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A1307 HAVERHILL TO CAMBRIDGE

PREFERRED OPTIONS REPORT

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A1307 HAVERHILL TO CAMBRIDGE

DRAFT PREFERRED OPTIONS REPORT

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APPENDIX G - TRAFFIC FLOW DIAGRAMS;

APPENDIX H – BUS USER ORIGIN-DESTINATION MAPS;

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

1.1.1 WSP Parsons Brinckerhoff has been appointed by Cambridgeshire County Council to identify a package of sustainable transport interventions for the A1307 corridor from Haverhill to Cambridge. This report documents the option development and selection process and outcomes following a first round of public consultation in summer 2016.

1.1.2 This work has been undertaken on behalf of the Greater Cambridge City Deal to inform the first tranche of the City Deal infrastructure programme. This work is part of a wider package of major public transport improvements across the city and into South Cambridgeshire, based on a corridor approach, as set out in the Authority's adopted Transport Strategy for Cambridge and South Cambridgeshire (TSCSC). The Greater Cambridge City Deal has successfully secured a first tranche of Government's City Deal funding to unlock major growth and economic potential in the greater Cambridge area.

1.2 A1307 CORRIDOR

1.2.1 The A1307 Haverhill to Cambridge corridor is one of the key radial routes into Cambridge and suffers from congestion during peak periods, particularly at the Cambridge end, at the junction with the A11 and around the village of Linton.

1.2.2 The corridor is over 20km in length and connects a large number of important settlements and key employment areas including:

- Haverhill (a major town in Suffolk with substantial industry and business parks including the future Haverhill Research Park);
 - Horseheath;
 - Linton (near the Cambridgeshire border with Essex);
 - Great Abington / Little Abington / Hildersham;
 - Granta Park (a major employment area for science, technology and biopharmaceuticals);
 - Babraham and the Babraham Research Campus (a major bioscience employment area);
- Furthermore, close to the corridor are:
- Sawston, Great Shelford & Stapleford which are near to the route; and
 - Addenbrooke's Hospital / Cambridge Biomedical Campus.

- 1.2.3 Recognising that there is significant economic growth planned for the A1307 corridor and in a wider context, proposed developments within the Greater Cambridge area may also interact with the A1307 corridor through their connections to the A505, and A11. This will lead to increased transport demand in the south east of Cambridge which could potentially be mitigated by creating more capacity for sustainable travel along the A1307 corridor, seeking to maintain traffic volumes at today's levels. Therefore this study aims to identify potential sustainable travel interventions which would create more capacity for non-car modes and increase the attractiveness of public transport, walking and cycling within the A1307 corridor to encourage mode shift.

1.3 STUDY SCOPE

- 1.3.1 The geographic scope of the project currently considers the section of A1307 west of Haverhill to the south arm of Addenbrooke's Hospital site access Roundabout on Hills Road in Cambridge as shown below in Figure 1-1.

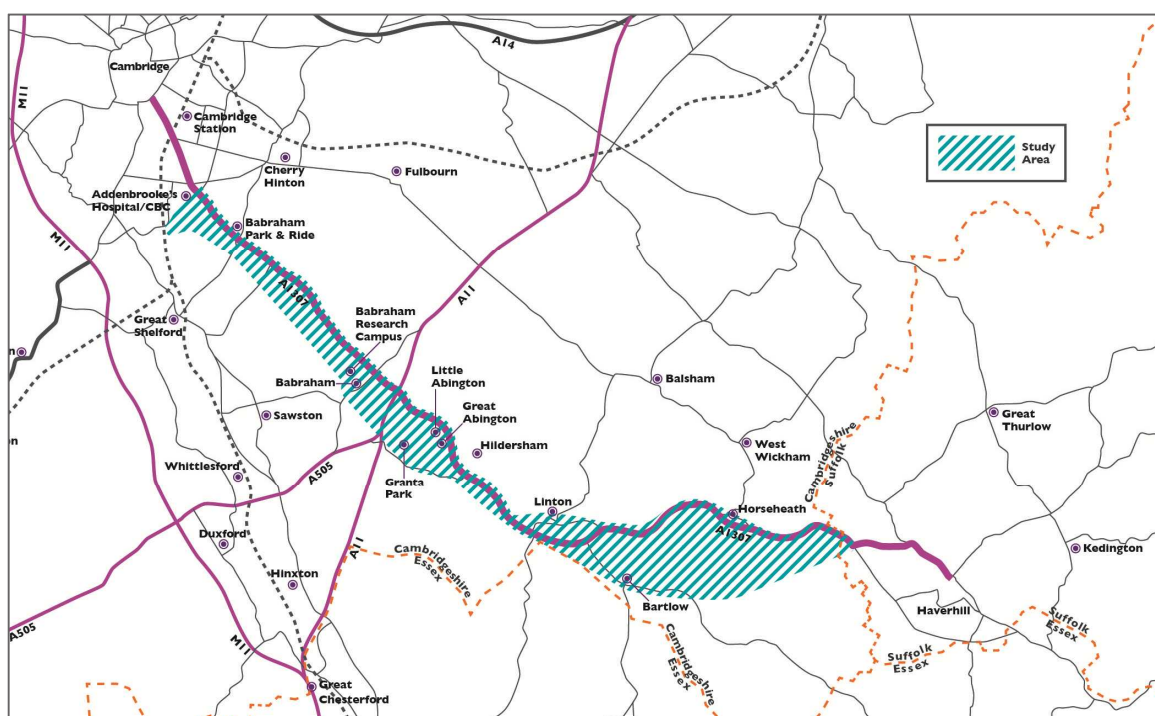


Figure 1-1 A1307 Haverhill to Cambridge Study Area

1.4 CITY DEAL OBJECTIVES & TRANSPORT VISION

- 1.4.1 The project is to be funded through the first tranche of the Greater Cambridge City Deal. Potentially up to £39m can be allocated to the A1307 for delivery of schemes which can be implemented (or commenced) by 2020. Therefore the solutions proposed are naturally focussed on schemes which are potentially deliverable within the City Deal First Tranche budget and likely to be feasible for delivery (commencement on site) by 2020. Solutions which could be delivered in the second tranche of the City Deal are identified for further consideration.
- 1.4.2 In order to maximise opportunity for funding, the option selection process therefore seeks to prioritise those schemes and packages which best meet the City Deal objectives and vision:

City Deal Objectives:

- ➔ Securing future economic growth and quality of life, supporting growth, and facilitating easy movement between major employment and residential areas.

- The City Deal will invest in enhancing transport infrastructure that makes it easier for people to travel between places of work, home or study using sustainable modes of transport, reduce congestion and support our city region's connectivity with regional and national transport networks.

City Deal Transport Vision:

The City Deal will make it easier to travel in, out and around Cambridge and South Cambridgeshire by public transport, cycle or on foot, and reduce and maintain lower traffic levels to ease congestion.

1.5 A1307 STUDY AIMS

1.5.1 The A1307 study aims to:

- Identify a variety of options which will improve the reliability, safety and speed of movement along the A1307 corridor, and ultimately reduce the number of vehicles driving into the city of Cambridge.
- Investigate whether combinations of schemes will provide the greatest benefit.

1.6 A1307 STUDY OBJECTIVES

1.6.1 The project objectives can be summarised as follows:

- To improve opportunities for sustainable travel along the A1307 corridor, including consideration of public transport and non-motorised users, within all scheme elements.
- To maintain traffic levels at today's levels in Cambridge.
- To consider the potential for enhancing the environment, streetscape and air quality in the A1307 corridor.
- To assess the impacts on existing residents and highway capacity for each option.
- To identify areas along the route, and measures, where user safety can be improved.
- To improve connectivity with surrounding villages and places of employment along the A1307.

1.7 SUPPORTING ECONOMIC GROWTH WITHIN THE CORRIDOR

1.7.1 The Cambridge City, South Cambridgeshire and St Edmundsbury submitted Local Plans have identified future growth in housing and employment along the corridor, both immediately to the south of Cambridge, to the north-east of Haverhill as well as key employment areas within the corridor. The committed developments alone proposed for the area alongside the corridor need to cater for over 8,500 new homes and nearly 20,000 additional jobs through to 2031.

1.7.2 This growth includes the following major developments (amongst others) which are likely to increase travel demand along the corridor. The study seeks to support this economic growth, seeking to provide transport interventions which help improve opportunities for sustainable travel between these key growth areas:

- Haverhill – up to 4,260 homes (2009-2031);
- Granta Park – up to 3,200 new jobs;
- Babraham Research Campus – up to 1,000 new jobs; and
- Cambridge Biomedical Campus – around 6,000 new jobs in the next 3-5 years, with further growth to follow.

1.8 INITIAL OPTION CONCEPTS

1.8.1 A first round of public consultation entitled 'A1307 Three Campuses to Cambridge' was held in summer 2016 with a series of high level option concept ideas presented to members of the public. These included 'on-highway' and 'off-highway' options for improving and prioritising sustainable and healthier travel options as well as seeking to enhance road safety along the corridor.

1.8.2 Chapter 2 of this report summarises the public consultation feedback and this sets the context and key themes which have informed the preferred option selection, development and assessment. The initial concept options presented for consultation are summarised below:

Park & Ride

- Concept 1A - Babraham Road Park & Ride – redevelopment and expansion of the Park & Ride site to cater for committed and future growth within the Cambridge Biomedical Campus area; and
- Concept 1B – A11 Park & Ride Site – new Park & Ride adjacent to the A11 Fourwentways junction.

→ Bus Rapid Transit

- Concept 2A – Granta Park to Cambridge Biomedical Campus (off highway) – segregated, off highway rapid transit from Granta Park via a new A11 Park & Ride, Babraham Research Campus to Addenbrooke's Hospital / Cambridge Biomedical Campus. Potential for guided Busway, dedicated public transport road or other method of rapid transit. Additional walking, cycling and equestrian improvements provided alongside;
- Concept 2B – Granta Park to Cambridge Biomedical Campus (on highway) – segregated, on highway rapid transit from Granta Park via new A11 Park & Ride, Babraham Research Campus, Babraham Road Park & Ride to Cambridge Biomedical Campus. Additional walking, cycling and equestrian improvements provided alongside;
- Concept 2C – Linton Bus Priority – on highway bus priority improvements through Linton. Additional transport and public realm improvements alongside;
- Concept 2D – Babraham Road Park & Ride to Cambridge Biomedical Campus (off highway) – segregated, off highway, rapid transit from Babraham Road Park & Ride to Cambridge Biomedical Campus from the west. Additional walking, cycling and equestrian improvements alongside; and
- Concept 2E – Babraham Road Park & Ride to Cambridge Biomedical Campus (on highway) – segregated, on highway, rapid transit from Babraham to Cambridge Biomedical Campus from the east. Additional transport and public realm improvements alongside.

→ Walking & Cycling

- Concept 3A – Three Campus Cycling & Walking Route (off highway) – segregated, off highway, route from Granta Park via new A11 Park & Ride, Babraham Research Campus with a connection to National Cycle Network (NCN) 11;
- Concept 3B – Three Campus Cycling & Walking Route (on highway) – segregated, off highway, route from Granta Park via new A11 Park & Ride, Babraham Research Campus and along the A1307 through to Babraham Road Park & Ride and Cambridge Biomedical Campus;
- Concept 3C – Haverhill to Three Campus Route (on highway) – segregated, on highway route from Haverhill via Horseheath and Linton linking to the Three Campus cycle route at Granta Park; and
- Concept 3D – Haverhill to Three Campus Route (off highway) – segregated, off highway route from Haverhill along the disused railway corridor to Linton and Granta Park linking to the Three Campus cycle route at Granta Park.

→ Other Scheme Components

- Public Realm Improvements - Ensure all schemes incorporate appropriate public realm improvements to meet with the objectives of the City Deal;
- Bus Stop Accessibility Improvements - Ensure all bus stops along the corridor are fully accessible and meet the latest guidance for bus stops; and
- Road Safety Improvements - Additional road safety improvements are proposed for a number of locations on the corridor, outside the major concept areas, to deliver a consistent route length approach to the road (e.g. junctions, speed limits etc).

1.8.3

An overview of the initial option concepts is shown below in Figure 1-2 below

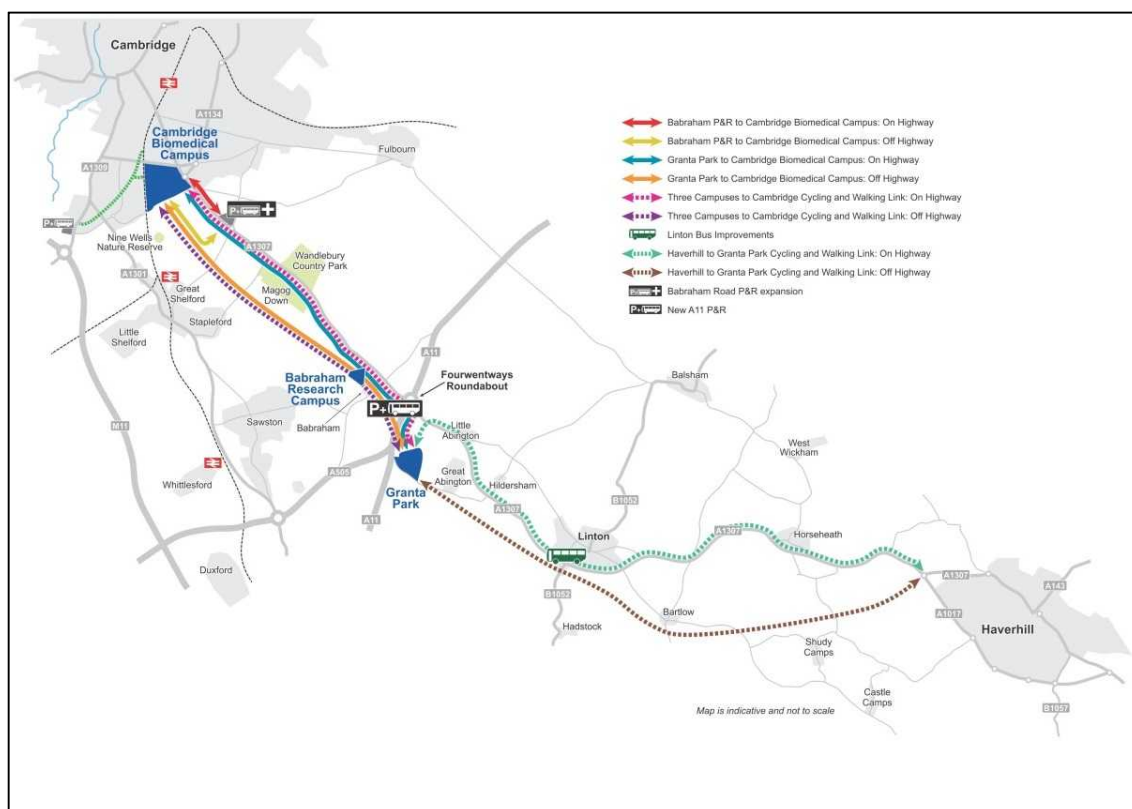


Figure 1-2 Summer 2016 Consultation Initial Option Concepts

1.9 DISCOUNTED OPTIONS

1.9.1 Prior to public consultation, several major schemes were considered as part of the study. A number of these schemes were discounted because they were unlikely to be affordable or implementable within the first tranche of City Deal funding allocation of £39m or within the timescales required for the first tranche of spending (by 2020) due to the scale of works involved and land acquisition requirements. However, these schemes could potentially be considered or pursued via other studies using alternative budgets in the future. The discounted options included the following:

- Reopening the railway line between Haverhill and Cambridge
 - Capital cost £390-650M
 - Benefit to cost ratio assessed as 0.5 – 1.0
- Introducing an off-road Bus Rapid Transit route from Haverhill to Cambridge
 - Capital cost £150-200M
 - Benefit to cost ratio assessed as 1.0-1.5
- Several road options, including duelling and a Linton bypass
 - Capital cost £15M - £100M
 - Benefit to cost ratios assessed as 0.2 – 0.5

1.10 DEVELOPING THE PREFERRED OPTIONS

1.10.1 The option selection process seeks to identify the preferred option package for the A1307, from Haverhill to Cambridge taking into account a range of factors and design considerations. The A1307 route has been split geographically into sections, and preferred options for each section of the route have been considered and developed, taking into account public consultation feedback:

- **Addenbrooke's to Hinton Way** – this section considers the opportunities for implementing an on-road bus lane between the existing Babraham Road Park and Ride site and Addenbrooke's roundabout. The on-road option is considered in combination with alternative options for creating new off-road bus only links directly connecting with the Cambridge Biomedical Campus (CBC) Development with onward connections to central Cambridge.
- **Hinton Way to Babraham Village** – This section considers the feasibility and viability of bus priority measures from BRC to Hinton Way and improved cycle routes connecting Babraham Research Campus to Wandlebury County Park and Hinton Way. Junction enhancements are also considered where there are specific safety issues.
- **Babraham Village and Granta Park to Linton** – Options to create or enhance new off-road cycle and pedestrian routes crossing the A11, connecting the village of Babraham with Great Abington as well as key employment sites at Babraham Research Campus and Granta Park.
- A **Park and Ride study** has been carried out to consider in more detail the potential scheme options of either adding a new Park and Ride site close to the A11 junction or expanding the existing Babraham Road Park & Ride site. The viability of retaining the existing Park and Ride site in addition to a new A11 facility is also considered.
- **Linton Village** – This chapter considers key junctions on the A1307 around the village of Linton and the feasibility of bus priority measures that could be installed to improve bus journey times. Public realm enhancements for reducing congestion within Linton High Street are also considered, seeking to improve the flow of buses through the centre of the village.
- **Linton to Haverhill** – This section considers speed management opportunities and road safety enhancement options, seeking to reduce the frequency and severity of accidents along this stretch of the route.

