedestrian and cycle access via Swansley Lane.

Lower Cambourne is accessed from Broad Street and School Lane from the east and from the A1198 to the south west. This is a predominantly residential area with associated facilities including a Local Centre. Pedestrian routes are available for access to Cambourne Village College and adjacent Primary School.

Two routes have been identified which present an opportunity to connect Cambourne with the proposed Cambourne West development site via existing highway infrastructure and consistent with the current Cambourne West Masterplan:

- In line with the proposed main vehicular access along Sheepfold Lane; and
- Bus-only access via Cambourne Business Park.

Sheepfold Lane forms the outline consented all-vehicle eastern access to Cambourne West although an alternative access via the business park is being investigated. Uncertainty over the nature of the business park access is a risk to achieving fast, frequent and reliable journey times along this stretch of the route.

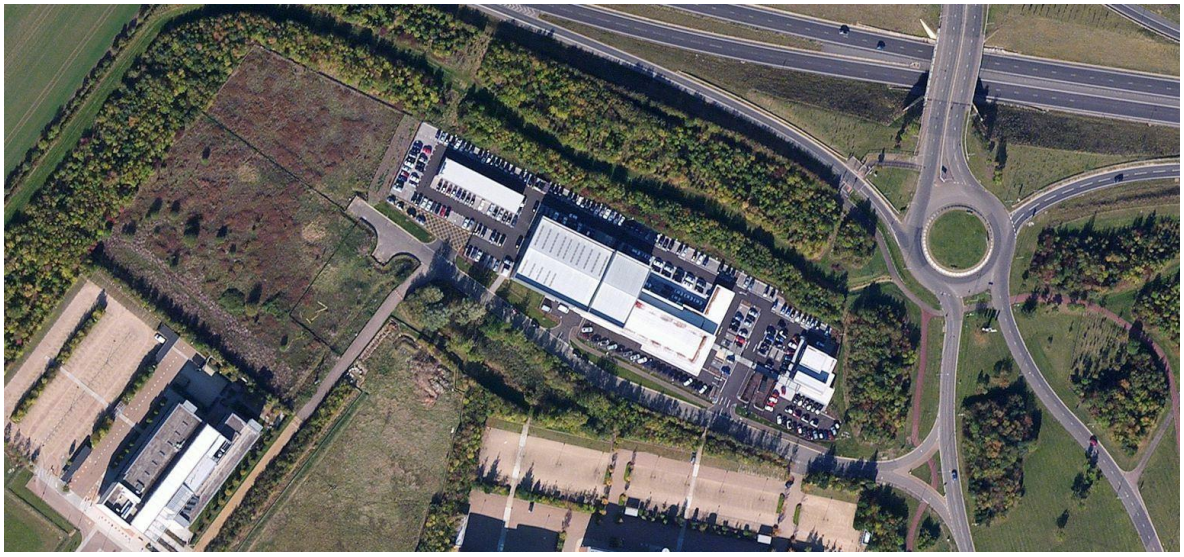
4.1. Sheepfold Lane

Existing Arrangement

The following information provides a summary of the existing arrangement along the proposed route. Photographs of the existing arrangements are presented in Appendix A2.

Sheepfold Lane extends west from Cambourne Road and provides access to Cambourne Village College and business premises. It is a two-way single carriageway approximately 450 metres in length and 7.3 metres in width. Its junction with Cambourne Road is a priority controlled junction. The highway is bounded to the north by a car dealership and open land and to the south predominantly by business premises. Sheepfold Lane is located within a derestricted speed limit zone and only lit by column mounted street lighting for the first 30 metres from Cambourne Road. A footway of approximately 1.8 metres wide is located on the northern side of the carriageway extending 200 metres from Cambourne Road, beyond this there is no footway provided. There are no parking or loading restrictions present but due to its location little or no parking was observed during a site visit on 26th August 2016.

Figure 4-1 Sheepfold Lane



(Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation)

Existing Constraints

The following information provides a summary of the existing constraints along the route corridor. These are also presented in Plan 4-1 in Appendix B:

- The land either side of Sheepfold Lane is bounded predominantly by commercial properties each of these having a private access by means of vehicular crossover or minor access road;
- The junction with Cambourne Road only provides a left turn out or left turn in as this section of Cambourne Road is one-way northbound;
- A footway is only provided for a short distance at the eastern end of Sheepfold Lane and therefore does not provide a continuous pedestrian link;
- Street lighting is only provided for a short distance at the eastern end of Sheepfold Lane and therefore does not provide a continuous link;
- A raised table providing an equestrian crossing is located at the western extent of Sheepfold Lane;
- A 20 mph zone is imposed at the western extent of Sheepfold Lane at the commencement of access to the Village College; and
- Sheepfold Lane is currently identified as one of the primary access routes to the Cambourne West development site and as such will see a significant increase in vehicle trips to that currently observed.

The layout of Cambourne Road and Sheepfold Lane are proposed to be reconfigured as part of the proposals for the Cambourne West Development (S/2903/14/OL – Drawing PL01 'Proposed A428 Southern Roundabout & Sheepfold Lane Access Modifications'). The proposals retain the one-way nature of Cambourne Road.

Design Interventions

The following design interventions have been explored at Sheepfold Lane. These options are not exhaustive and represent possibilities for each route as presented in Plan 4-2 in Appendix C. Measures identified are considered feasible with or without the proposals outlines for Cambourne West.