1.11 REPORT STRUCTURE

- 1.11.1 Chapter 2 provides an overview of the key findings of the public consultation and explains how feedback from members of the public has been used to inform the option selection process.
- 1.11.2 The remainder of this report considers each section of the route in more detail and documents the option development, assessment and selection process for each component of the preferred option package of measures.
- 1.11.3 Supporting background information is also provided in the appendices as follows:
- Appendix A – Consultation Report;
 - Appendix B – Scheme Option Drawings - A11 Park and Ride;
 - Appendix C – Scheme Option Drawings - Addenbrooke's to Hinton Way;
 - Appendix D- Scheme Option Drawings - Hinton Way to Babraham Village;
 - Appendix E - Scheme Option Drawings - Babraham to Granta Park cycleways;
 - Appendix F - Scheme Option Drawings – Linton Village;
 - Appendix G - Traffic Flow Diagrams;
 - Appendix H – Bus User Origin-Destination Maps;

2 PUBLIC CONSULTATION SUMMARY

2.1 INFORMING THE PUBLIC

2.1.1 An initial round of Public Consultation was undertaken between 16 June and 1 August 2016 to seek feedback on some initial concept options for sustainable transport infrastructure improvements in A1307 corridor. A total of 7 events were held at the following locations:

- Haverhill Arts Centre;
- Linton Village College;
- Babraham Park and Ride;
- Addenbrooke's Hospital Main Concourse;
- Spicer's Pavilion, Sawston;
- Memorial Hall, Great Shelford; and
- St John's Church Hills Road.

2.1.2 Consultation materials were published on the Greater Cambridge City Deal website:

http://www.gccitydeal.co.uk/citydeal/info/2/transport/1/transport_projects_and_consultations/9

2.1.3 Electronic questionnaires were available online and hard copy questionnaires were available from public places and at the public events. A copy of the leaflet is shown in Appendix A, along with a more detailed consultation report summarising the key findings. Consultation leaflets were also delivered to over 14,000 residential properties and businesses in the catchment to advertise the events. In Haverhill and Cambridge awareness raising activities were carried out such as emails to stakeholders, library displays, bus stop posters, leaflets at park & ride, bus ticket adverts, on buses, social media including ads targeting the Cambridge and Haverhill area on Facebook.

2.1.4 A very good level of response was recorded with 1489 responses received including 796 paper survey responses and 632 online survey responses, as well as several letters and emails. This represents a response rate in excess of 10%.

2.2 OVERALL SUPPORT FOR CONCEPT OPTIONS

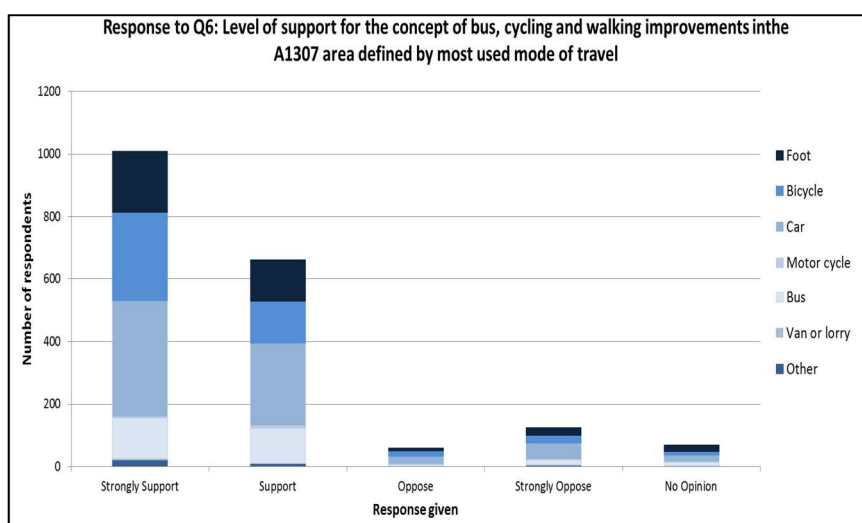


Figure 2-1 Overall Support for Concept Options

2.2.1 The survey results indicate that there is a very high level of support for the concept options presented in the round 1 public consultation with 83.3% of respondents indicating that they either support or strongly supported the concept of bus, cycling and walking improvements on the A1307 and these Levels of support were broadly consistent across the various modes of travel.

2.3 GEOGRAPHIC DISTRIBUTION OF RESPONSES

2.3.1 Consultation leaflets were distributed to households and businesses in the catchment shown in Figure 2-2 below which also shows the home postcode of respondents.

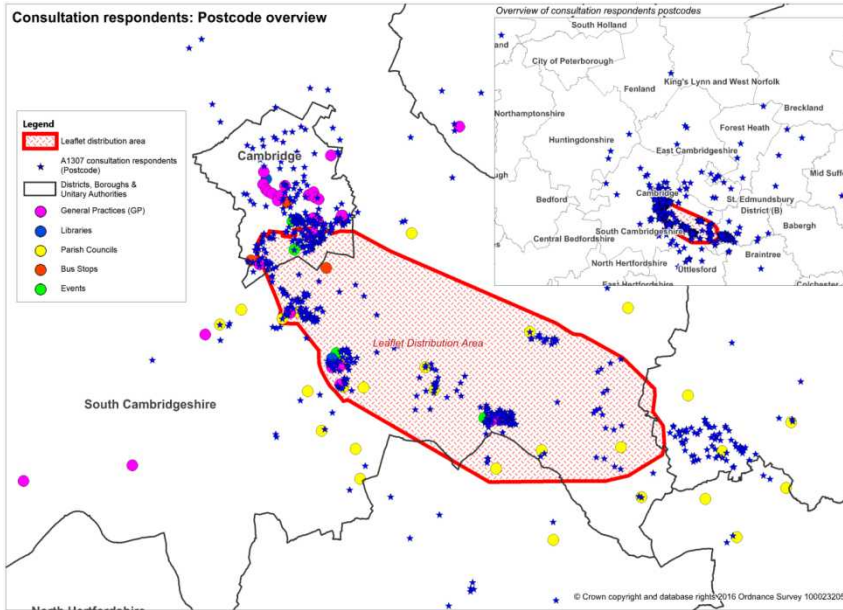


Figure 2-2 Leaflet distribution catchment and responses by postcode

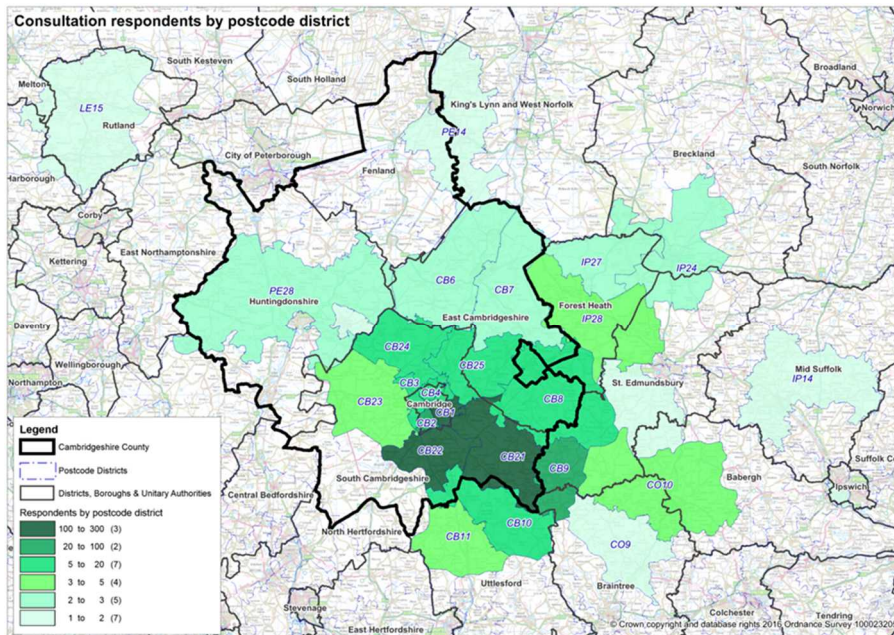


Figure 2-3 Questionnaire respondents by postcode district

2.3.2 As shown in Figure 2-2 and Figure 2-3, the majority of respondents were from within the A1307 catchment, or from Cambridge and Haverhill urban areas, as well as Great Shelford, Linton, Sawston, and Haverhill. However, a small number of responses were also received from a much wider catchment including postcodes in Rutland, Ipswich and King's Lynn.

2.4 RESPONDENT JOURNEYS IN THE A1307 CORRIDOR

2.4.1 The questionnaire included questions on travel behaviour to understand how respondents use the A1307 corridor at present.

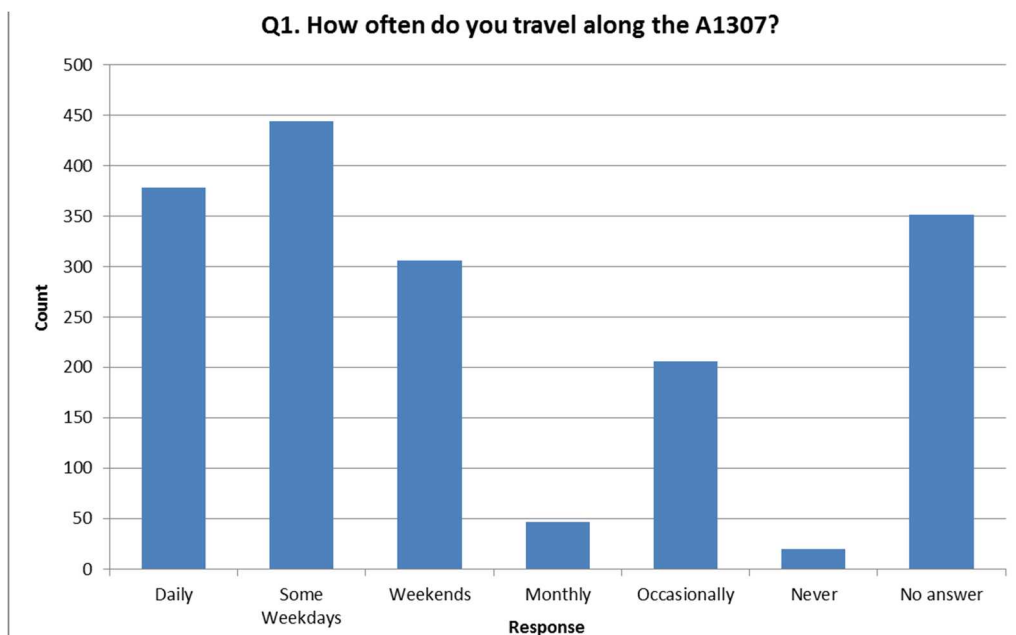


Figure 2-4 Respondent's typical A1307 Usage frequency

2.4.2 Figure 2-4 shows that the majority of respondents were regular users of the A1307 and Figure 2-5 demonstrates that the sample included users of various transport modes, so the results are not likely to be biased towards a single mode or user type.

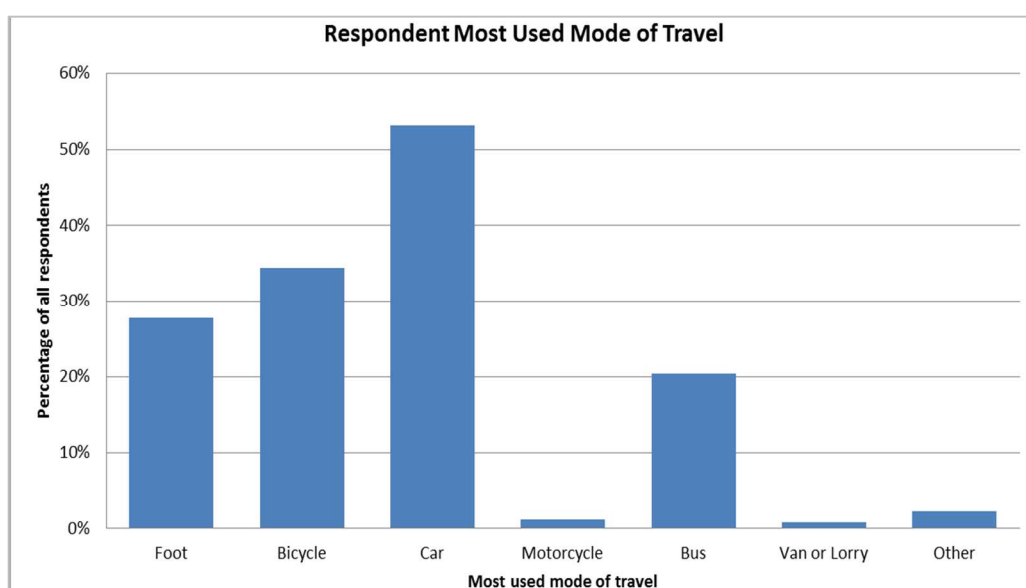


Figure 2-5 Main Mode for Respondent's Typical Journey in A1307 corridor

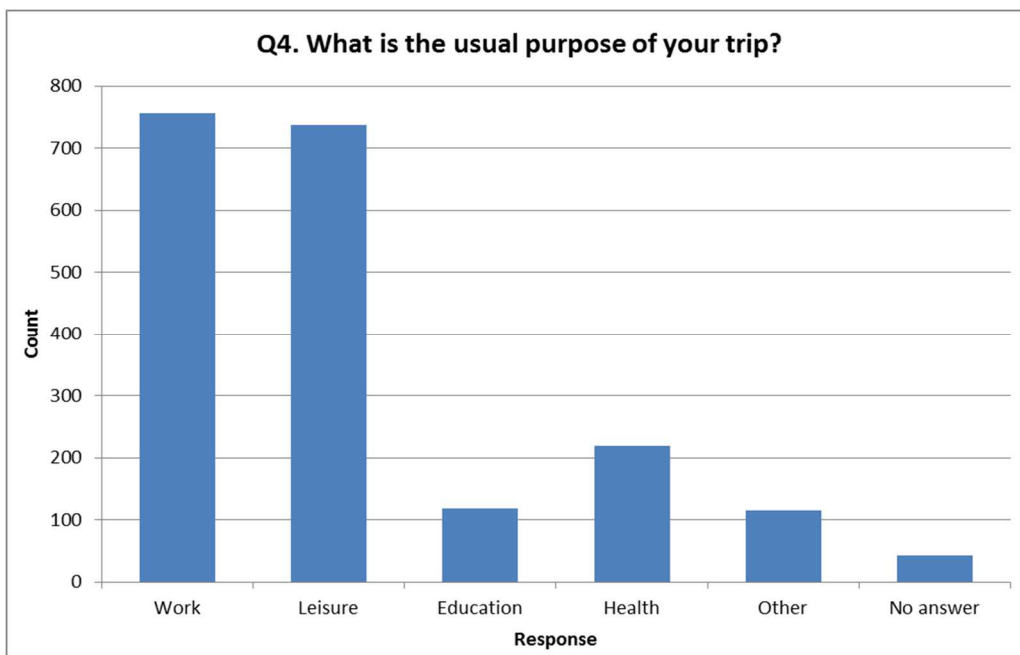


Figure 2-6 Trip Purpose for Respondent's Typical Journeys in A1307 corridor

2.4.3

The results in Figure 2-6 above suggest that about 80% of users travel for either work or leisure purposes with a significant group (about 10%) travelling for health reasons.

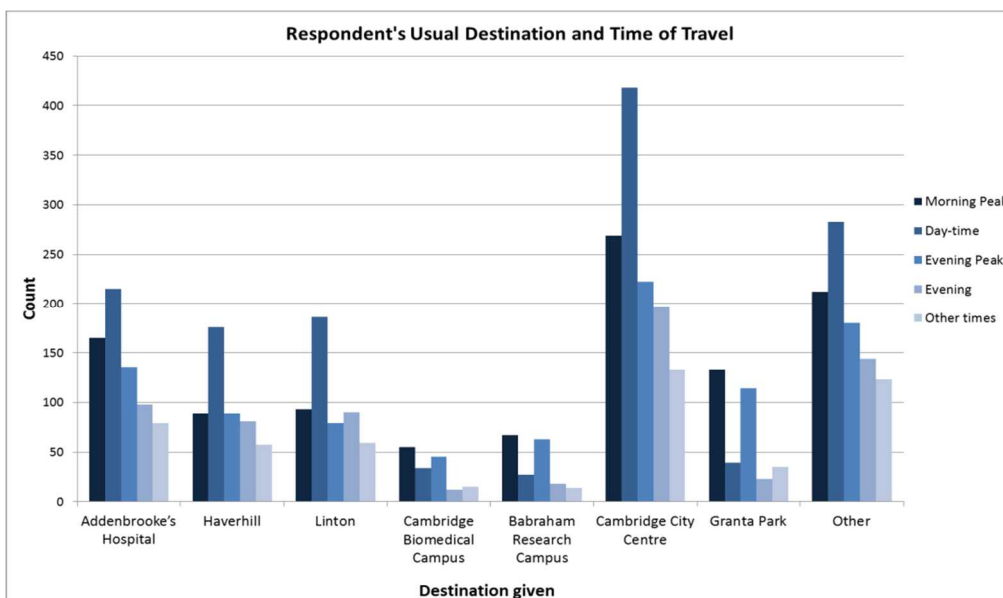


Figure 2-7 Respondent typical journeys by time of day

2.4.4

The results shown in Figure 2-7 suggest that the majority of respondents were daytime users but the peak periods and other time periods were also well represented in the survey sample.

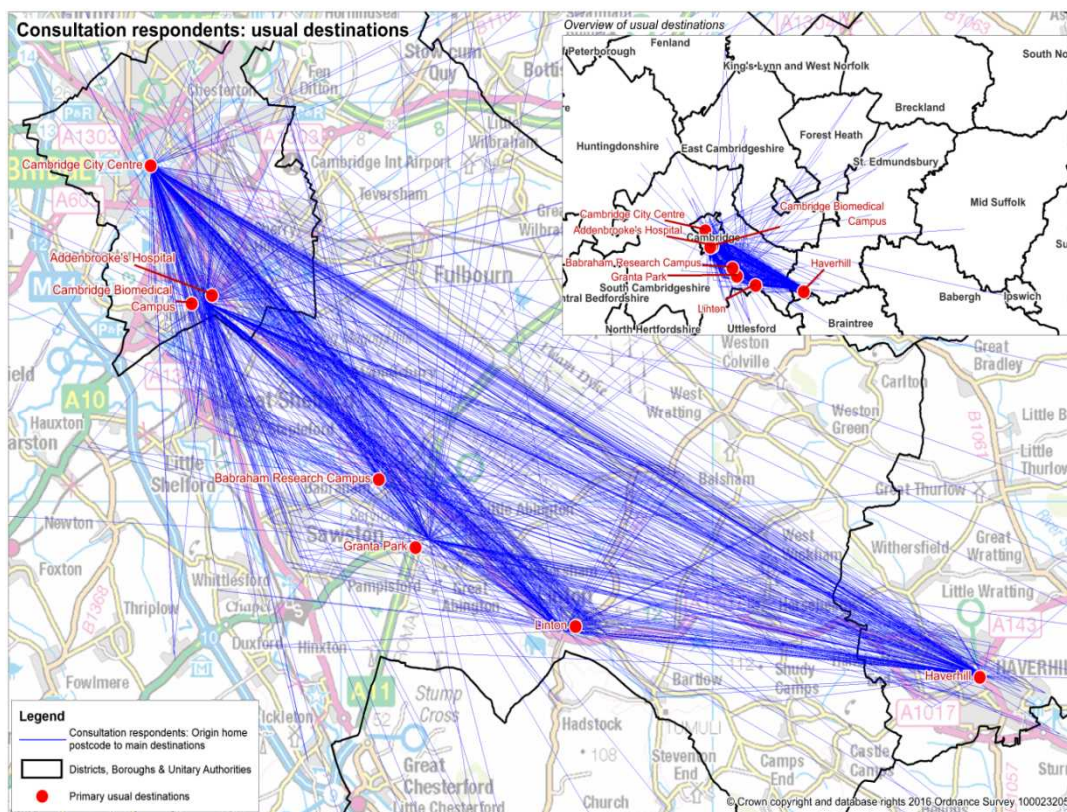


Figure 2-8 Questionnaire respondents Origins and Destinations for typical A1307 journeys

2.4.5 The map above in Figure 2-8 shows the typical trip origins and destinations of respondents' Journeys being undertaken in the A1307 corridor. This indicates that the majority of respondents generally use the corridor for longer distance trips between key settlements.

2.5 BUS LINK P&R TO ADDENBROOKE'S & CBC

2.5.1 As shown in Figure 2-9 below, approximately half of the survey respondents supported or strongly supported the idea of dedicated bus links from the Babraham Road Park and Ride site to the CBC site. However there was slightly more support for the on-highway option with a greater number of people who strongly opposed the off-highway option in comparison and this seemed to be due to environmental concerns, as an off-highway link would be closer to the Nine Wells Nature reserve.

- 49.9% supporting the 'On Highway' option;
- 44.9% supported for the 'Off Highway' option; and
- 16% strongly opposed 'Off Highway' option whereas 8.5% strongly opposed the 'On Highway' option.

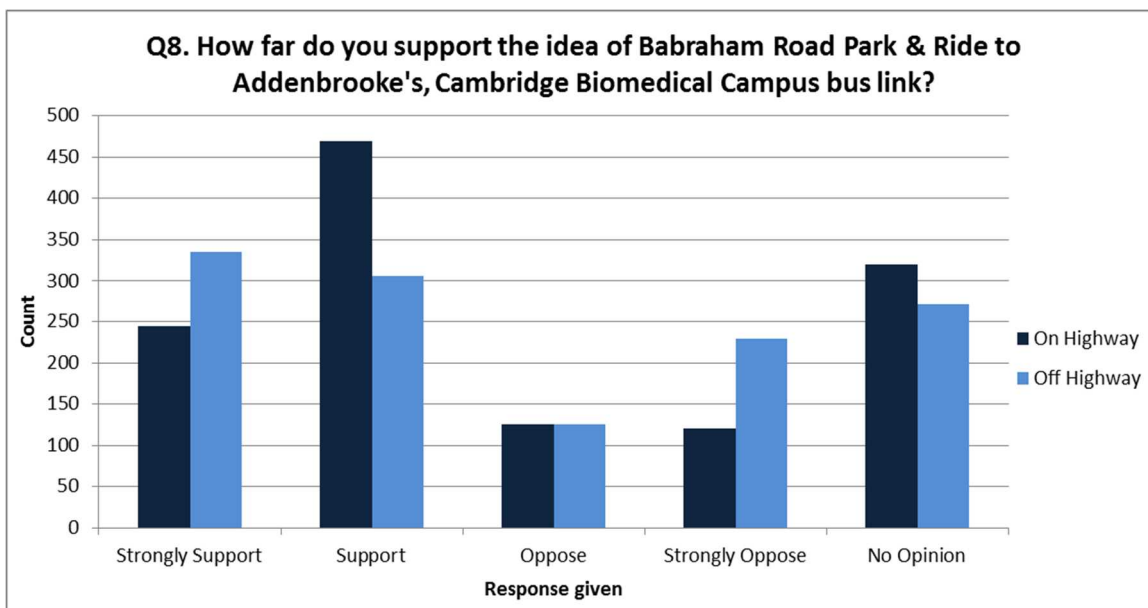


Figure 2-9 Levels of support for Bus links from Babraham Road P&R to Addenbrooke's CBC

2.6 SUPPORT FOR PARK AND RIDE OPTIONS

2.6.1

The idea of additional Park and Ride capacity was generally well supported with both of the options supported by over 60% of respondents. The option to expand the existing site was marginally more popular (2%) than the idea of creating a new site close to the A11 junction. Hence a Park and Ride study was commissioned to look into the two options in more detail.

- 62.8% supported Babraham Road Park & Ride Site expansion; and
- 60.8% supported a new A11 Park & Ride.

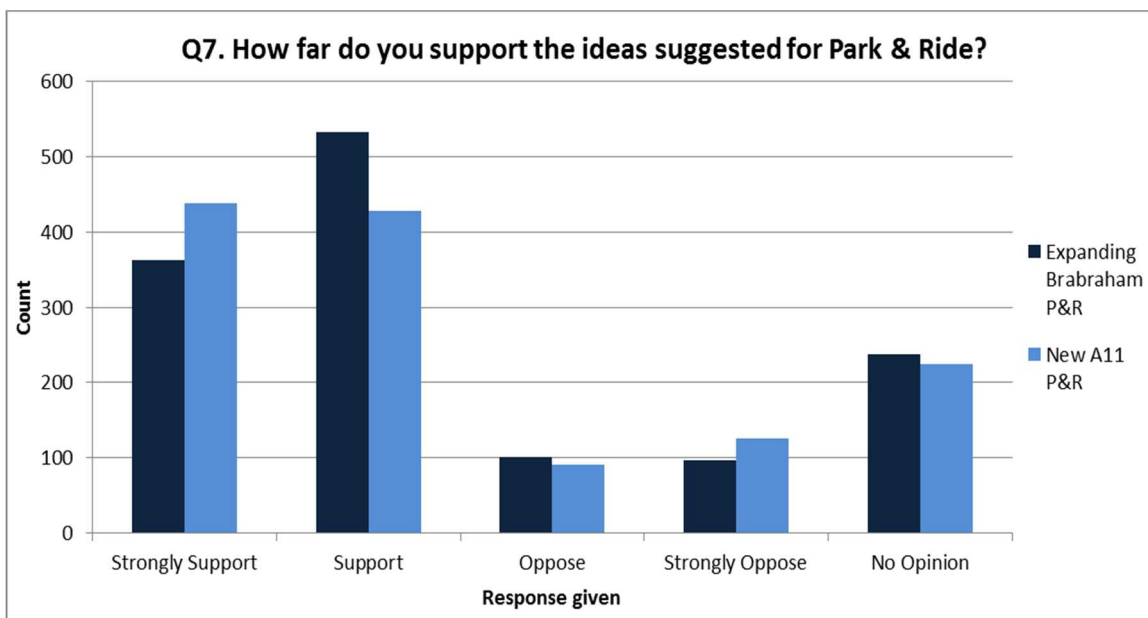


Figure 2-10 Levels of support for A1307 Park and Ride options

2.7 GRANTA PARK TO CAMBRIDGE BIOMEDICAL CAMPUS

2.7.1

There was a good level of support expressed for improved bus links between Granta Park and Cambridge Biomedical Campus, with more than half of respondents supporting this idea. However, there was a clear preference in favour of making best use of the public highway land extents before using new land as an off-highway route was 10% less popular. Again, those who opposed the off-highway option were generally concerned about the environmental and visual impact on the historic landscape, given the context of the indicative route shown which runs close to the Gog Magog Hills. This contributed to the preference to use the public highway land before purchasing new land for additional bus capacity.

- 53.7% of respondents supported or strongly supported the 'On Highway' bus link. Whilst 43.6% were for the off highway option; and
- 40.4% of strongly supporting respondents for the 'Off Highway' bus link are car users, with 19.7% of strongly opposing respondents being bus users.

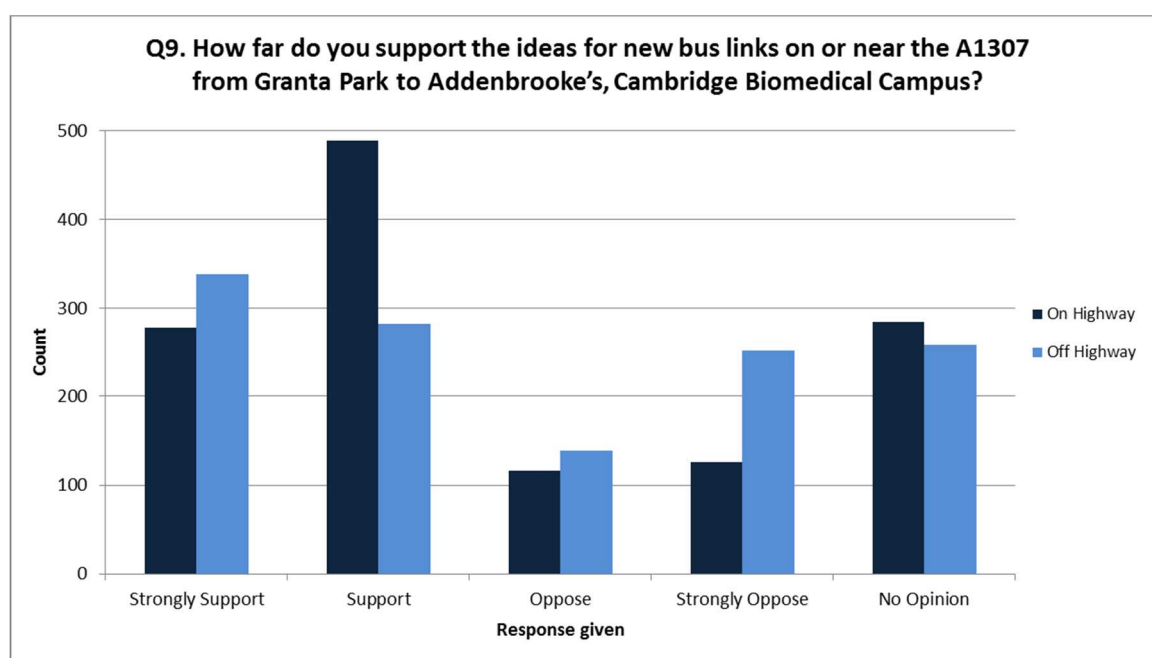


Figure 2-11 Levels of support for improved bus links between Granta Park and CBC

2.8 LINTON BUS OPTIONS

2.8.1

The results of the consultation showed support for the proposals to improve bus infrastructure in the vicinity of Linton, with a total of 54.5% supporting or strongly supporting this concept. 35.7% of respondents said they had no opinion on the subject. However, this group of respondents were generally those whose home locations are closer to Cambridge and therefore do not use this section of the route regularly.

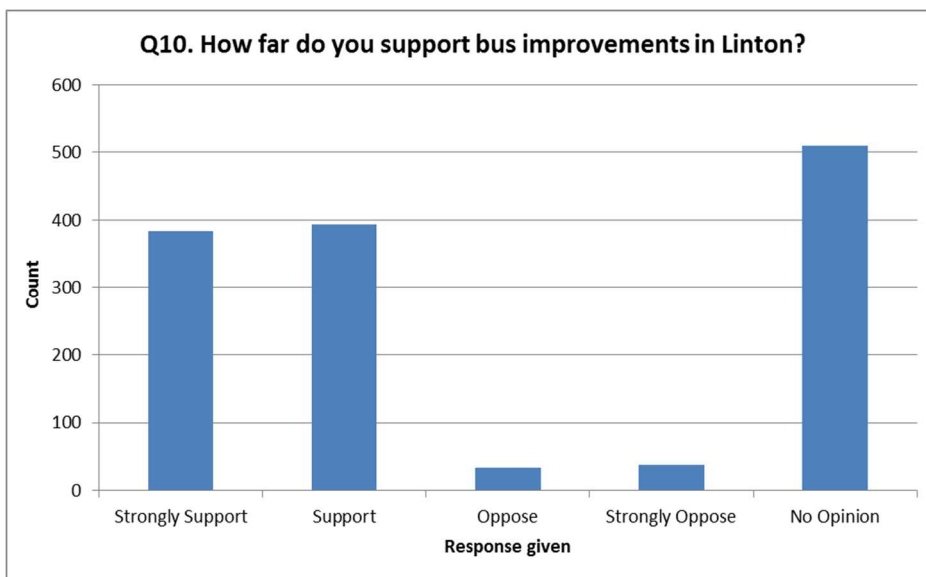


Figure 2-12 Levels of support for bus improvements in Linton

2.9 WALKING & CYCLING LINKS

2.9.1 Respondents were asked whether they support the idea of creating new cycle and walking links. Two routes were shown (Three Campuses to Cambridge (west of A11) and Granta Park to Haverhill (east of A11), with on-highway or off-highway options suggested as alternatives for each section.

2.9.2 Overall 63.8% supported or strongly supported the Three Campuses to Cambridge option and 53.6% supported the concept of links from Haverhill to Granta Park. However, there was mixed feedback in relation to the type of route (on-highway versus off-highway). The off-highway routes were slightly more popular but there was also support evident for on-highway options. The key issue of concern from the comments provided seemed to be user safety and level of segregation provided. This suggests that an on-highway option would be acceptable if users are adequately segregated from traffic.