- A bus priority measure in the form of access control at the western end of Sheepfold Lane could be installed to prioritise the access of bus services along this route. However, as the highway infrastructure for Cambourne West has not yet been concluded a solution cannot be identified nor indeed the potential effectiveness assessed. Furthermore, as Sheepfold Lane has been identified as a primary access route for Cambourne West any proposals would need to consider or incorporate general traffic as part of the design;

- The introduction of a segregated bus route is not viable due to the restrictive width of the existing highway corridor, as such on-road provision could only be accommodated for this route option;

- The introduction of a shared surface for pedestrians and cyclists along the entire route would need to be implemented if the proposals for Cambourne West did not come forward. It is also recommended that this route could be lit by a series of street lights for its entire length;

- The installation of a bus priority measure in the form of traffic signals at the eastern end of Sheepfold Lane could be introduced to prioritise the egress of bus services onto Cambourne Road. However, the existing highway corridor may not be of sufficient width to accommodate the additional road space required to enable buses to bypass any predicted queue lengths during peak periods associated with trips generated by the Cambourne West development. This is further compounded by the existing highway geometry where all vehicles are required to turn left onto Cambourne Road and circumnavigate the A428 junction before returning into Cambourne for continuation of their route; and

- The introduction of a new bus-only access route extending east from Sheepfold Lane between the northern and southern links of Cambourne Road addresses any concerns associated with the potential circumnavigation of the A428 junction. Priority could be given to buses by introducing traffic signals on both links of Cambourne Road but is wholly reliant on the ability to introduce bus priority measures on the approach from Sheepfold Lane.

Summary

As identified above, a number of interventions could be implemented to provide better access by buses along this route corridor, but due to the influences of other elements, including an increase in traffic as a result of the Cambourne West proposals, there is a risk associated with the effectiveness of this corridor as a viable option to provide BRT, as such we would not recommend Sheepfold Lane as a primary access route.

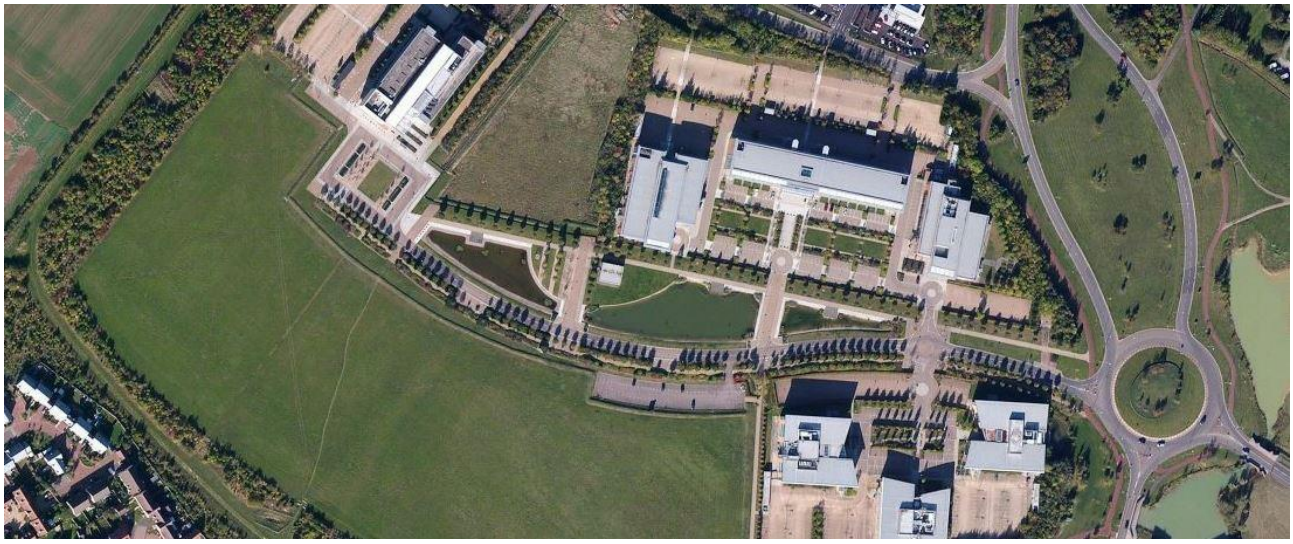
4.2. Cambourne Business Park

Existing Arrangement

The following information provides a summary of the existing arrangement along the proposed route. Photographs of the existing arrangements are presented in Appendix A3.

Cambourne Business Park extends west from Cambourne Road and provides access to multiple business premises. It is a two-way single carriageway approximately 525 metres in length and 7.3 metres in width. Its junction with Cambourne Road is via a large four arm roundabout. The highway is bounded to the north by landscaped areas fronting business premises and to the south by business properties beyond a shared pedestrian and cycle surface and landscaped areas. Cambourne Business Park is located within a 20mph speed limit zone and lit by column mounted street lighting for the entire length. A footway of approximately 3.0 metres wide is located to the north of the carriageway beyond a wide landscaped area and a pedestrian & cycle surface of approximately 3.5 metres on the southern side. There are no parking or loading restrictions present but due to its location little or no parking is observed. Two bus stops are provided on the northern side of this route, each having shelters.

Figure 4-2 Cambourne Business Park



(Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation)

Existing Constraints

The following information provides a summary of the existing constraints along the route corridor as are presented in Plan 4-3 in Appendix B.

- The land either side of this route is bounded predominantly by commercial properties each of these having a private access by means of vehicular crossover or minor access road; and
- Raised tables are located at the intersection of each junction to improve pedestrian permeability and reduce vehicle speeds, as such these may affect passenger ride comfort when being traversed.

Design Interventions

The following information provides a summary of design interventions considered, with one or more options being implemented at any one time. These options are not exhaustive and represent possibilities for each route as are presented in Plan 4-4 in Appendix C.

- The installation of a new access road extending west from the Cambourne Business Park could provide connectivity with the Cambourne West development. The route could incorporate a bus priority measure in the form of access control to only permit access by buses.
- Reconstruction of the existing raised tables to provide a more relaxed gradient on approaches could have the benefit of improving passenger ride comfort; and
- The introduction of a segregated bus route is not recommended due to the character and nature of this route corridor, as such on-road provision should be considered for this route option.

Summary

Combined with a new bus-only access road from Cambourne West, the existing infrastructure provision already in-situ along this route corridor minimises the extent of change necessary to facilitate a BRT service. This route also addresses potential patronage by passing through a key employment area as well as close to the existing Cambourne Village College and Primary School. As such we would recommend the Cambourne Business Park route as a primary access route.

5. Internal Gateway

The Internal Gateway covers the area of the village to the east of Cambourne Road and Broad Street. The area to the south of High Street consists of predominantly residential properties. Broad Street consists of a mixture of residential and business uses including a supermarket. Monkfield Park Primary School is located to the south of Broad Street, off School Lane.