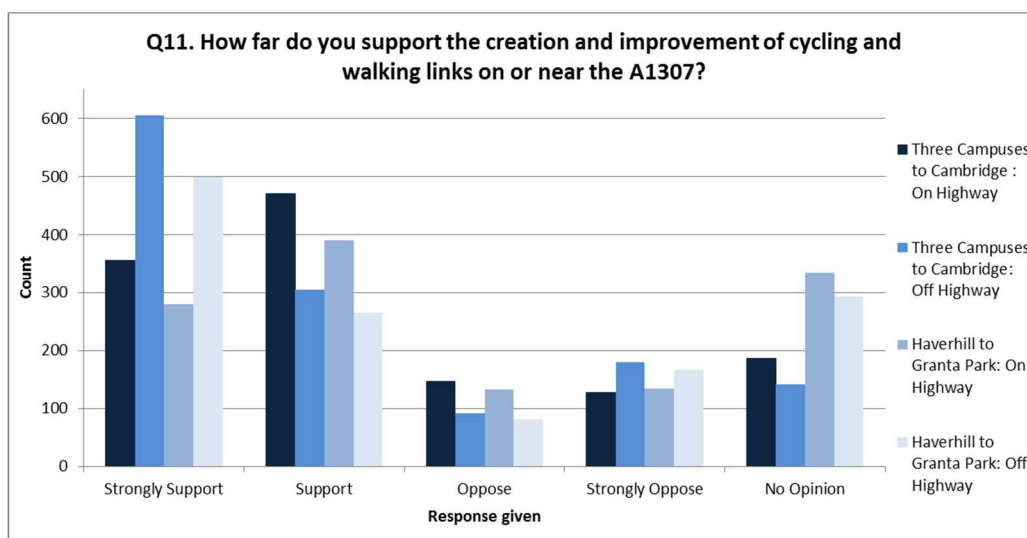


Figure 2-13 Levels of support for Walking and Cycling Options

2.10 MOST BENEFICIAL CONCEPTS

2.10.1 Respondents were asked which concepts they thought would provide most benefit to the A1307 corridor – the following were key themes in response to this question:

- Of the two Park and Ride options, the proposed A11 Park and Ride site was mentioned and supported the most, although at times under different names (e.g. “Fourwentways” and “Granta Park”);
- The majority of the cycle and walking link responses did not refer to a specific section, but stated a general preference for ‘Off Highway’ links in the interests of user safety; and
- ‘On Highway’ bus links were preferable, with the Babraham Road Park and Ride to Cambridge Biomedical Campus bus link being favoured more.

2.11 ADDITIONAL SUGGESTIONS

2.11.1 The questionnaires also included the opportunity for respondents to suggest additional ideas which may form part of the A1307 strategy going forward. The following suggestions from members of the public have been investigated where possible when considering the preferred options.

RESPONDENT SUGGESTION	WSP-PB RESPONSE
Extending the busway to Haverhill, using the old rail line. However, there were many respondents who opposed this suggestion as well	Refer to section 1.9
Reinstating the old railway, building a light rail way or building a tramway. Building an underground was also mentioned	Refer to section 1.9
Park and Ride in Haverhill	The options available for this would be outside of the county boundary.
Improving access to villages west of the A1307, such as Sawston, Whittlesford and Stapleford. This is in relation to both bus stops and footpaths	See chapter 6
Dualling the entire A1307	Refer to section 1.9
Better access to Addenbrooke's (south approach) and the current busway.	See section 4.8
Using one lane of the current A1307 dual carriageway as a bus lane during peak times	See section 5.5
Safer crossing points at bus stops and Wandlebury	See section 5.6
Improving cycle access and parking facilities at Park and Ride sites.	See section 3.11
Change the speed limit to 50mph for the entire road	See section 8.2

RESPONDENT SUGGESTION	WSP-PB RESPONSE
Reduce education-related peak hour car trips by encouraging mode shift & independent travel	See section 7.2
In reference to the Linton traffic lights, either change the timings or convert it into a roundabout	See section 7.2
Install traffic lights at the Cherry Hinton Road roundabout	See section 5.4
Additional filter lane to Babraham Road Park and Ride on A1307	See section 5.4

Table 2-1 Additional Suggestions and WSP-PB responses

2.12 KEY FINDINGS AND DISCOUNTED OPTIONS

- 2.12.1 The key findings of the public consultation indicated that users of the A1307 corridor were supportive of sustainable transport improvements to give people more realistic alternative choices of travel modes. However, in view of environmental concerns, there was a distinct preference for solutions to be delivered within the available public highway land where possible before additional land take is considered, especially close to sensitive assets of ecological and historic significance such as the Gog Magog hills and Nine Wells Nature Reserve.
- 2.12.2 Therefore on-highway options have been prioritised for taking forward as part of the preferred options package. As a result of the consultation feedback, as well as concern over cost, deliverability and value for money, the following scheme options were discounted and do not feature as part of the preferred options proposals:
- The longer off-road bus links west of A11 (Granta Park to Cambridge Biomedical Campus) and corresponding off-road cycleway along the same route. However, the option development work has included the shorter section off-highway bus, cycle and walking links between Babraham Road Park and Ride and Cambridge Biomedical Campus; and
 - The longer distance off-road cycleway options between Granta Park and Haverhill have also been discounted. It was considered that these would require substantial investment and would offer recreational enhancement but may not contribute significantly to meeting the City Deal objectives, whereas on-road routes would be more likely to be used at peak times for commuting purposes and would therefore offer more tangible economic benefit to users. However, on review of feedback regarding user safety, an off-road section between Babraham Research Campus and Granta Park via existing (upgraded) segregated A11 crossing facilities seeking to avoid highway safety issues at the A11 roundabout was taken forward for further development.



Figure 2-14 Concept Options Discounted Following Public Consultation

3 PARK & RIDE STUDY

3.1 EXISTING CONDITIONS

3.1.1 The A1307 corridor is currently served by Babraham Road Park and Ride site which is located approximately 1.3km south east of Addenbrooke's roundabout and 200m west of the Hinton Way roundabout. The site location is shown below in Figure 3-1:



Figure 3-1 Babraham Road Park and Ride Site Location

- 3.1.2 The site covers an area of approximately 100Ha and has two access points – a signalised junction on Babraham Road for bus, pedestrian and cycle access plus a vehicle access onto Cherry Hinton Road, approximately 350m north of the Hinton Way roundabout.
- 3.1.3 There are 1458 car parking spaces plus 250 covered cycle parking spaces at the park and ride site currently. There are 4 ticket machines, a user helpdesk centre with toilets and vending machines plus internal and external sheltered waiting areas.
- 3.1.4 A parking charge of £1 is applicable for durations of stay exceeding one hour. A one day Park and Ride return ticket is £3, a P&R 'Hop' ticket is £2.40 (Babraham to Addenbrooke's) and a weekly ticket is £13 for unlimited Park and Ride usage. There are also group tickets available for £8.50 for upto 5 people using the bus.
- 3.1.5 The services currently operating to the site include the Green Park and Ride services operated by Stagecoach. The service frequency is advertised as every 10 minutes with buses operating from 7am to 9pm (Mon-Sat) and every 15 Minutes on Sundays. Since November 2016 there have been changes to the Park and Ride (P&R) services with the Babraham Road P&R Service separated from the Milton P&R Service, so the service now terminates in central Cambridge.
- 3.1.6 The services also stop at the following locations en-route to Emmanuel Street in the City Centre and no longer continue to the Grafton Centre and further north:

- Babraham Road P&R;
- Addenbrooke's Hospital;
- Hills Road 6th form college - Restricted stop, check timetable for specific times;
- Rail Station; and
- Stop E5 Emmanuel Street (City Centre).

3.1.7 The revised Park and Ride service routing is shown below in Figure 3-2:



Figure 3-2 November 2016 Park and Ride revised routing (source CCC website):

http://www.cambridgeshire.gov.uk/info/20149/park_and_ride/556/park_and_ride/5

3.1.8 Whippet Coaches also use Babraham P&R site as a pick up and drop off point for their 7A service. The 7A is a local feeder service which serves Stapleford, Sawston, Pampisford, Hinxton, Heathfield and Whittlesford.

3.3 KEY ISSUES

- 3.3.1 Following the introduction of car parking charges, it is understood based on consultation feedback that the utilisation of the Park and Ride sites and services has reduced. However the site is increasingly used by CBC workers and hospital visitors for Park and cycle or Park and Stride usage. This is evident from consultation feedback and was visibly apparent during a site visit to the Park and Ride facility, with the majority of the available cycle parking fully occupied at the start and end of the day.
- 3.3.2 Due to congestion on the A1307 in the AM peak hours, alternative bus routing has been arranged via Worts Causeway which is restricted for bus only use between 7.30am and 9.30am. This takes buses away from the A1307 route and therefore the highly visible branded Park and Ride services are less well advertised to road users on the corridor.

3.4 OPTIONS CONSIDERED

- 3.4.1 In response to consultation feedback, the following scenarios have been considered as part of this study and these are considered in turn in the following sections:
- Option 1 Expand the existing Babraham Road Park and Ride site with no A11 Park and Ride
 - Option 2 Relocate the Park & Ride site closer to the A11 junction.
 - Option 3 New A11/A505 Park & Ride Site in addition to existing Babraham Road site.

OPTION 1 EXPANSION OF THE EXISTING PARK AND RIDE SITE

3.5 SITE CONSTRAINTS

- 3.5.1 The current P&R site at Babraham Road is not owned by the County Council and is leased from the land owners on a long lease. However the surrounding land to the north and west is in County Council ownership. The land is within the greenbelt and the surrounding land has a draft allocation for housing in the Cambridge Local Plan.
- 3.5.2 Options for expanding the capacity of the existing Park and Ride site may be constrained by a Landscape mitigation strip around the northern boundary which may require relocation of expansion to compensate for additional land take. There may also be established ecology habitats within the landscape area.
- 3.5.3 There are some areas of unused space within the existing site which could be utilised to create additional car parking or cycle parking capacity. However, this would increase the area of hard landscaping on the site and may require additional surface water attenuation space to compensate. The areas available within the existing site are also close to the main accesses on the A1307 and Cherry Hinton Road approaches which may be visually intrusive if filled with additional car parking, although this may help to increase the profile of the site from a marketing point of view. At the A1307 frontage it would be helpful to increase cycle parking as this is the non-car entrance and offers connectivity with potential improved cycle links alongside A1307.

3.6 ENVIRONMENTAL CONSIDERATIONS

- 3.6.1 The existing Park and Ride site is located on the edge of the Cambridge Greenbelt and within the South Cambs Greenbelt, therefore any proposal to expand the existing facility may be met with opposition from the Local Planning Authority and environmental groups. However, the type of development may be considered as essential infrastructure and the site is immediately adjacent to an allocated site for a substantial residential development to the west.

- 3.6.2** The existing Park and Ride site at Babraham Road is located within view of a listed building approximately 275m to the north west on Worts Causeway. Expansion of the site to the north or west may increase development proximity to the listed building and may affect the setting, in which case landscape mitigation may be required by English Heritage which would further increase the land take requirement. There is also a listed building on the south east corner of the Hinton Way roundabout but due to the dense vegetation around the roundabout, there is no direct line of site to the Park and Ride site from this building.
- 3.6.3** The site is also within 1km of Scheduled Ancient Monuments at Wandlebury Country Park to the east of the Park and Ride site. However, the golf course to the east of Cherry Hinton Way which is flanked by mature trees close to the Hinton Way roundabout junction provides a buffer to the Scheduled monuments, so a Park and Ride expansion proposal on the existing site west of Cherry Hinton Way is unlikely to affect the setting of these monuments.
- 3.6.4** There are several ecological designations affecting areas in the wider landscape around the Park and Ride site. The Gog Magog Golf Course has SSSI status and the Nine Wells Nature Reserve 1.3km to the south west is a Local nature Reserve, there is also another Local nature reserve approximately 350m east of the site. However, the majority of these designated sites are separated by linear features such as roads which would act as a barrier to wildlife. Should this option proceed, it is recommended that an extended Phase 1 habitat survey is undertaken of the existing landscape buffer surrounding the Park and Ride site and tree belts and hedgerows along A1307 frontage, Hinton Way and Worts Causeway to understand if there are any habitats suitable for protected species which may be affected by expansion works.

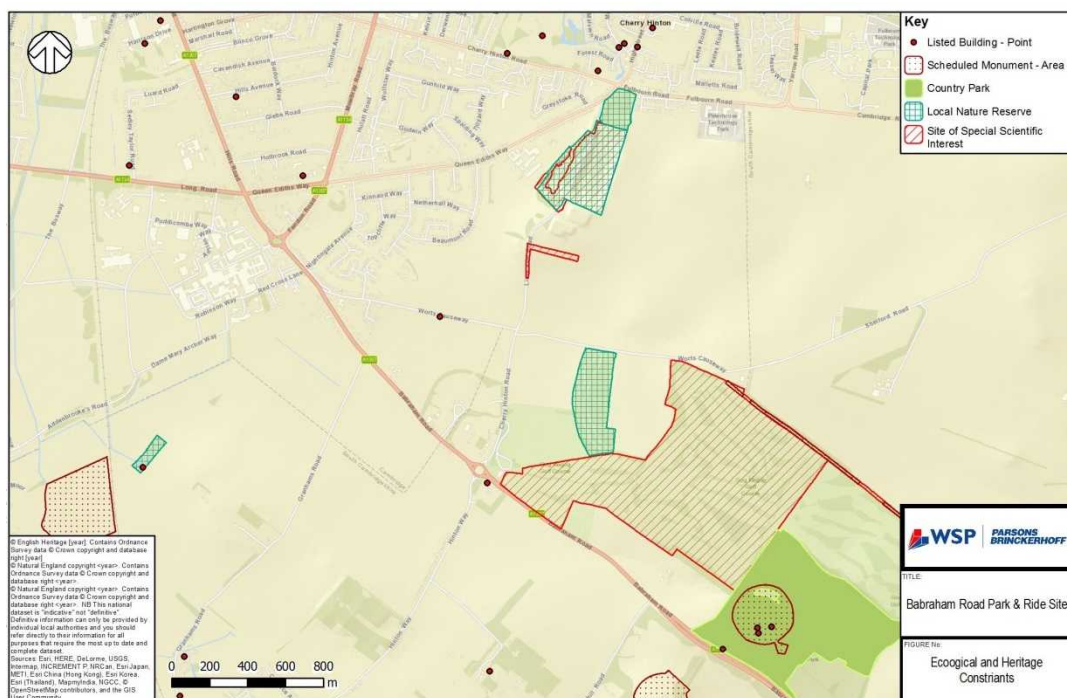


Figure 3-3 Ecological and Heritage Constraints around Babraham Road Park and Ride Site

3.7 EXISTING PARK AND RIDE USAGE

- 3.7.1** Detailed on board bus survey interview data was collected on 10 November 2015. This included survey responses from users of the Green Park and ride service which operates to Babraham Road and Milton Road P&R sites. The data collected represents an 11.6% sample. Approximately 29% of those interviewed specifically stated Babraham Road P&R site as their bus journey origin or destination. Of which 67 people had home locations outside of Cambridgeshire to the south or east of Cambridge (Essex, Suffolk & Hertfordshire).

TIME	P&R VEHICLE ARRIVALS	P&R VEHICLE DEPARTURES	CAR PARK OCCUPANCY
07:00	93	4	89
07:30	217	34	272
08:00	188	6	454
08:30	151	8	597
09:00	72	2	667
09:30	61	8	720
10:00	41	6	755
10:30	44	7	792
11:00	33	13	812
11:30	18	7	823
12:00	22	12	833
12:30	23	22	834
13:00	36	33	837
13:30	22	30	829
14:00	19	29	819
14:30	14	43	790
15:00	19	44	765
15:30	7	50	722
16:00	19	75	666
16:30	7	101	572
17:00	1	143	430
17:30	4	82	352
18:00	8	102	258
18:30	4	54	208

Table 3-1 Existing Park and Ride Site Car Park Accumulation

- 3.7.7 As highlighted in the public consultation, the existing Babraham Road Park & Ride is used frequently as a Park and Stride or Park & Cycle facility as well as for access to bus services.
- 3.7.8 This type of usage has been estimated based on cycle parking site observations. Site visits were undertaken on various weekdays and the typical occupancy of the 250 space cycle park was found to be approximately 85% at the start and end of the day. This equates to 212 spaces.
- 3.7.9 The car park occupancy data above has therefore been modified to deduct Park and cycle users from the survey to understand the typical parking demand related to bus patronage only element.

TIME	TOTAL 2016 CAR PARK OCCUPANCY	BABRAHAM RD PARK & CYCLE (15%)	REMAINING P&R BUS USERS
07:00	89	23	66
07:30	272	69	203
08:00	454	115	339
08:30	597	152	445
09:00	667	169	498
09:30	720	183	537
10:00	755	192	563
10:30	792	201	591
11:00	812	206	606
11:30	823	209	614
12:00	833	211	622
12:30	834	212	622
13:00	837	213	625
13:30	829	210	619
14:00	819	208	611
14:30	790	201	589
15:00	765	194	571
15:30	722	183	539
16:00	666	169	497
16:30	572	145	427
17:00	430	109	321
17:30	352	89	263
18:00	258	66	192
18:30	208	53	155

Table 3-2 Existing Babraham Road P&R Car Park Accumulation on a typical weekday (Oct 2016)

- 3.7.10 A snapshot total of P&R usage at Babraham Road for May and June 2016 was also provided by Cambridgeshire County Council which indicates that the typical usage for one month is approximately 20,000. On average this equates to 666 bus users per day.
- 3.7.11 The current Local Plan growth includes 6000 new jobs at the CBC site which would increase demand significantly and this would potentially soak up the spare capacity in the current Park and Ride site. In 2015 approximately 33% of employees at the Campus and 28% arrived by bus according to the CBC travel plan survey.
- 3.7.12 Taking into account the proposed Local Plan background growth would potentially increase demand by in 2026 (based on predicted growth forecasts from Temprow v7.0 with adjusted planning assumptions to reflect the Cambridge and South Cambs draft local plan growth scenario for MSOA Cambridge 013). The resulting potential future demands for usage of the existing Park and Ride site are provided below in Table 3-5 based on an adjusted growth factor for bus and cycle of 1.46. This does not include the effects of the Cambridge Central Access study if it were to be implemented and does not include for revised or new bus services operating or potential effects of additional bus and cycle priority measures as proposed in the following sections of this study.

3.7.13

The forecasting suggests that the car park occupancy would reach 1222 spaces which is about 84% of the total capacity, so there would not be a need to add extra parking spaces until after 2026, although the assessment is based on a typical weekday and there may be higher usage events occurring at weekends or during Christmas shopping. Demand for cycle parking would exceed the current capacity by about 25% in 2026. It is suggested that increased cycle parking (of approximately 70-100 extra spaces) is likely to be required to support future growth.

TIME	FUTURE 2026 CAR PARK OCCUPANCY	BABRAHAM RD PARK & CYCLE (15%)	REMAINING P&R BUS USERS
07:00	130	34	96
07:30	397	101	296
08:00	663	168	495
08:30	872	222	650
09:00	974	247	727
09:30	1051	267	784
10:00	1102	280	822
10:30	1156	293	863
11:00	1186	301	885
11:30	1202	305	896
12:00	1216	308	908
12:30	1218	310	908
13:00	1222	311	913
13:30	1210	307	904
14:00	1196	304	892
14:30	1153	293	860
15:00	1117	283	834
15:30	1054	267	787
16:00	972	247	726
16:30	835	212	623
17:00	628	159	469
17:30	514	130	384
18:00	377	96	280
18:30	304	77	226

Table 3-3 Existing Babraham Road P&R Forecast Car Park Accumulation on a typical weekday (2026)

OPTION 2 - PARK AND RIDE RELOCATION TO A11

- 3.7.14 Options for relocating the Park and Ride site to a new location close to the A11 junction have been considered. All four quadrants of the junction have vacant areas of land with sufficient area available for creating a new Park and Ride facility with bus turning area, 1000 parking spaces, basic user facilities (toilets, shelters & RTP1) and at least 300 cycle parking spaces. Figure 3- below shows the broad locations of potential A11 park and ride site options:



Figure 3-4 Potential Site constraints affecting Park and Ride site options at the A11 junction.

- 3.7.15 The potential site options to the west of A11 junction (both north and south of A11) are also located within the South Cambs Greenbelt. However, a transport scheme such as a park and ride facility could be considered as essential infrastructure and it may be possible to obtain an exception for this type of development.
- 3.7.16 However, the alternative site options to the east of A11 are located outside of the Greenbelt designation area. Therefore, the site options east of A11 are likely to be considered to be sequentially preferable by the local planning authority in comparison with other options.
- 3.7.17 As shown above there is a national transmission high pressure gas main running to the west of the A11 and due to Padhi hazard zones around such infrastructure, there are significant constraints on what type and density of development can be undertaken within the inner and outer hazard zones. For example schools are not usually permitted within 200m of the gas main and only low density development would be permitted in the inner zone (c100m each side of the pipe).
- 3.7.18 There is also a likely easement of approximately 12-15m either side of the pipe which will need to remain clear of development. However, a park and ride facility may be considered to be less vulnerable development and may be suitable for construction within the outer or inner zone. There is also a risk that the pipe would need reinforcement works to protect it from explosion during development in the event that any roads or car park areas need to cross the gas main.

3.7.19 A stopple charge for stopping the flow of gas would also be likely to be triggered if such reinforcement works are required. This would add a significant cost to the scheme in the order of £1.5-£3m depending on the extent of existing heavy wall pipe required and duration of stopple. Consultation with National Grid regarding the existing condition of the pipe would be required to enable a park and ride scheme to the west of the A11 to proceed. The Hazard clearance zones around such major infrastructure are also a planning constraint, so any works within 200m of the gas main on either side of the pipe would also need to be approved by the LPA. Advantages and Disadvantages

3.8 ADVANTAGES AND DISADVANTAGES OF A11 SITE OPTIONS

3.8.1 A summary of the potential A11 Site location Advantages and disadvantages are shown in Table 3- below:

LOCATION OPTIONS	ADVANTAGES	DISADVANTAGES
	<ul style="list-style-type: none"> Landownership: single landowner Opportunity to address safety issues at Babraham High Street junction. 	<ul style="list-style-type: none"> Area: within Cambridge's Greenbelt Utilities: National Grid high pressure gas pipe running west of A11 Security: isolated location Future developments: little to no room for expansion Creates new desire line crossing A11 from Babraham Village.
	<ul style="list-style-type: none"> Landownership: single landowner Existing infrastructure: NE1 could use existing bus stops on A1307 near The Grange Traffic: additional crossing and/or slow-down of traffic could reduce currently proportionally high number of accidents at A1307 and Shell/Travelodge Hotel access route Future developments: plenty of room for expansion. 	<ul style="list-style-type: none"> Area: listed as Agricultural Land Class 3a and b Security: isolated location Requires A11 traffic to turn off away from desire line to Cambridge. Creates new desire line crossing A11 from Granta Park.
	<ul style="list-style-type: none"> Existing infrastructure: existing bus stops on A1307 near The Grange; easy access to Travelodge Hotel, Cambridge International School, PFS, Abington, Granta Park Traffic: junction changes could reduce currently proportionally high number of accidents at A1307 and Shell/Travelodge Hotel access route Security: overlooked by residential properties Future developments: may benefit from increased connectivity due to development of footpath and cycle lane connecting Babraham and Abington. 	<ul style="list-style-type: none"> Landownership: access routes through areas of 2-3 different landowners. May lead to longer access route. Access: Priority Habitats along southern side of A1307; Construction: potential construction access constraints on west side, and residential properties on east side; Community: potential opposition from Cambridge International School and surrounding residents Future developments: less room for expansion due to complexities of land control. Requires A11 traffic to turn off away from desire line.
	<ul style="list-style-type: none"> Landownership: single landowner Existing infrastructure: walking distance from Babraham and its facilities Traffic: junction changes could reduce risk of accidents at A1307/Babraham High St cross roads. Future developments: may benefit from increased connectivity due to development of footpath and cycle lane Babraham to Great Abington; Space for future expansion. 	<ul style="list-style-type: none"> Area: within Cambridge's Greenbelt Adjacent to conservation area. Utilities: National Grid high pressure gas pipe running west of A11 May require additional land take for environmental mitigation.

Table 3-5 A11 Park and Ride site option Advantages and Disadvantages

3.8.2 A site to the north of A1307 would create a new desire line with the majority of local users living or working within the catchment needing to cross the busy A1307, which would introduce additional safety risk. The north-west site option would also require all westbound traffic to turn right into the site which may cause blocking back into the A11 junction or may be less convenient for users than a left turn approach in the AM peak. Therefore for accessibility and highway safety reasons the north western site option has been discounted.

3.8.3 The site to the north east of A11 junction is slightly more accessible due to the opportunity for a left turn entry from A11 direction but is away from the general desire line towards Cambridge and would require a significant number of right turning movements from A1307 Westbound direction. The land in the North East quadrant of the junction also classed as good grade agricultural land, so other sites would be preferable from a planning and accessibility point of view.

- 3.8.4 It is apparent from the above summary that the options to the south of A1307 have more synergy with existing built development and research campus growth proposals on the south side of A1307. Therefore an option to the south East or South West of the junction is preferred. This also avoids creating a pedestrian desire line crossing the A1307 which is preferable in terms of pedestrian safety.
- 3.8.5 In terms of land issues all options require third party land. The creation of a new access into the site to the west would have more significant ecology impacts than the site to the east and both options also create the opportunity to resolve existing accident problems at the Babraham High Street junction or the A11 services junction by introducing a roundabout.

3.9 TRANSPORT MODELLING

- 3.9.1 The CSRSM (Cambridgeshire Sub-Regional Model) has been used to test the relative benefits of a potential new park and ride site on the A1307 close to the A11 junction. Tests have been carried out using the current CSRSM1 model as the new updated and revalidated model (CSRSM2) was not available at the time of preparing this report.
- 3.9.2 It will be important to test the options in the newly updated CSRSM2 model. However, at this stage the CSRSM1 model land use forecasting has been updated for the purposes of this study to reflect the key strategic Local Plan developments identified in Section 1.7 above. The model is considered to be suitable for option testing and gaining a high level indication of the relative impacts of the park and ride options considered within this study.
- 3.9.3 For this reason the modelled results are expressed in terms of relative differences from the baseline forecast Do Minimum Scenario and the modelled differences have then been applied to the observed access arrival and departure data from the 2016 ANPR survey. Various scenarios were tested and the relative differences in P&R demand from the future year Do Minimum run by time period are summarised Table 3- below:

TIME	DO MIN	P&R E OF A11	P&R W OF A11	P&R W +BUS P2	P&R W +BUS P1	P&R E +BUS P2	P&R E +BUS P1
AM	1	1.23	1.21	1.55	1.38	1.57	1.40
IP	1	1.15	1.26	1.47	1.36	1.34	1.25
PM	1	1.15	1.15	1.34	1.25	1.33	1.24
12hr	1	1.19	1.22	1.49	1.36	1.46	1.33

Table 3-6 CSRSM1 Model results for A11 P&R scenario tests

- 3.9.4 The 12 hour ratios in Table3-3 above for each scenario have been applied to the observed data with a background growth factor of 1.37 applied to convert 2016 observed to the 2026 future year scenario (Public Transport growth factor derived from Temprow7.0 with adjusted planning assumptions for MSOA South Cambs 017 consistent with the Local Plan).

3.9.5

TIME	2016 SPACES OCC	FUTURE DO MIN	RELOCATED E OF A11	RELOCATED W OF A11	E OF A11 + PRIORITY	W OF A11 + PRIORITY
07:00	89	122	145	149	162	166
07:30	272	373	444	455	496	507
08:00	454	622	740	759	828	846
08:30	597	818	973	998	1088	1113
09:00	667	914	1088	1115	1216	1243
09:30	720	986	1174	1204	1313	1342
10:00	755	1034	1231	1262	1376	1407
10:30	792	1085	1291	1324	1444	1476
11:00	812	1112	1324	1357	1480	1514
11:30	823	1128	1342	1376	1500	1534
12:00	833	1141	1358	1392	1519	1553
12:30	834	1143	1360	1394	1520	1555
13:00	837	1147	1365	1399	1526	1560
13:30	829	1136	1352	1386	1511	1545
14:00	819	1122	1335	1369	1493	1527
14:30	790	1082	1288	1321	1440	1473
15:00	765	1048	1247	1279	1395	1426
15:30	722	989	1177	1207	1316	1346
16:00	666	912	1086	1113	1214	1241
16:30	572	784	933	956	1043	1066
17:00	430	589	701	719	784	802
17:30	352	482	574	588	642	656
18:00	258	353	421	431	470	481
18:30	208	285	339	348	379	388

Table 3-7 Proposed A11 Park and Ride site forecast car park accumulation

- 3.9.6** The above results suggest that there is likely to be a 19-22% increase in park and ride usage at a new A11 facility in comparison with the existing Babraham Road site. With additional westbound bus priority measures in place the increase would be more pronounced with a 33-36% increase in Park and Ride patronage at an A11 Park and Ride site.
- 3.9.7** The site to the west of the A11 junction is expected to be more attractive for users over the whole day with up to 1560 spaces occupied at 1pm in 2026. Of the two new site options, the site to the west of A11 appears to be slightly more attractive in the AM peak three hour period than a new site east of A11.
- 3.9.8** However the model results without the existing Babraham Road Park and Ride site indicate that there is re-routing of traffic and increased pressure on the network close to Cambridge with slower journey times between Hinton Way and Addenbrooke's as the existing site no longer intercepts trips on this section of route. The model indicates that there would be up to 200 extra peak hour trips approaching the Hinton Way roundabout with the park and ride replacement and relocation option. The situation is worsened with the SE A11 Park and Ride option in comparison with the SW option.
- 3.9.9** In scenarios with the P&R site relocated to A11, there is also an increase in vehicle journey times between A11 and Hinton Way. This suggests that the network would be adversely affected by removal of the existing P&R site as there is an element of reliance on this facility for users who live west of the A11 who would be unlikely to divert to the new P&R facility.

3.10 MODELLING ASSUMPTIONS

- 3.10.1 The above modelling and calculations for the relocated site assume that the same bus services operate to the proposed A11 park and Ride site on the same routing, cost and frequency towards Cambridge via A1307 and the onward bus routing into Cambridge remains unchanged.
- 3.10.2 The bus priority P1 assumptions are based on one way westbound priority for buses allowing them to travel with a 30% increase in speed in comparison with the Do Minimum scenario. Bus Priority scenario P2 assumes that buses have a 30% speed increase in both directions. However, substantial additional land purchase would be required to achieve this in two directions from A11 to Hinton Way roundabout, passing the Gog Magog Hills, so this scenario is unlikely to be viable in full.
- 3.10.3 The above scenarios do not take account of the implications of other City Deal schemes being implemented such as the Cambridge central access study. It is expected that this may significantly increase the demand for Park and Ride services in the future. This scenario should therefore be tested once the new CSRM2 model and City Deal Foundation Case becomes available in early 2017.
- 3.10.1 It should be noted that the data on Park and Cycle usage of the existing Babraham Road P&R site is not modelled within CSRM for the existing Park and Ride site as the CSRM model assumes all vehicle entries to the Park and Ride site are bus users as the attractiveness functions within the model which govern the demand generation are defined by bus fare costs combined with parking charges. This functionality may be updated in the new CSRM2 model once it becomes available.

3.11 OPTION 3 ADDITIONAL A11 PARK AND RIDE SITE

- 3.11.1 This option reviews a combination of retaining the existing Babraham Road Park and Ride site as well as adding a new A11 Park and Ride site. The maximum occupancy of the two scenarios presented above have been considered and the potential for redistribution of existing trips in response to the new proposal and westbound bus priority measures has been considered. This assumes that one of the Park and Ride sites has a new 10 minute service in addition to the existing green park and ride service.
- 3.11.2 A review of geographic distribution of bus users in the catchment indicates that the new A11 Park and Ride site would intercept about 40% of trips which currently use the existing Babraham Road Park and Ride site, so the demand would decrease in the future at Babraham Road if both sites were operational. The resulting parking accumulation for both sites is shown below:

Time	P&R Vehicle Arrivals	P&R Vehicle Departures	Car Park Occupancy
07:00	240	10	229
07:30	559	88	701
08:00	485	15	1170
08:30	389	21	1539
09:00	186	5	1719
09:30	157	21	1856
10:00	106	15	1946
10:30	113	18	2042
11:00	85	34	2093
11:30	46	18	2122
12:00	57	31	2147
12:30	59	57	2150
13:00	93	85	2158
13:30	57	77	2137
14:00	49	75	2111
14:30	36	111	2037
15:00	49	113	1972
15:30	18	129	1861
16:00	49	193	1717
16:30	18	260	1475
17:00	3	369	1109
17:30	10	211	907

Table 3-4 Option3 total site car park accumulation (New A11 P&R plus retain existing)

- 3.11.3 The combined assessment suggests that 800-1000 additional car parking spaces between the two sites would provide sufficient capacity to cater for the predicted local plan growth to 2026, with some spare capacity for busier periods such as Christmas shopping and major events. In the event that the South East A11 Park and Ride option is selected, the existing Park and Ride facility at Babraham Road would lose slightly less patronage.

- 3.11.4 The local plan proposals also include new housing clustered around the existing Park and Ride site. This would place new residents in walking distance of the Park and Ride site, which has not been included in the above calculations, as only Park and Ride and Park and Cycle demand was considered directly. Additional demand generated by the City Deal Central Access study are also not taken into account in the above assessment.
- 3.11.5 It is suggested that the existing Park and Ride site is retained unaltered other than to increase cycle parking provision by 70-100 spaces. The additional 800-1000 car parking capacity would then be provided at the new site either south west or south east of the A11 junction.
- 3.11.6 Initial discussion with bus operators indicated commercial interest in the proposed A11 Park and Ride option but only if coupled with significant bus priority measures. Ideally this would be best packaged with the off-highway link to CBC. However the viability, frequency and routing of new services require further discussion with bus operators going forward.