The area to the east of Cambourne Road includes a number of retail uses, the Cambridge Belfry Hotel and residential properties.

Two routes have been identified which present an opportunity to provide an internal gateway for buses within the Cambourne development site:

- Cambourne Road to Back Lane; and
- High Street.

5.1. Cambourne Road to Back Lane

Existing Arrangement

The following information provides a summary of the existing arrangement along the proposed route. Photographs of the existing arrangements are presented in Appendix A4.

Cambourne Road to Back Lane is an existing open space providing public amenity and access provision forming part of the wider pedestrian and cycle network. It is approximately 525 metres in length and varies in width between 20 metres and 40 metres. The route commences from the southbound arm of Cambourne Road, heading east it then crosses New Hall Road before ending at Monk Way and Back Lane. The route is bounded to the north by residential properties and to the south by the Belfry Hotel complex and residential properties. A footpath of approximately 2.5 metres in width runs the entire length of the route with multiple paths extending from it providing further access to residential properties and connectivity to the wider area.

Figure 5-1 Cambourne Road to Back Lane

(Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation)

Existing Constraints

The following information provides a summary of the existing constraints along the route corridor as are presented in Plan 5-1 in Appendix B:

- The entire route has been designated as a Wildlife Trust Nature Reserve with areas of open grassland and reed beds. It is assumed the areas of reed bed are used to provide attenuation of surface water during intense storm periods;
- A small play area is present and located to the east of the junction with New Hall Lane and provides local amenity;
- A number of residential properties that bound the route directly front the open space and will therefore use it as their primary access point; and
- Two large mature trees are located at the eastern end of the route and may restrict access opportunities.

Design Interventions

The following information provides a summary of design interventions considered, with one or more options being implemented at any one time. These options are not exhaustive and represent possibilities for each route as are presented in Plan 5-2 in Appendix C.

- A bus priority measure in the form of access control at the western end of this route could be installed to prioritise the access of bus services to and from Cambourne Road;
- A new highway corridor comprising of a bus-only access road and adjacent shared surface for pedestrians and cyclists could be introduced between Cambourne Road and Back Lane. However, the combined width may result in its proximity to existing dwellings being an unacceptable loss of local amenity;
- The installation of a bus priority measure in the form of traffic signals at the junction of New Hall Lane could be introduced to prioritise the access of bus services along this route; and

- The installation of a bus priority measure in the form of traffic signals at the eastern end of this route option could be introduced to prioritise the access of bus services to and from Back Lane.

Summary

As identified, a number of interventions could be implemented to provide access by buses along this route corridor. However, the viability of this route option is somewhat dependent upon the potential of Sheepfold Lane as a bus route for more direct access to it (see Section 4.1 above). Furthermore, the introduction of a new highway corridor at this location could be detrimental to existing local amenity and open space, as such we would not recommend this as a viable option.

5.2. High Street

Existing Arrangement

The following information provides a summary of the existing arrangement along the proposed route. Photographs of the existing arrangements are presented in Appendix A5.

High Street, between its junctions with Monkfield Lane and Sackville Way, is a narrow two-way single carriageway of approximately 185 metres in length and varies between 4.5 metres and 7.3 metres in width. The central section is a level surfaced single carriageway with passing places, with priority given to westbound traffic. The High Street is situated adjacent to the central retail area and is bounded to the north by retail units, open landscaped areas and commercial properties. To the south the highway is bounded predominantly by landscaped areas with residential premises beyond and a public house with a car park. This section of the High Street is located within a 30mph speed limit zone and lit by column mounted street lighting for the entire length. A footway of approximately 2.0 metres wide is located on the southern side of the carriageway for its entire length. On the northern side of the carriageway a wide footway fronts the retail and commercial properties at either end.

A bus stop with a shelter is present only on the southern side of the carriageway. Lay-bys for servicing and parking are located at either end of the road within the wider two-way sections, with waiting and loading restrictions in the form of double yellow lines protecting the approaches to the junctions at either end.

Figure 5-2 High Street

(Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation)

Existing Constraints

The following information provides a summary of the existing constraints along the route corridor as also presented in Plan 5-3 in Appendix B:

- High Street reduces in overall width to a single carriageway for 70 metres of its length with priority given to westbound vehicles;
- Bus infrastructure in the form of bus stops and shelters are only present on the southern side of the route;
- High level of pedestrian footfall crossing High Street has the potential to cause delay to buses;
- A continuous footway is not provided on the northern side of High Street; and
- Access by delivery vehicles to service commercial and retail premises is required.

Design Interventions

The following information provides a summary of design option considered as presented in Plan 5-4 in Appendix C.

- A bus priority measure in the form of access control on High Street could be installed to prioritise the access of bus services along this route. The location would need to consider existing kerb side activities such as servicing and parking as well as access to the public house car park. General traffic could be redistributed along existing nearby routes with minimal disruption to journey times.

Summary

This route option provides a new bus-only access within the Cambourne central retail and commercial area with minimal disruption to existing traffic patterns. This will improve accessibility as well as provide more direct bus service for passengers. This route has the potential to aid the development of land either side of High Street and provide more passing trade for existing businesses. As such we would recommend the High Street as a preferred access route with a stop providing pedestrian access to the retail and commercial units.

6. Eastern Gateway

Upper Cambourne lies within the Eastern Gateway and predominantly consists of residential properties.

Upper Cambourne can be accessed via Back Lane and High Street. Pedestrian routes through the development provide access to the Broadway and Bourn Airfield further afield. Jeavonswood Primary School is located to the west of Upper Cambourne and is accessed via Eastgate. The Vine Primary School is located to the east of Upper Cambourne and is accessed via Brace Dein.

One route has been identified extending between Sterling Way and Broadway which presents an opportunity to provide an eastern access point for buses only from the Cambourne development site.

6.1. Sterling Way to Broadway

Existing Arrangement

The following information provides a summary of the existing arrangement along the proposed route. Photographs of the existing arrangements are presented in Appendix A6.