3.12 POTENTIAL A11 PARK & RIDE SCHEME OPTION COSTS

- 3.12.1 High level cost estimates have been provided for each of the new A11 Park and Ride considered within this study as set out in Table 3-5 below. Access junction costs are provided but bus priority costs on A1307 are excluded as these are considered in later chapters of this report.
- 3.12.2 At this early stage a 44% optimism bias is included to allow for potential unknown risk items in the absence of detailed surveys of ground conditions, ecology and topography for example. A high level appraisal of land values have also been provided by rural surveyors Carter Jonas Ltd.

COST ELEMENTS Q4 2016	NEW P&R SW OF A11	NEW P&R SE OF A11	NEW P&R NW OF A11	NEW P&R NE OF A11
Total Construction Cost Estimate	£11,460,000	£12,030,000	£10,820,000	£10,520,000

Table 3-5 Proposed A11 Park and Ride Site Option Costs

3.13 COSTING ASSUMPTIONS

- 3.13.1 A high level appraisal of average land values per hectare has been provided by rural surveyors Carter Jonas Ltd. At this stage the land value has been applied to the permanent works areas only and no allowance has been made for additional temporary land or compensation for construction access or crop loss. All land area values are assumed based on vacant possession.
- 3.13.2 The Park and Ride site costs have been estimated based on a new A11 Park and Ride site of 40,000sqm either east or west of the A11 junction. The gas main risk has also been added to the cost summary.
- 3.13.3 Optimism bias of 44% has been included at this early stage to cover unknown risk items such as environmental mitigation, CPO risk and commuted sums.
- 3.13.4 The above costing assessment is based on 2016 Q4 prices with no up lift for inflation to account for construction occurring in the future, since the year of construction is unknown at this stage.

3.14 INTERPRETATION OF RESULTS

- 3.14.1 The CSRM1 modelling indicates that a new A11 Park and Ride facility is likely to attract 19-36% more patronage than the existing Babraham Road facility if it were provided instead of the existing Babraham Road site (depending on site location at A11 and extent of bus priority measures implemented on A1307). The Park and Ride daily maximum parking accumulation increases by 732 vehicles per day on a typical weekday (noting that the Park and Ride sites are also well used for retail trips during weekend periods not modelled in this report). Therefore based on the increase in Park and Ride arrivals and departures required to achieve this extra accumulation This would potentially result in a reduction in traffic on the A1307 to the west of A11 in the order of 1614 vehicles per day (2 way) when coupled with westbound bus priority measures from BRC to CBC.
- 3.14.2 The proposed A11 Park and Ride site location close to Granta Park, BRC and Babraham Village would also support expansion of the two research campuses (especially when coupled with a safe cycle route connecting the two campuses which crosses the A11 using a grade separated route option). A location close to the A11 may also be more convenient than the current Babraham Road site for car sharers to meet for pick up and drop off for example if one person is on a longer commute via A11/A505 and their passenger has an onward journey into Cambridge by Park and Ride.
- 3.14.3 Given the proximity of the existing facility to the Cambridge Biomedical Campus, there appears to be a good synergy and increasing pattern of use of the P&R site as a Park and Cycle or Park and Stride facility. The model results indicate that the presence of this facility currently helps to relieve traffic on the section of route between Hinton Way and Addenbrooke's. Hence, if the existing Park and Ride facility were removed there would most likely be a noticeable increase in journey times and delays on this already congested section of road.
- 3.14.4 However, there is some overlap between the existing Park and Ride catchment and the proposed facility at the A11 junction, therefore it is envisaged that some of the trips which currently use the existing Babraham Road P&R facility originating east of A11 would transfer to the new facility. Site observations and traffic surveys suggest that the existing P&R site is only 57% occupied at present and there is expected to be sufficient spare capacity to accommodate the additional demand generated by proposed housing and employment growth in the corridor to 2031. Hence it appears to be unnecessary to enlarge the existing vehicle parking facility if a new P&R is added at the A11. Although additional cycle parking is likely to be required to support the growth in Park and cycle activity going forward, especially considering employment growth of 6000 new jobs at the Cambridge Biomedical Campus.
- 3.14.5 This would potentially support the forecast large scale growth of the CBC site without the requirement for extra land take for car parking within the hospital grounds. The existing Park and Ride site is also known to be well used during off-peak periods by hospital visitors and outpatients. However, the on-site parking charges at Addenbrooke's hospital require review so that a more CBC focussed Park and Ride site would be competitive and used to its full potential.
- 3.14.6 The preferred option is therefore to create a new A11 Park and Ride site on the South West or South East quadrant of the A11 junction close to Babraham Village and retain the existing P&R site at Babraham Road with increased cycle parking to help support job growth at the CBC site as this would help to minimise downstream pressure on the local road network.
- 3.14.7 CSRM1 modelling suggests that opportunities for attracting passengers to the new site are maximised if the proposed option is coupled with improved bus priority measures on A1307 and enhanced cycleway links crossing A11 to Granta Park.

3.15 POTENTIAL A11 SITE OPTION LAYOUTS

- 3.15.1 Figure 3-5 below shows an indicative layout of the south west preferred A11 Park and Ride site option South West of the A11 junction. The proposed site area of 40,000sqm is based on parking space area only as environmental mitigation requirements are currently unknown and this may increase the land required for the Park and Ride facility, following ecology phase 1 and heritage Phase 1 desk top assessments to be completed in Spring 2017.



Figure 3-5 Proposed A11 Park and Ride Site – SW Option Indicative Site Layout

- 3.15.2 The site would take access from a new roundabout created at the existing Babraham High Street junction with A1307. For westbound traffic approaching the Park and Ride site on exit from the A11 Fourways junction, a left-in only turning lane would be provided to minimise congestion at the proposed roundabout.
- 3.15.3 The south west option would be convenient for A1307 and A11 users travelling towards Cambridge, as well as potentially intercepting trips from Babraham village and Sawston.
- 3.15.4 The proposed roundabout junction is designed as an online configuration to fit within the extents of public highway available around the High Street junction to minimise land take, cost and complexity. However the online configuration would cause some disruption during construction.
- 3.15.5 The left-in only lane also requires localised widening on the A1307 approach in the vicinity of the High Pressure gas main. Whilst the gas main is expected to be of reinforced heavy wall pipe construction below the A1307, there is a risk of triggering stoppage charges during the works which could cost in the order of £1.2m. Part of the proposed Park and Ride site falls within the Padhi Hazard Zone but Park and Ride usage is likely to be considered less vulnerable development within this zone.
- 3.15.6 The site is located within the South Cambs greenbelt adjacent to the Babraham Village conservation area. Therefore discussions with the LPA and Historic England are advisable at an early stage. Additional landscape mitigation may also be required to screen the park and ride car park from view. It is recommended that a phase 1 heritage assessment is undertaken and LVIA are undertaken prior to the completion of a major scheme business case.

- 3.15.7 The proposal to introduce a new roundabout would provide additional priority to traffic approaching A1307 from the Babraham High Street arm of the junction. Whilst this offers a safety enhancement, there is a minor risk that the proposed roundabout may have wider impacts by increasing the attractiveness of travelling through Babraham village for traffic originating in Sawston and possibly for A505 users. A review of the highway network to the south of Babraham Village will also be required to assess the potential for attracting trips through the village of Babraham.
- 3.15.8 For bus services, a dedicated bus only looped turning area is proposed to minimise conflicts of bus movement with private cars. This would take access along the southern boundary of the site via the existing junction of High Street with Oak Lane. A shared surface cycleway along side the bus access would connect to the site and could potentially continue onwards further south and east to link in with existing footpaths and the strategic cycleway proposals (BRC to Granta Park cycleway) to enable non-motorised user access from both sides of A11.
- 3.15.9 The land is in single ownership and further landowner discussions are required to understand their views on the proposals.
- 3.15.10 Figure 3-7 below shows the alternative option to the south east of the A11 junction.

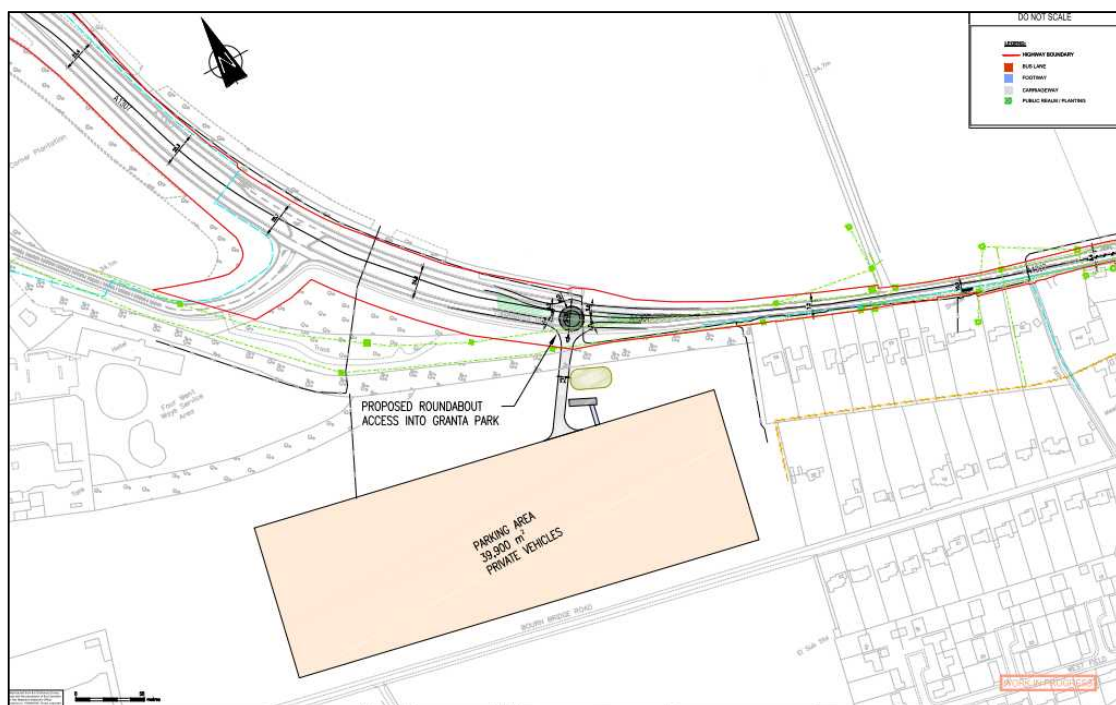


Figure 3-7 Proposed A11 Park and Ride Site – SE Option Indicative Site Layout

- 3.15.11 The site would take access from a new roundabout to the north on A1307 approximately 250m east of the services access which currently has a relatively poor accident record, with six accidents (2 serious and 4 slight) in the five year period 2010-2015. The new roundabout may help slow westbound traffic on approach. However there may also be opportunities for combining these two junctions into a single roundabout in the interests of highway safety as the scheme develops and moves forward. However, there are potential ecology constraints where the access crosses through a landscape buffer which contains dense vegetation.
- 3.15.12 The SE option would be convenient for A1307 westbound traffic originating from settlements to the east such as Haverhill, Horseheath, Linton and Hildersham, and would reduce traffic using the Fourwentways roundabout to cross the A11. The queue length at the A11 junction may also help to influence the user's decision whether to use the Park and Ride site.

- 3.15.13 However, the new site would be less attractive to A11 users wishing to access Cambridge as they would need to turn away from their desire line and turn right into the facility. Residents of Babraham village and workers at the BRC site are also less likely to use the SE option as it is away from their desire line.
- 3.15.14 From a transport point of view, the south west A11 Park and Ride site option is likely to be preferred. However, from an environmental point of view the South East site may be preferable as this avoids the Greenbelt and is further from residential properties and a conservation area setting. At this stage, both the south west and south east options are to be taken forward for further development, consultation and assessment.
- 3.15.15 Further landowner, public and key stakeholder consultation in relation to reaching a single option is also required going forward in spring 2017. CSRM2 modelling would also assist with confirming the above modelling assumptions and results. Environmental surveys and assessments are also required to fully understand the ecological, heritage and arboricultural mitigation requirements of the preferred option going forward.

4 ADDENBROOKE'S TO HINTON WAY

4.1 EXISTING CONDITIONS

4.1.1 This section of the route links Addenbrooke's Hospital roundabout at the south east edge of Cambridge with Hinton Way and is the most heavily congested section of the A1307 on approach to the urban area of Cambridge. The section of road considered is highlighted in Figure 4-1 below:

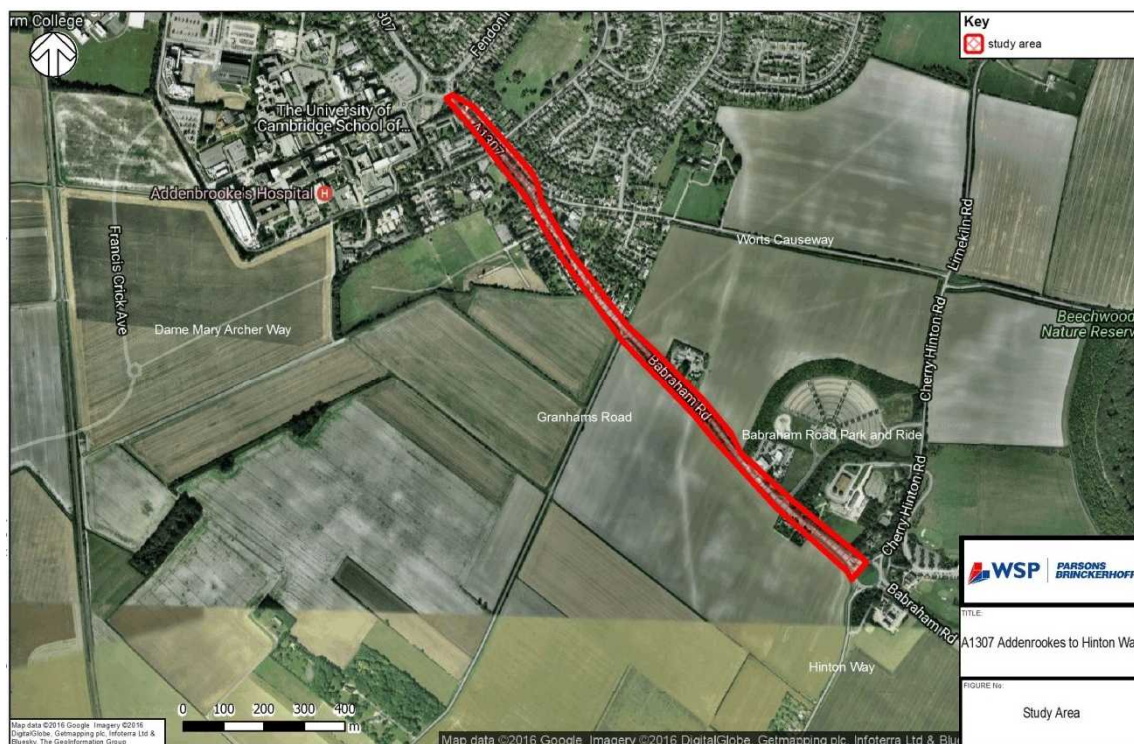


Figure 4-1 Site Location – Cambridge Biomedical Campus to Hinton Way

4.1.2 This section of the route is approximately 1.5km in length and carries approximately 18,000-20,000 vehicles per annum (source DfT).

4.1.3 Traffic flow diagrams for the AM and PM peak hours are shown in Appendix H for the 2016 base year and future year of 2031. The 2016 base year is derived from traffic surveys undertaken in October and November 2016 by Intelligent Data capturing turning movements at the Hinton Way Roundabout and on Thursday 13th October 2016 at the Addenbrooke's access roundabout by ATR (Advanced Transport Research).

4.1.4 There are a wide range of bus services which operate to the CBC. However the key services operating along A1307 are 13, X13 and 13A Stagecoach gold services from Haverhill to Cambridge and the Green Park and Ride services, all of which also connect with the rail station and City centre bus station at Emmanuel Street.

- 4.1.5 The Green Park and Ride services and recent operational changes since November 2016 are described in Chapter 3. The Stagecoach 13 Haverhill Gold service operates several variants (13/13A/13B/13C & X13). These services operate hourly with X13 operating half hourly offering a combined service frequency of 4 buses per hour throughout the day. The X13 is an express service which has a shorter journey time from central Haverhill to central Cambridge as it avoids travelling through the centre of villages such as Linton. Within the study area, the timetabled one-way journey times for the Stagecoach Gold services between Haverhill Sainsburys and Addenbrooke's hospital are typically 35-36 minutes for the 13 and 13A services and 25 minutes each way for the X13 which only operates at peak times.