Sterling Way to Broadway is an existing open space providing public amenity and access provision forming part of the wider pedestrian and cycle network. It is approximately 400 metres in length and 16 metres in width. The route commences from Sterling way and heads east to Broadway. The route is bounded to the north and south by residential properties beyond a fence or hedgerow interspersed with semi-mature trees. A path of approximately 3.8 metres in width runs the entire length of the route with a number of paths extending from it providing further access to residential properties and connectivity to the wider area.

Figure 6-1 Sterling Way to Broadway

(Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation)

Existing Constraints

The following information provides a summary of the existing constraints along the route corridor as presented in Plan 6-1 in Appendix B:

- The entire route has been designated as a Wildlife Trust Nature Reserve with an area of semi-mature woodland located towards the western end of the route; and
- A level difference of approximately 2 metres is present between the existing footway and Broadway, as such the vertical alignment of any proposed route would need further consideration such that it does not have any detrimental visual impact upon adjacent residential dwellings.

Design Interventions

The following information provides a summary of design interventions considered, with one or more options being implemented at any one time. These options are not exhaustive and represent possibilities for each route and are presented in Plan 6-2 in Appendix C.

- A bus priority measure in the form of two-way access control at the junction with Sterling Way could be installed to prioritise the access of bus services along this route. This would be in keeping with measures currently used on the Cambridgeshire Guided Busway such as car traps or rising bollards;
- Reprioritisation of junctions between High Street and Lancaster Gate could provide bus priority towards Broadway;
- A new highway corridor comprising of a bus-only access road and adjacent shared surface for pedestrians and cyclists could be introduced between Sterling Way and Broadway; and
- The installation of a bus priority measure in the form of access control at the junction with Broadway could be introduced to prioritise the access of bus services along this route.

Summary

This route option provides new bus-only access to the existing highway network to the east of Cambourne, providing a more direct bus service for passengers. In addition, it also provides greater opportunities for connectivity to the residential development proposed for Bourn Airfield. As such we would recommend the route option between Sterling Way and Broadway as a preferred access route.

7. Great Cambourne

Great Cambourne to Broadway is an existing open space providing public amenity and access provision forming part of the wider pedestrian and cycle network. Great Cambourne is located approximately 1km from Broadway. Cambourne Nature Reserve lies between Great Cambourne and Broadway and includes Sirius and Whomping Willow Lake as well as designated Trust Areas to the south and west of Great Cambourne and adjacent to Broadway. Lake Ewart and Redgrave Water lie to the west of Great Cambourne along with Crow Hill, an elevated area of grassland with views over Cambourne to the north and rural areas of South Cambridgeshire to the south.

Three routes have been identified, two extending between Great Cambourne and Broadway, and one bypassing Great Cambourne to the south. All three routes provide opportunity for bus-only access to and from the Cambourne development.

7.1.1. Monkfield Lane to Broadway

Existing Arrangement

The following information provides a summary of the existing arrangement along the proposed route. Photographs of the existing arrangements are presented in Appendix A7.

Monkfield Lane is an existing residential road and bus route and forms the main access to Great Cambourne from High Street. A green corridor runs from Monkfield Lane, at its junction with Jeavons Lane and connects with the existing pedestrian and cycle network around Cambourne. The green corridor is approximately 250 metres in length and 20 metres wide and is bounded by residential properties to the north and south. A path of approximately 3 metres in width runs the entire length of the route with a number of paths extend from it providing further access to residential properties and connectivity to the wider area.

Figure 7-1 Green Corridor from Monkfield Lane and Green Open Space towards Broadway

(Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation)

Existing Constraints

The following information provides a summary of the existing constraints along the proposed route alignment as presented in Plan 7-1 in Appendix B:

- The corridor between Great Cambourne and Broadway is open space with a number of existing pedestrian routes linking adjacent residential areas;
- Residential properties – options for exiting Cambourne via Great Cambourne are fronted by residential properties;

- Buried electricity cables lie within the open space between the Green Corridor and the private property;
- A private property lies between the exit from Cambourne and Broadway. The route would require diversion to the north of the property;
- Drainage Swales in the form of Cambourne SUDS, along the Green Corridor, and more extensive ditches within the open space; and
- Significant level differences between Cambourne and Broadway including a number of drainage ditches, culverts and services. Level differences are likely to lead to additional noise and visual intrusion for residents to the east of Cambourne and users of the open space.

Design Interventions

The following information provides a summary of design options considered, with one or more options being implemented at any one time. These options are not exhaustive and represent possibilities for each route and are presented in Plan 7-2 in Appendix C.

- Bus priority in the form of access control with adjacent pedestrian and cycle facilities from Monkfield Lane, across Jeavons Lane, to Broadway;
- Pedestrian and cycle facilities to be retained and upgraded from Jeavons Lane alongside the route;
- Alignment of the route option to avoid conflict with private property located adjacent to the alignment; and
- The installation of a bus priority measure in the form of access control at the junction with Broadway could be introduced to prioritise the access of bus services along this route.

Summary

This route option provides direct and segregated access from existing bus routes in Great Cambourne to Broadway. Existing constraints in the form of proximity to residential properties, level differences, drainage ditches and a private property have potential to lead to engineering costs and challenges in excess of routes from Sterling Way. For this reason it is considered that this route would not be favourable to take forward.

7.1.2. Jeavons Lane to Broadway

Existing Arrangement

The following information provides a summary of the existing arrangement along the proposed route. Photographs of the existing arrangements are presented in Appendix A8.

Jeavons Lane is an existing residential road accessed via Monkfield Lane. A green corridor runs from Jeavons Lane, to the south of Great Cambourne and connects with the existing pedestrian and cycle network around Cambourne. The green corridor is approximately 220 metres in length and 20 metres wide and is bounded by residential properties to the north and south. A path of approximately 3 metres in width runs the entire length of the route with a number of paths extending from it providing further access to residential properties and connectivity to the wider area.

Figure 7-2 Jeavons Lane and Green Open Space towards Broadway

(Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation)

Existing Constraints

The following information provides a summary of the existing constraints along the proposed route alignment as presented in Plan 7-3 in Appendix B:

- Existing pedestrian routes between residential properties provide access to residential properties and leisure routes to the south of Great Cambourne;
- Existing maintenance track and vehicular access off Jeavons Lane provide access to the Electrical Sub-Station and pumping station to the south of the Green Corridor;
- Residential properties fronting onto potential route;
- Public utilities below ground;
- Cambourne Nature Reserve includes Whomping Willow Lake to the south of the Green Corridor and existing pedestrian and cycle routes;
- Significant level differences between Jeavons Lane, open space and Broadway including drainage features. Level differences are likely to lead to additional noise and visual intrusion for residents to the east of Cambourne and users of the open space; and
- Private access road to property off Broadway.

Design Interventions

The following information provides a summary of design options considered, with one or more options being implemented at any one time. These options are not exhaustive and represent possibilities for each route and are presented in Plan 7-4 in Appendix C.

- A bus priority measure in the form of access control at the junction with Jeavons Lane could be installed to prioritise the access of bus services along this route;
- Pedestrian and cycle facilities to be retained and upgraded from Jeavons Lane alongside busway route; and
- The installation of a bus priority measure in the form of access control at the junction with Broadway could be introduced to prioritise the access of bus services along this route.

Summary

This route option provides direct and segregated access from existing bus routes in Great Cambourne to Broadway. Existing constraints in the form of proximity to residential properties, level differences, drainage ditches and a private property have potential to lead to engineering costs and planning challenges in excess of routes from Sterling Way. For this reason, it is considered that this route would not be favourable to take forward.

7.1.3. School Lane to Broadway

The following information provides a summary of the existing arrangement along the proposed route. Photographs of the existing arrangements are presented in Appendix A9.

Figure 7-3 School Lane and Cambourne Nature Reserve

Existing Arrangement

School Lane is an existing residential road and bus route running from High Street through Lower Cambourne to the A1198. Crow Dean, to the south of School Lane provides vehicular access to Anglian Water facilities and pedestrian and cycle access to Cambourne Nature Reserve. The Nature Reserve consists of a number of pedestrian and cycle routes that connect the residential areas of Cambourne and leisure areas to the south and east. The primary footpath through the nature reserve runs over Crow Hill to the south of Great Cambourne and connects with a bridleway towards Broadway.

Existing Constraints

The following information provides a summary of the existing constraints along the proposed route alignment as shown in Plan 7-5 in Appendix B:

- The route requires services to turn west along School Lane before turning east towards Broadway;
- An existing Sub Station and Pumping Station owned by Anglian Water are located off Crow Dean south of School Lane;
- A watercourse and culvert lie south of School Lane. The pedestrian access to the Nature Reserve run over the culvert;
- Cambourne Nature Reserve between Great Cambourne and Lower Cambourne consists of Ewart Lake and a number of pedestrian routes leading south of Great Cambourne towards Broadway;
- The distance and extent of route has the potential to lead to high construction and engineering costs; and
- Significant level differences south of School Lane within the Nature Reserve over Crow Hill – route alignment would be visible from large proportions of Cambourne leading to significant noise and visual intrusion.

Design Interventions

The following information provides a summary of design options considered, with one or more options being implemented at any one time. These options are not exhaustive and represent possibilities for each route and are presented in Plan 7-6 in Appendix C.

- A bus priority measure in the form of access control at the junction with School Lane could be installed to prioritise the access of bus services along this route;
- Pedestrian and cycle facilities to be retained and upgraded from School Lane alongside busway route; and
- The installation of a bus priority measure in the form of access control at the junction with Broadway could be introduced to prioritise the access of bus services along this route.

Summary

This route option provides direct and segregated access from existing bus routes in Cambourne to Broadway. Existing constraints in the form of proximity to level differences, visibility and drainage ditches have potential to lead to engineering costs and challenges in excess of routes from Sterling Way. The

alignment of the route between Lower Cambourne and Great Cambourne has the potential to lead to significant severance, and loss of amenity between the two villages. As the longest route option this alignment is considered to be the high cost option. For these reasons it is considered that this route would not be favourable to take forward.

7.2. Conclusion

This section has presented options from Great Cambourne to Broadway. It is recommended that options presented for Great Cambourne are not taken forward in terms of the Cambourne to Cambridge Better Bus Journeys Project as they are not considered to adhere to the aims of the project and do not offer the most direct route between Cambourne and Cambridge.

Given the constraints in Greater Cambourne it is considered that a route alignment from Sterling Way to Broadway (Section 6.1) provides an alternative direct route towards Bourn whilst allowing for a suitably located bus stop in Cambourne. The length of this option makes it the low cost option for this Gateway whilst avoiding significant level differences and areas of environmental and leisure significance to the south.

8. Summary of Considerations and Interventions

This section of the report assesses each of the route options outlined in Chapters 3 to 7 in terms of journey time and high level cost.

8.1. Assessment Methodology

Journey times have been calculated based on speeds obtained from real-time passenger information provided by CCC. This covers various types of bus infrastructure including: urban busways; rural busways; on-road urban; on-road rural; and urban bus lanes. The journey times presented below include for two potential bus stops within Cambourne; one in Cambourne West and one in the Internal Gateway.

High-level costs are also presented below. These are based on perceived engineering cost only due to the length and level of segregation involved in the route interventions.

Table 8-1 presents the approximate route lengths, journey times and costs of the route options.