4.2 KEY ISSUES AND OPPORTUNITIES

- 4.2.1 This section of the route is on the urban fringe of Cambridge and is within walking and cycling distance of residential development and employment sites on Hills Road. Therefore users of this section potentially have more choice of modes available and it is envisaged that any form of accessibility improvement along this section supporting sustainable travel which could lead to mode shift away from the private car is likely to provide wider capacity benefit to the A1307 corridor as a whole. Whereas improvements to highway capacity in general are likely to attract more trips into Cambridge by car and this would potentially have onward impacts in terms of air quality. Therefore the selected measures seek to enhance the alternative options by offering journey time improvements for bus users and improved network capacity and quality for cyclists and pedestrians.
- 4.2.2 The demand for link capacity increases with proximity to Cambridge and journey speeds reduce correspondingly. Slower moving traffic is experienced more significantly in the westbound direction in the AM peak hour between Wandlebury and CBC. Buses which operate to the CBC and central Cambridge along this section and are often delayed by congestion. Peak hour bus journey times along this section can be unreliable (with observed data indicating a range of 10-15 minutes delay westbound at peak times). However the journey times are more reliable in the eastbound direction with delays in the range of 5-10 minutes in both peak hours.
- 4.2.3 Worts Causeway is currently used by Park and Ride buses to avoid some of the congestion and this alternative route is subject to an AM peak (7.30am-9.30am) access restriction controlled by a bus gate to prevent usage by other vehicles, enabling buses to access the City centre more efficiently in the morning. However, the revised routing increases the journey distance for buses.
- 4.2.4 The key opportunity for influencing mode shift is to provide improvement to bus journey times along the congested sections of the corridor where buses are delayed and to increase the attractiveness of the park and ride services, so that longer distance car users have a viable non-car alternative option for the final section of their journey into Cambridge. Table 4-1 below shows bus Journey time data for various locations along the route:

Bus Stop	Length	Speed in Miles per Hour				
		Inbound		Length	Outbound	
		08:00 – 09:00	17:00 – 18:00		08:00 – 09:00	17:00 – 18:00
Hills Road	654.99	7.59	10.35	552.42	16.88	15.29
Red Cross Lane	1221.94	23.53	31.30	1248.45	0.00	17.15
Shelford Bottom	1646.54	26.69	30.93	1585.02	31.04	30.06
Fort	2802.76	39.02	34.22	2790.19	37.60	43.58
Cambridge Lodge	893.89	44.41	36.81	967.92	38.26	44.22
High Street, Babraham	1785.97	32.14	32.91	1785.61	32.20	26.65
Cambridge Road	2188.11	29.14	28.11	2134.05	20.12	30.82
Pampisford Road	2202.97	37.07	40.04	2225.18	35.14	24.09
High Street, Linton	7269.08	17.77	12.73	7213.33	30.55	36.24
Horseheath Green	3355.76	33.27	34.30	3211.42	35.74	34.46
Haverhill Sainsbury's	619.28	14.47	20.32	666.97	21.20	18.70

Source: Cambridgeshire County Council (August 2015)

Table 4-1 Observed Bus Speeds along existing A1307 corridor 2015

- 4.2.5 The Journey time data indicates that buses are experiencing noticeable delays on the inbound (westbound) direction towards Cambridge in the AM peak between Shelford Bottom and Hills Roads, in the vicinity of High Street Linton and also on exit from Haverhill. In the PM peak hour the delays are less pronounced on all sections and confined to a shorter section of route heading out of Cambridge in an eastbound direction.
- 4.2.6 Outbound buses appear to travel at a reasonable speed west of Shelford bottom but experience delays between High Street Babraham and A11 and also around Linton. Therefore bus priority measures would be beneficial between Shelford Bottom and Hills Road and around Linton. However, if a two way bus priority solution cannot be achieved in a cost effective manner, improvements would be best focussed on the westbound direction of travel from Shelford Bottom to Cambridge to maximise benefit to the corridor.
- 4.2.7 Due to proximity to Addenbooke's hospital, ambulances are often required to use this route in blue light conditions, however, road space is limited and during peak times it is often difficult for other vehicles to pull over to enable Ambulances to pass through the congestion. Additional on-highway bus lanes or an off-highway solution could therefore potentially be of benefit to ambulances and other emergency service vehicles, offering an opportunity to improve response times.
- 4.2.8 The off-highway link options additionally create an opportunity for onward busway connectivity through the CBC site which could further improve bus journey times to the rail station and city centre by removing buses from the congested Hills Road route. However, in order for buses to access the busway, suitable single deck vehicles would be required due to a height restriction at Hills Road underpass. The busway also can only be used by adapted vehicles with guide wheels.
- 4.2.9 The opportunities for onward connectivity to the busway for Green P&R and Haverhill Gold X13 services are being explored in consultation with bus operators. Initial discussions with Stagecoach indicated potential interest in operating services along the bus only link as it provides a range of new opportunities for connectivity and may enable more flexibility of routing towards the rail station and the centre of Cambridge.

4.3 PROPOSED OPTION CONCEPTS

- 4.3.1 During the Round 1 consultation there was public support expressed for the proposed concept options for bus and cycle improvements - either an 'on-highway' option with additional road space allocation to ease the movement of buses and cycles or an off-highway section running parallel with the A1307 to the south of the existing route with an alternative new access route via the CBC (Cambridge Biomedical Campus) connecting to the internal road network within the Addenbrooke's site. In response to consultation feedback, both of these options have been developed further to understand the constraints, costs and impacts in more detail, prior to making a recommendation on a preferred option.
- 4.3.2 Whilst some of the congestion on the A1307 is likely to be related to onward capacity within Hills Road and key junctions further north which are beyond the scope of this study; changes to the Addenbrooke's bus station access would also be desirable for enabling more efficient bus movement and minimising delays as they negotiate the main Addenbrooke's roundabout turning left out of A1307 Babraham Road in a westbound direction into the bus station.

4.4 SITE CONSTRAINTS

- 4.4.1 For the On-highway option, there is potentially sufficient space within the extents of existing public highway to create a new one-direction bus lane and widen the footways to create more space and priority for non-car modes. This would require changes to the kerblines of the road and would reduce the extents of highway verge. The existing verges include standard footways which are generally 1.8m-2m wide on both sides, with wider sections in places, flanked by soft verges along the kerbside which vary in width from 1.2-2m.
- 4.4.2 The footways have several private access cross overs on both sides of the road and there are several highway trees positioned within the soft verges which would potentially be affected by any works to create new bus and cycle lanes. The surrounding area is a conservation area and consequently the trees within this are subject to a TPO (Tree Protection Orders).
- 4.4.3 It is also evident that there are substantial public utilities within the verges and footways which would require relocation if the main carriageway was to be widened.
- 4.4.4 The land to the south of A1307 which could be used for creating a new bus way or bus-only road into the CBC site is currently in agricultural use. There are relatively few above ground constraints affecting this route, although there are several mature trees and hedges within the highway verges of the A1307 between the edge of the housing and the Park and Ride access junction.
- 4.4.5 There is an existing public footpath along the south edge of the potential off-highway route site running east-west connecting Granhams Road to the CBC site. The off-highway options would incorporate and enhance this as a shared surfaced footway/cycleway alongside the bus only road. However Granhams Road has no existing footways to connect to this route from A1307.
- 4.4.6 The off-highway options are contained within the Cambridge City boundary, although the extents of works for all options would be immediately adjacent to the South Cambridgeshire border. Land ownership to the south of A1307 is largely controlled by Cambridgeshire County Council, which may facilitate more rapid delivery of an off-highway solution. The solution can also be constructed off-line which would minimise disruption to traffic flows on the A1307 during the works.

4.5 COMMITTED DEVELOPMENTS

- 4.5.1 The part of the route west of Babraham Road Park and Ride site falls within the Cambridge City boundary and the key committed developments are set out within the Cambridge Local Plan. Figure 4-2 below shows the Policies Map.

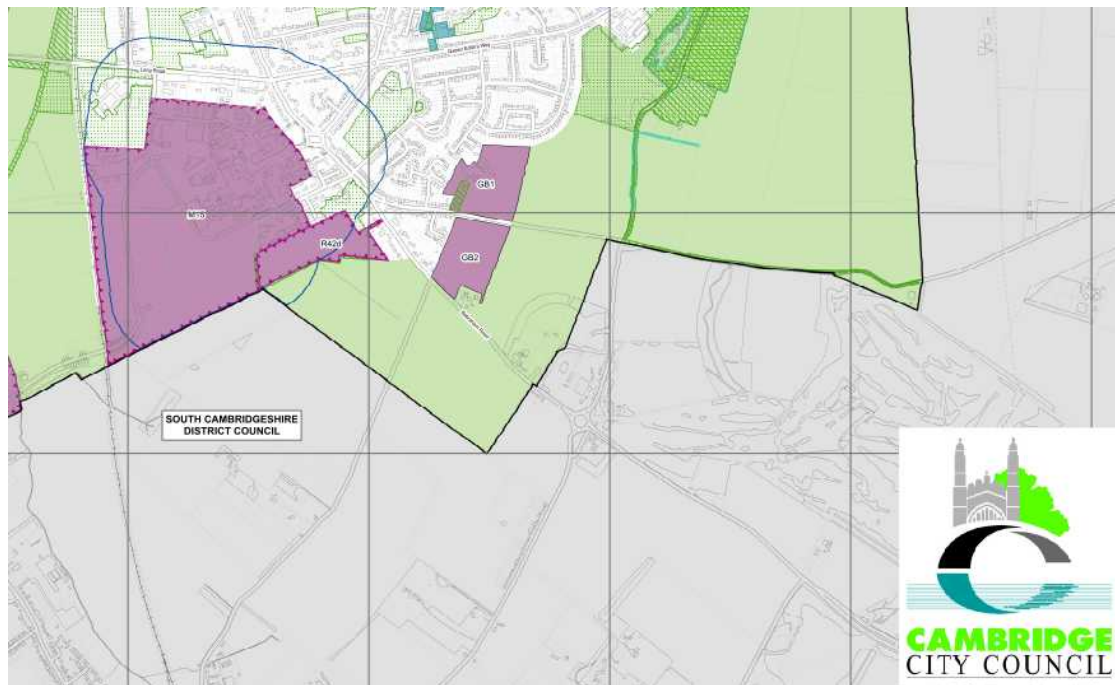


Figure 4-2 Extract from Cambridge City Council Draft Local Plan 2014 Policies Map

- 4.5.2 As shown in Figure 4-2 there are four draft allocations relevant to this section of the A1307:
- GB2 – Land to the South of Worts Causeway;
 - GB1 – Land to the North of Worts Causeway;
 - M15 - Cambridge Biomedical Campus; and
 - R42d – Bell School residential development.

4.5.3

The CBC site is also currently experiencing significant growth with 6000 new jobs being created as part of the Biomedical Campus expansion proposals including the Astra Zeneca (AZ) development which brings a new corporate headquarters within the CBC site. Construction work is ongoing at the Addenbrooke's site with the majority of the expansion works expected to be completed by 2019, with staff relocation and growth on-going progressively over the next 5 years. Figure 4-3 and Table 4-2 are taken from the CBC website showing the scale and timeframe for the various new CBC Phase 1 developments coming forward:

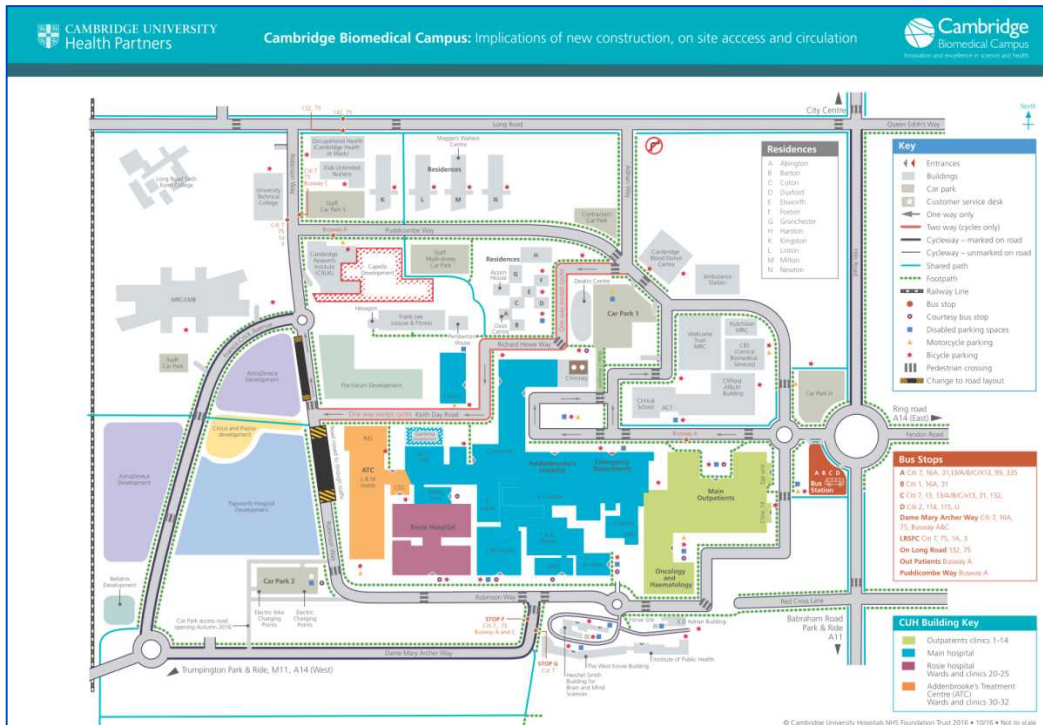


Figure 4-3 Cambridge Biomedical Campus Expansion Proposals

Development	Anticipated Completion	Size (GIA sq m)	Lead
New MRC Laboratory of Molecular Biology (LMB)	Opened 2013	25,000	Medical Research Council
AstraZeneca	End 2016/early 2017	80,705	AstraZeneca
New Papworth Hospital	Spring 2018	32,300	Papworth
The Forum	TBC	35,000	John Laing/Cambridge University Hospitals
Capella	Mid-2018	18,000	Cambridge University Hospitals
Gemma	End 2016	4,000	University of Cambridge
Bellatrix	Autumn 2017	25,000	University of Cambridge
Heart & Lung Institute	pending project fundraising	7,500	University of Cambridge
The Circus	End 2016		Liberty Property Trust & Countryside

Table 4-2 Cambridge Biomedical Campus Expansion Proposals

Source: <http://cambridge-biomedical.com/about-the-campus-2/masterplan-2/>

4.5.4 An outline planning application has also been made for the CBC Phase 2 development south of Dame Mary Archer Way (Planning Ref 16/0176/OUT). This development comprises up to 75,000 sqm floorspace (excluding plant areas) of Research and Development (B1b) and Clinical (C2 and/or D1), sui generis and higher education uses, including related support activities within use class B1; ancillary uses in addition (A1, A3, A4, A5, D1 and/or D2); up to two multi storey car parks; open space and landscaping.

4.5.5 The Gillespies proposed masterplan for the CBC Phase 2 site is shown below in Figure 4-4. The ABCAM part of the site at the western edge adjacent to the roundabout junction of Dame Mary Archer Way and Francis Crick Avenue already has full planning permission.



Figure 4-4 CBC Phase 2 Masterplan Indicative Layout

4.6 ENVIRONMENTAL CONSIDERATIONS

- 4.6.1 The green space surrounding the southern edge of Cambridge is subject to Greenbelt status, so any proposals requiring additional land take on greenfield land is at risk of objection from the LPA. From this respect, an on-highway option would be preferable. However, the draft Local Plan currently includes proposals for several developments within greenbelt land.
- 4.6.2 There are existing mature trees within the highway which would be impacted by the proposals in either option. A tree condition survey is recommended prior to the submission of a major scheme business case to fully understand the level of protection required in relation to the highway trees. Where footway widening works are proposed within the root protection zones of trees, appropriate construction techniques are required under and appropriate arboricultural method statement to be agreed with the relevant tree officer at Cambridge City Council or South Cambs District Council.
- 4.6.3 The off-highway route section is located to the east of Nine Wells Nature Reserve which is a Local Nature Reserve 1.1km to the south west of the A1307. The trees and highway verges may also have ecological habitat potential. An extended phase 1 habitat study is recommended prior to the submission of a major scheme business case to understand the ecological significance and identify any habitats which are suitable for protected species which may be impacted by the development. The Phase 1 survey would also highlight any further Phase 2 species population surveys required.
- 4.6.4 There are a small number of listed dwellings which are potentially in view of the off-highway CBC link. The nearest listed buildings are located at Nine Wells Nature reserve, Hinton Way roundabout and Worts Causeway. The landscape is relatively open however, the construction works would not introduce new elevated structures and the listed assets are located more than 300m away.
- 4.6.5 There is a medium risk of below ground archaeological remains being present at the off-highway site given the context of the site between Nine wells and Wandlebury Country Park and the close proximity of the Gog Magog Hills. The recent CBC developments nearby have required archaeological mitigation For example Astra Zeneca recently published the findings of the archaeological excavation work on their CBC site, revealing that the site was once a thriving settlement during the Bronze Age, Iron Age and Roman period. The main findings were:
- Pottery and flint dating back to the Early Neolithic period in the 4th millennium BC;
 - The outline of a Bronze Age enclosure, as well as artefacts such as animal bone, worked flint, metal objects and over 500 pottery shards dating to approximately 1500 to 1100 BC. Metalwork found on the site included tools such as chisels and awls as well as a spearhead, which represent rare and important finds from this period;
 - Evidence of Iron Age settlements, including the remains of a number of structures likely to date back to this period between 600 and 100 BC;
 - A dense pattern of ditches, enclosures and postholes indicating building plots associated with Roman settlement activity. Artefacts discovered here included pottery and coins suggesting that there was a settlement at the site for much of the Romano-British period, from the first to the fourth century AD;
 - Nearly 6,000 fragments of pottery, including shards from jars, dishes, flagons and other large vessels originating from the local area and from Central and Southern France and the Rhineland;
 - A large quantity of metalwork, including Roman coins ranging in date from the first to the fourth century AD, an iron cleaver and personal items such as a copper alloy bracelet and military buckle; and

- Two small cemeteries, one dating to the first or second century AD and containing four cremation burials in pottery vessels and one, made up of five graves, dating to the fourth century AD. Among the personal effects found in the graves was a rare, fully intact glass unguent bottle likely imported from the Mediterranean.