Table 8-1 Transport Planning Assessment of Route Alignments

Route Alignment	Route Distance (approximate)	Journey Time	Cost (high, medium, low)	Transport Planning Comments
Cambourne West (from Caxton Gibbet roundabout to boundary of existing settlement)				
From Caxton Gibbet via old A428	2km	4 minutes 30 seconds (including stop)	Medium	Most direct route. Potential for adjacent walking / cycling provision. Least catchment potential
From Caxton Gibbet via new access from A1198	2.5km	7 minutes (including stop)	Medium	Longer route including unsegregated sections in urban areas leads to increased journey times. Potential for greater patronage depending on location od stops.
From Caxton Gibbet via A1198 roundabout	3km	9 minutes (including stop)	Low	Lack of segregated nature leads to increased journey times. Potential for maximum patronage depending on location of stops.
Western Gateway (from boundary with Cambourne West to Cambourne Road Roundabout)				
Sheepfold Lane	900m	3 minutes 30 seconds	Medium	Navigation of Cambourne Road one-way system required
Cambourne Business Park	650m	2 minutes 30 seconds	Medium	Avoids need to navigate one-way system on Cambourne Road Existing pedestrian and cycle routes
Internal Gateway (from Cambourne Road Roundabout to High Street / Back Lane)				
Cambourne Road to Back Lane	1km	3 minutes (including stop)	High	Low patronage as route does not run through centre of development

Route Alignment	Route Distance (approximate)	Journey Time	Cost (high, medium, low)	Transport Planning Comments
High Street	700m	3 minutes (including stop)	Low	Greater patronage potential with a stop in centre of settlement on High Street
Eastern Gateway (from High Street / Back Lane to Broadway)				
Sterling Way to Broadway	1.5 – 2km (depending on routing from Cambourne Road)	6 minutes	Medium	Shortest and most direct route Most potential for walking and cycling trips due to direct route
Great Cambourne (from High Street to Broadway)				
Monkfield Lane to Broadway	2km (assuming route from High Street)	5 minutes	Medium	Visual impact Impact on local amenity and severance
Jeavons Lane to Broadway	2.8km (assuming route from High Street)	6 minutes	Medium	Visual impact Impact on local amenity and severance
School Lane to Broadway	3.5km (assuming route from High Street)	5 minutes 30 seconds	High	Longest route – may discourage walking / cycling trips especially those originating in Upper and Great Cambourne. Highest visual impact Environmental impact

Table 8-1 summarises the high level transport planning impacts of each of the potential route alignments for the Cambourne to Cambridge Better Bus Journeys scheme though Cambourne.

8.2. Recommended Routing Alignment

Given the predicted journey times, potential for walking and cycling infrastructure and maximum patronage it is considered that the hybrid option with a new bus-only access off the A1198 is most appropriate to access the Cambourne West development as it provides a balance between effective journey times and potential patronage. This route allows for a stop in the new Cambourne West development and access to Sheepfold Lane and Cambourne Business Park.

Journey times from Cambourne Business Park and Sheepfold Way vary by 1 minute due to the need for a bus travelling from Sheepfold Lane to navigate the one – way system on Cambourne Road. Given this, and the existing pedestrian and cycle infrastructure available, it is considered that access from Cambourne West to Cambourne is most favourable via Cambourne Business Park.

Access from Cambourne Business Park favours an alignment towards High Street through the internal gateway. High Street also offers the potential to intercept a larger proportion of trips from Cambourne than a route via Back Lane due to the leisure and shopping destinations along High Street. As journey times are comparable, it is considered that an alignment via High Street is most favourable.

Alignment via Sterling Way, Monkfield Lane, Jeavons Lane or School Lane is feasible from High Street. Although routing via School Lane and Cambourne Nature Reserve offers favourable journey times, this option is likely to have high environmental and visual impact. This is also likely to be the highest cost option due to engineering and infrastructure costs associated with the length of the route. Routing from Monkfield Lane and Jeavons Lane offer journey times between High Street and Broadway of approximately 5 and 6 minutes respectively. These are also likely to have high environmental and visual impact due to their proximity to existing residential areas and footways as well as Cambourne Nature Reserve. Given this it is

considered that the route from Sterling Way to Broadway is most favourable for accessing Bourn Airfield to the east. The direct nature of this route is also likely to encourage the most cycling and walking trips from and to Cambourne.

8.3. Recommended Interventions

Following the analysis presented in Chapters 3 to 8, the following interventions are recommended in order to facilitate BRT in Cambourne:

- **Cambourne West**:
  - Bus priority and a bus-only access from the A1198 between the Caxton Gibbet roundabout and the realigned roundabout to the south via a new junction;
  - A segregated route between the A1198 and the Primary Road through the development to the north east of the central lakes; and
  - Bus-only link from Cambourne West to Cambourne Business Park.
- **Western Gateway**:
  - Installation of a new access road extending west from the Cambourne Business Park to provide connectivity to Cambourne West including a bus priority measure in the form of an access control to only permit access by buses; and
  - Reconstruction of the existing raised tables to provide a more relaxed gradient on approaches in order to improve passenger ride comfort.
- **Internal Gateway**:
  - The installation of a bus priority measure in the form of access control at a point on High Street to allow access by buses only.
- **Eastern Gateway**:
  - The installation of a bus priority measure in the form of access control at the junction with Sterling Way;
  - A new highway corridor comprising of a bus-only access road and adjacent shared surface for pedestrians between Sterling Way and Broadway; and
  - The installation of a bus priority measure in the form of access control at the junction with Broadway to prioritise access of buses.

It is suggested that the Eastern Gateway provides the best option for a bus priority connection between Cambourne and Bourn in terms of journey time, cost and impact on existing residential and green areas of Cambourne. Given this it is not suggested that routes from Great Cambourne are progressed at this stage.

9. Stakeholder Engagement

9.1. Stakeholder Workshop

A stakeholder workshop was held in Cambourne on Tuesday 14th March 201. The interventions explored within this report were presented and discussed. The following stakeholders were invited to the workshop although not all invitees attended:

- Ashley Heller, Cambridgeshire County Council, Team Leader, Public Transport Projects
- Tim Watkins, Cambridgeshire County Council, Project Manager, Major Infrastructure Delivery
- Adrian Shepherd, Cambridgeshire County Council, Project Manager, Major Infrastructure Delivery
- Colin Young, WS Atkins on behalf of CCC
- John Wetton, Skanska n behalf of CCC
- Ed Durrant, SCDC, Principle Planning Officer
- Nick Smith, Major Projects
- Andrew Wilson TW Regional Land Director.
- Ben Coles, TW Strategic Land Director
- Duncan Mason (Developer of the High Street)
- Julian Clarke, Director Transport Planning Associates (developer's consultant)
- Andy Campbell, Managing Director, Stagecoach East.
- Matthew Wooll, Commercial Manager, Tower Transit Operations Ltd (Whippet)
- Lesley Scobell (from the Business Park)
- Representatives from the schools (5)
- District Councillors (4); and
- Parish Councillors (13)

The workshop sought to obtain inputs and opinion from the attendees on the following 6 areas:

1) What levels of bus services (route and frequencies) could be achievable through Cambourne West and Cambourne;
2) Where are the key destinations from Cambourne;
3) Where do buses need to travel within Cambourne, i.e. what stops are needed;
4) Where are the problems for buses in Cambourne – getting in and out and around the town;
5) What interventions are needed for better bus operations in Cambourne;
6) How do these interventions get implemented i.e. a short series of action points and next steps.

Attendees were organised into groups to discuss the areas above and were provided with a map, post-it notes, and paper with which to provide their response. Copies of the feedback are shown in Appendix D. The feedback responses were reviewed and some key themes were drawn out. These themes are listed below which correlate to the questions listed above.

1) 10 – 15 minutes frequency at peak hours;
2) Connections to rail services in Cambridge and St Neots are favoured along with connections to Papworth, Huntingdon, and Royston;
3) Stops within all villages (Upper Cambourne, Lower Cambourne, Great Cambourne and Cambourne West as well as near to the Schools and key employment areas;
4) Narrow roads within Cambourne are a constraint to bus movements along with the layout of Broad Street. Concerns were also raised about the configuration of the roundabout on the A428;
5) Bus priority, integrated fairs, RTPI, shelters, accessible bus stops for all users;
6) Cycle paths along bus routes, road widening, phased completion with high priority measures first, additional Park & Ride at Madingley.

In general, attendees agreed that access from Cambourne West by bus is most suitable through Cambourne Business Park.

9.2. Engagement with Bus Operators

A stakeholder workshop was held between CCC, Atkins and Stagecoach East on 28th February 2017 in order to obtain opinion from Stagecoach on the Cambourne to Cambridge Busway proposals. The following comments relate to the route through Cambourne:

Stagecoach:

- It is accepted that 400m is the maximum desirable distance to a bus stop but that bus hubs may attract users from a wider catchment;
- Loops via Sterling Way and Monkfield Lane could be retained in one direction only;
- It is accepted that all services could service a bus hub on High Street;
- Stagecoach would consider routing the X5 via Cambourne, however this is likely to be via Cambourne Road rather than Cambourne West;
- Stagecoach prefer to be routed through the Cambourne West development rather than along the old A428 in order to serve the largest catchment. The hybrid route is preferred; and
- Services to Cambourne West require a link through to Cambourne High Street. Stagecoach are in support of a link through to the Business Park.

Whippet:

- Service to Cambourne is required to increase patronage throughout; and
- Potential for one stop every 7 minutes;

10. Bus Infrastructure

The following section provides a summary of the existing bus infrastructure arrangements along the existing bus routes and identifies potential for installation of BRT characteristics within Cambourne. The existing bus routes and stop locations are presented in Figure 10-1 in Appendix E.

Existing Infrastructure

The existing bus infrastructure associated with bus stops is inconsistent within Cambourne. The level of provision at each stop varies between a simple flag attached to a nearby lamppost, to an individual flag and bus shelter, with road markings only being provided at some bus stops. In addition, a clear and direct access path and waiting area for passengers is not always present, with a few having no direct access as they are bounded by the carriageway and a deep drainage ditch.

Design Options

The overall passenger experience would benefit from providing a consistent approach throughout the Cambourne area, ensuring safe and protected access to each stop. With respect to the proposed HQPT routes it is recommended that new bus shelters and associated infrastructure are installed at the defined stops with real time information displays to inform passengers bus departure times. Provision of real-time passenger information (RTPI) is likely to increase the attractiveness of the service for users. HQPT stops, particularly in the Cambourne West Square and on High Street could be complemented with cycle parking to encourage use from a wider catchment and serve a 'hub' function.

Bus Stop Location

A HQPT network needs to strike a balance between BRT and patronage capture, and in the case of the Cambourne to Cambridge Better Bus Journeys Scheme consideration needs to be given to bus stop locations at key destinations within Cambourne.

The minimum desirable distance for a bus stop from a resident's property is 400m according to guidelines developed by the Institute of Highways and Transportation (IHT[3]). However, observed evidence from the Cambridgeshire Guided Busway[4] indicates that users are willing to walk further to access a BRT facility. For the Cambridgeshire Guided Busway there is evidence that people will walk upwards of 800m to reach the service. Route options summarised in Chapter 8 provide options for maximum patronage whilst using the most direct route therefore they are considered to provide options for suitable bus stop locations to maximise usage of the BRT.

The existing bus services within Cambourne all alight at Broad Street near the Morrison Supermarket. It is considered that there is sufficient space to provide a HQPT bus stop or 'bus hub[5]' on Broad Street, De La Warr Way or High Street. Table 10-1 summarises the existing constraints and opportunities to provide a bus hub or HQPT stop at the each of the locations identified above.

Table 10-1 Bus Hub / Stop Location Constraints and Opportunities

Location	Constraints	Opportunities
Broad Street	• Heavily trafficked – main vehicle route to Lower Cambourne and Great Cambourne; • Avenue of trees and varying verge widths restrict options for location of bus stops; and • Parking and verge between footways and main carriageways require crossing to access stops;	• Existing bus stops – all Cambourne Buses alight; • Adjacent to key destinations; and • Central Location

[3] "Guidelines for Providing for Journeys on Foot" – The Institution of Highways and Transportation (2000)
[4] "Cambridgeshire Guided Busway Post-Opening User Research" – September 12th 2012
[5] A stop or series of stops where a number of services and modes converge

Location	Constraints	Opportunities
De La Warr Way	• Narrow route approximately 6m close to junction with Broad Street; • Existing access to supermarket from Lower and Great Cambourne; • Bus stop location constrained by development to the south; and • Require diversion of buses from most direct route through Cambourne.	• Central location; • Open space to the north could facilitate turning for buses and facilities associated with HQPT.
High Street	• Single carriageway; • Existing parking; and • Servicing requirements	• Potential for bus priority in the form of access control close to the High Street junction with Monkfield Lane; • Wide verges and footways offer space for facilities associated with HQPT; • Central location; and • Adjacent to key destinations.

It is considered that the 'bus hub' would be better located on High Street within the vicinity of the public house. This location would provide a similar catchment to Broad Street and serve to facilitate the service from and to Cambourne, with enough space to install the required infrastructure and provide bus priority.

In addition to a stop in the Internal Gateway on High Street it is also considered that a stop would be provided in the Cambourne West development, to the west of Cambourne Business Park, in order to allow for maximum potential patronage from the new settlement and access to the Business Park for employees and visitors.

11. Recommendations and Further Work

This report has assessed the possible route options for the Cambourne to Cambridge Better Bus Journeys project through Cambourne, between Cambourne West and Bourn Airfield. The routes aim to provide a fast and direct service whilst maximising on patronage.

11.1. Recommended Route Options

The following route is recommended through the development of Cambourne:

- **Cambourne West:** Bus-only access road with bus priority from a new junction off the A1198 into the new development. Bus-only access from Cambourne West to Cambourne Business Park;
- **Western Gateway:** via Cambourne Business Park from a dedicated bus-only access from Cambourne West;
- **Internal Gateway:** via High Street which could be restricted to other traffic by a bus priority measure. Consideration would need to be given to existing parking and access by service vehicles along this route; and
- **Eastern Gateway:** Sterling Way to Broadway via a bus priority measure in the form of access control and a highway corridor with adjacent shared surface.

The recommended route option through Cambourne is considered to provide the best option for Bus Rapid Transit by providing a balance between proximity to key employment and housing areas, to allow for greatest patronage, whilst also offering a direct and segregated route to and from Bourn Airfield, allowing for fast and reliable journey times.

11.2. Recommended Bus Stops

Broad Street, High Street and De La Warr Way were assessed in terms of feasibility to support the location of a Bus Hub. It is considered that locating a new bus hub on High Street would be most appropriate as there is sufficient space in which to locate it and it would sit on the recommended busway route as suggested by this study.

In addition to a bus hub in the Internal Gateway on High Street it is also considered that a stop would be provided in the Cambourne West development, to the west of Cambourne Business Park, in order to allow for maximum potential patronage from the new settlement.

11.3. Further Work

It is considered that further detailed work should be undertaken to assess the recommended routes through the development of Cambourne. This work would involve the following:

- Stakeholder engagement with the Local Authority and local developers;
- Public Consultation
- Design work; and
- Further traffic modelling.

Appendices

Appendix A. Site Photos

A.1. Cambourne West – old A428

Old A428 / A1198 Junction – looking east on A428

Old A428 / A1198 Junction – looking west towards A1198

Old A428 looking north east

Old A428 looking east

A.2. Sheepfold Lane

View from Sheepfold Lane looking West at western boundary

View from Sheepfold Lane looking west towards car dealership

View from Sheepfold Lane looking east towards Cambourne Road

View from Sheepfold Lane looking East at Cambourne Road junction

A.3. Cambourne Business Park

View from Cambourne Business Park looking West at western boundary (Map Data © 2016 Google)

View from Cambourne Business Park looking east (Map Data © 2016 Google)

View from Cambourne Business Park looking west (Map Data © 2016 Google)

View from Cambourne Business Park looking east toward Cambourne Road (Map Data © 2016 Google)

A.4. Cambourne Road to Back Lane

View looking East from Cambourne Road

View looking East along access path

View looking East along access path

View looking West towards access path from New Hall Lane

View looking East towards access path from New Hall Lane

View looking East along access path

View looking West along access path

View looking East towards Back Lane

A.5. High Street

View looking East towards High Street (Map Data © 2016 Google)

View looking East along High Street (Map Data © 2016 Google)

View looking East along High Street (Map Data © 2016 Google)

View looking East along High Street (Map Data © 2016 Google)

View looking East along High Street (Map Data © 2016 Google)

View looking West along High Street (Map Data © 2016 Google)

A.6. Sterling Way to Broadway

View looking East towards access path from Sterling Way

View looking East from access path towards wooded area

View looking West towards Sterling Way

View looking East from access path (adjacent to wooded area)

View looking East from access path (beyond wooded area)

View looking East from access path

View looking East from access path

View looking West towards access path from Broadway

A.7. Monkfield Lane to Broadway

Monkfield Lane / Jeavons Lane looking east along Green Corridor

Green Corridor looking west towards Monkfield Lane / Jeavons Lane

Green Corridor – looking east

Green Corridor – looking east

Green Corridor – looking east (including drainage swale)

Great Cambourne SUDS Plan – adjacent to Green Corridor from Monkfield Lane

Green Corridor – looking east towards Upper Cambourne and Broadway

Private Property and access road between Great Cambourne and Broadway

A.8. Jeavons Lane to Broadway

Green Corridor – view from Jeavons Lane looking south

Green Corridor – view of access off Jeavons Lane looking north

Green Corridor – View from Jeavons Lane looking south

View from green corridor looking east towards Broadway

Green Corridor – view from south looking north including Sub-Station

A.9. School Lane to Broadway

Crow Dean – Anglian Water Facilities

Crow Dean looking south towards Cambourne Nature Reserve

Looking south towards Cambourne Nature Reserve – Watercourse and Culvert

View from Crow Hill in Cambourne Nature Reserve – looking north towards Cambourne

View of Crow Hill looking north

Bridleway to the south of Great Cambourne looking towards Crow Hill

A.10. Bus Infrastructure

Typical Bus Stop located on School Lane, Cambourne (Map Data © 2017 Google)

Typical Bus Stop located on School Lane, Cambourne (Map Data © 2016 Google)

Typical Bus Stop located on School Lane, Cambourne (Map Data © 2017 Google)

Typical Bus Stop located on Jeavons Lane, Cambourne (Map Data © 2017 Google)

Appendix B. Constraints Plans

Appendix C. Potential Route Options

Appendix D. Stakeholder Consultation Feedback

Appendix E. Bus Infrastructure Plans

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