4.6.6 It is therefore recommended that a Phase 1 archaeological desk top study should be undertaken reviewing the HER data. In the event of a medium to high risk outcome, additional surveys may be required prior to the submission of a major scheme business case.

4.6.7 The site is not within an Air Quality Management area, although given the proximity of residential dwellings alongside the route on both sides, any proposal would require an air quality assessment. In the short term, the proposed off-highway link would potentially offer more air quality benefit than the on-highway option as it would remove diesel fuelled buses from the existing residential area. Although both concepts would potentially improve bus speeds and reduce diesel fumes in the vicinity of residential dwellings fronting Babraham Road.

4.7 ON-HIGHWAY BUS & CYCLE LANE OPTIONS

4.7.1 On reviewing the available space within the public highway boundary on Babraham Road from Addenbrooke's roundabout to Hinton Way, there was found to be sufficient room to create at least one additional lane by widening the main carriageway into the southern verge to create a westbound only bus lane. The footways in the northern verge could also be widened to create an improved shared surface cycle route alongside the road. This would improve connectivity for pedestrians and cyclists from the Babraham Road Park and Ride site.

4.7.2 As described in Section 4.1 above, the network is under more pressure in the AM peak hour inbound towards Cambridge than in the PM peak hour outbound heading east. Therefore additional bus priority measures in the westbound direction are likely to be of more benefit than an eastbound on-highway bus lane. Routing via Worts Causeway in the eastbound direction for PM peak hour buses is also available and less congested. Although there is a slight additional distance due to the diversion, the journey times were found to be quicker.

4.7.3 In order to test the impact of an on-highway option, a westbound bus lane has been designed as shown in Appendix D by widening the main carriageway into the southern verge of the A1307. This increases proximity to the footway by removal of the green strip of verge alongside the road. However, the existing footways on the south side of the road are generally not compromised. Adjacent residents alongside the A1307 will be consulted on these proposals going forward as they evolve.

4.7.4 At the eastern end of the route from Hinton Way roundabout to Addenbrooke's, the proposed bus lane would be generally 4m wide to enable swifter bus movement and more competitive journey time benefits. However at the Cambridge end of the route there are significant utilities diversions required to achieve a 4m wide route and the kerblines on both sides of the road would need to be relocated and the road carriageway re-profiled which adds cost. With a narrower width of 3.1m-3.5m a bus lane could be created at a lower cost, albeit the journey time benefits would be slightly reduced.

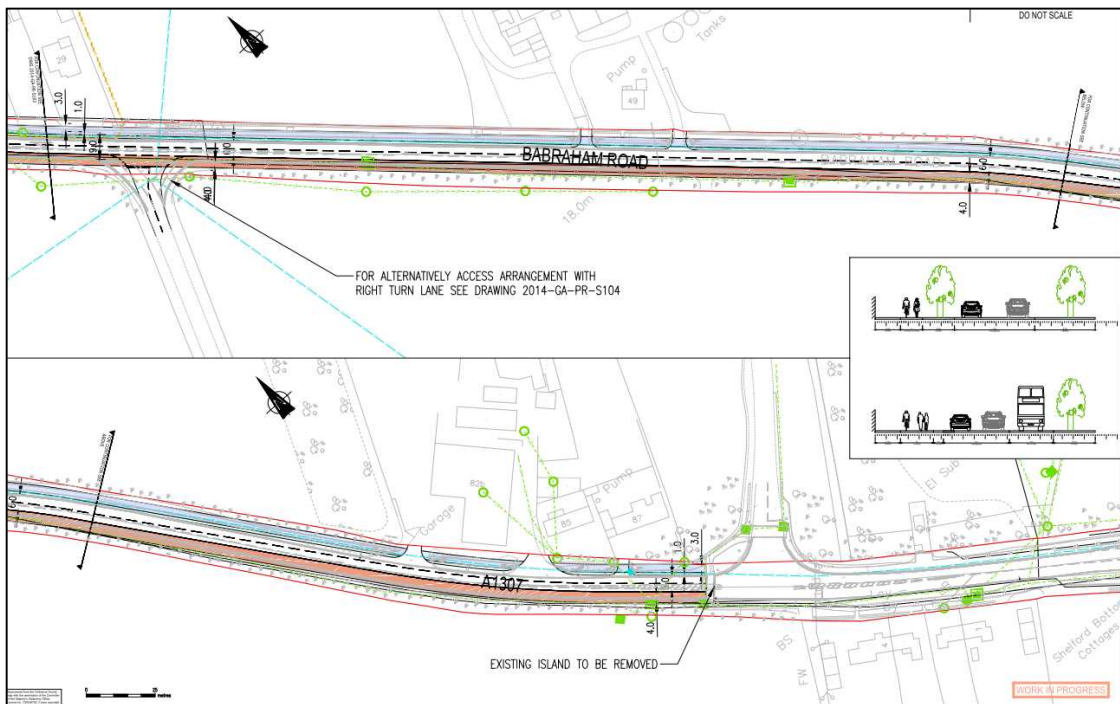


Figure 4-5 Proposed On-highway Westbound Bus Lane – P&R to Granhams Road

4.7.5

The Granhams Road junction is proposed to be reconfigured, seeking to create a ghost island arrangement to minimise eastbound delays when traffic is queuing to turn right. During site visits it was visibly apparent that vehicles often overrun the northern verge, when impatient drivers seek to avoid queuing traffic. The Granhams Road junction allows large vehicles to avoid a restriction on the alternative Hinton Way route for access to The Shelfords. However, this junction is also a key location in terms of strategic utilities with several stop values and an intermediate pressure gas main crossing the A1307 at this point.

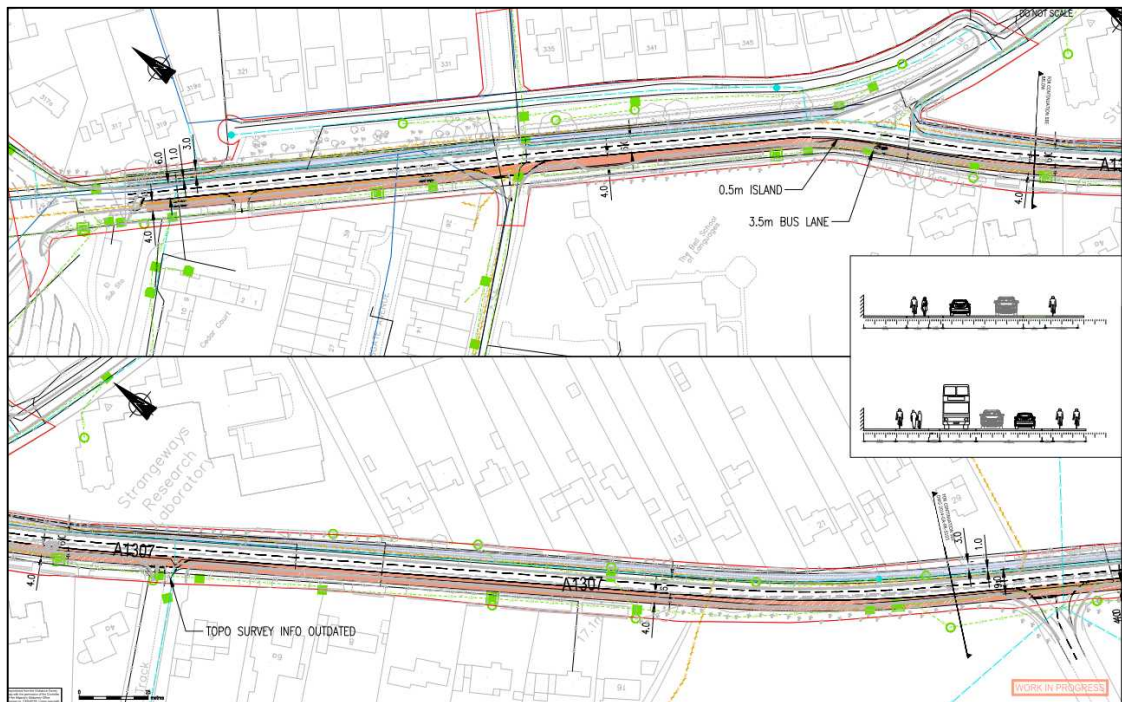


Figure 4-6 Proposed On-highway bus lanes westbound – Granhams Road to Addenbrooke's

- 4.7.6 At the Worts Causeway junction there is sufficient space within the public highway boundary to create a bus slip lane, enabling westbound buses to bypass the traffic signals. This would require removal of some verge space. This could potentially be configured as a short section of busway to prevent abuse by other vehicles.
- 4.7.7 On the north side of the road, the footways are proposed to be widened in order to create a shared surface cycleway/footway which would improve links with the existing Babraham Road Park and Ride site and provide additional capacity and safety for pedestrians.
- 4.7.8 The westbound bus lane could also potentially connect more directly with the existing Addenbrooke's bus station via a new left turn off-slip which allows buses to avoid the traffic lights. This option potentially offers a capacity and safety enhancement at the roundabout by removing the extremely tight left turn manoeuvre for buses.
- 4.7.9 Vehicle tracking has been undertaken to demonstrate that this would be achievable without buses needing to cross over into the adjacent traffic lane. However impacts on trees and utilities need more detailed consideration and discussion with stakeholders prior to committing to this element of the scheme.
- 4.7.10 The on-highway scheme options are shown in Appendix C.

4.8 OFF-HIGHWAY 2 WAY BUS LINK OPTIONS

- 4.8.1 There are three options under consideration for achieving an off-highway solution to the south of A1307, linking to the CBC development on the south eastern edge of the Addenbrooke's site. These options would potentially offer more rapid uncongested access in two directions via a new bus only road.
- 4.8.2 A busway track configuration was considered initially as this can enable buses to travel at higher speeds than on a standard road. However, the busway track option has been discounted as it would be more costly and less accessible to emergency service vehicles (which are considered to be an important benefit on the edge of Addenbrooke's hospital) and would require Transport and Works Act powers to dedicate the necessary powers to the local authority for operation of a segregated track system.
- 4.8.3 The journey time improvements offered over a short section of busway were also considered to be marginal in comparison with a bus only road. The road was also considered to be advantageous in terms of future proofing opportunities and could help with construction access to the CBC site.
- 4.8.4 The three options for a new bus only road link connecting to the CBC expansion site are shown in Figure 4-7 below:

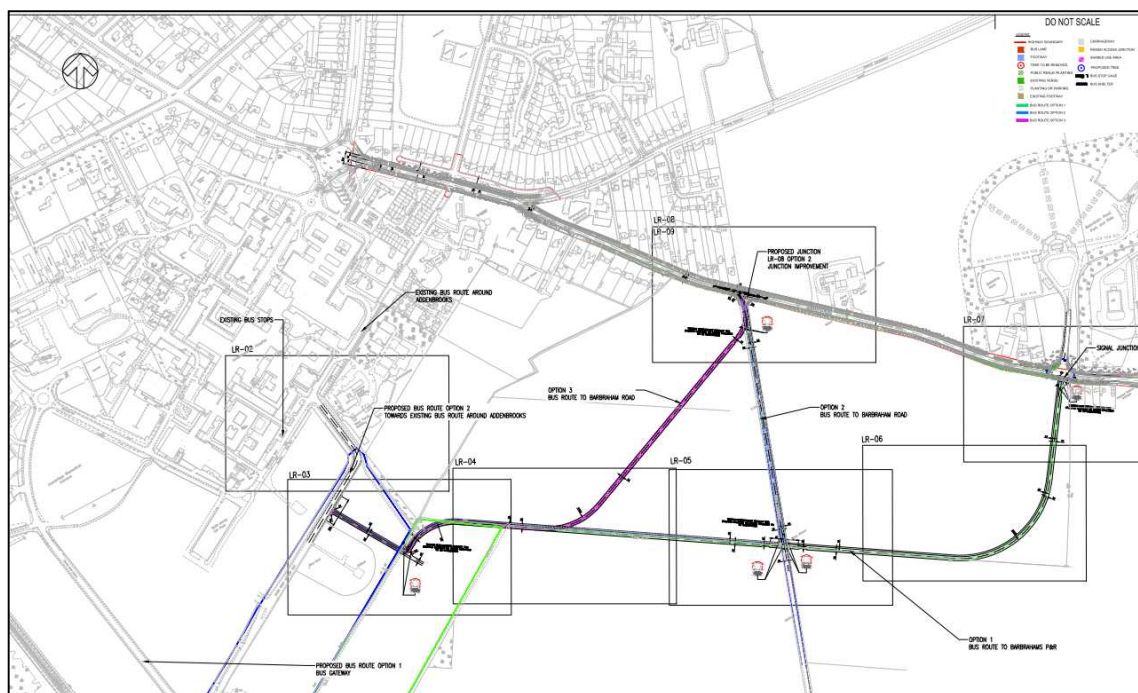


Figure 4-7 Off-highway bus only road options considered

- Option 1 (Green) – This could involve the creation of a new bus only road, c1900m in length, taking direct access from the existing signalised junction at Babraham Road Park and Ride, with the addition of a fourth arm to the south. The route would offer a two way bus access route varying in width from 6.1m to 7m with a shared surface footway alongside the road the shared surface would be approximately 3-3.5m width;
- Option 2 (Blue) - This option takes access from A1307 just to the south of the existing junction with Granhams Road which would be improved to create a new Ghost Island layout and improved crossing facilities for pedestrians and cyclists. In this option the existing section of Granhams Road north of the Public Footpath which runs parallel with A1307 along the Cambridge City Border 200m to the south west of A1307 which would be used by buses to

reach a new section of bus only road running to the west connecting with the CBC campus;
and

- Option 3 (Pink) – This option is similar to Option 2 but seeks to minimise the length of new road constructed and diversion length for buses, pedestrians and cyclists. This also takes access via the upgraded Granhams Road junction but takes a more direct alignment, diverting west into the agricultural field approximately 40m south of the Granhams Road junction at the location of an existing filed gate access. The bus only road section runs parallel with a strategic Intermediate Pressure gas main.

- 4.8.5 All of the above options are proposed to connect to the CBC site in the same location via a priority junction perpendicular to the future access route shown on the CBC phase 2 masterplan.
- 4.8.6 If the bus only road is adopted by the Local Highway Authority, access controls would be needed to prevent private vehicle use. In this event, access could be controlled by a TRO and bus gate at each end. However, there is the opportunity for the road to remain in private ownership initially to avoid the need for a TRO (and associated risk of objection) on opening and enable access permissions to be controlled by Cambridgeshire County Council.
- 4.8.7 To minimise reliance on third party land, the connection to the onward network within the CBC site at the western end of the alignment are currently proposed as a T junction . The choice of access route through the CBC site also seeks to minimise impact on the future development at CBC. However, more detailed discussions with CUHP and CBC partners and affected landowners will be required to refine the connections and routing within the CBC site, seeking a solution which also dovetails into the wider transport strategy within the CBC site.
- 4.8.8 The CBC Phase 1 development has outline planning permission with full planning permission for the ABCAM part of the site at the southern edge of the CBC site, adjacent to the roundabout with Dame Mary Archer Way. This prevents the opportunity for connecting the new link directly to the roundabout. However, there is a clear gap in the proposed outline layout which connects to a proposed access in the Phase 1 layout, so a new link could be created which ties into Dame Mary Archer Way further north at a T junction and this is also advantageous from an ecological point of view as it is further from the Nine Wells nature reserve.
- 4.8.9 The onward route within CBC land and connection to Dame Mary Archer Way requires discussion with the developers and land owners. Access rights for use of the onward network by buses would also need to be negotiated by CCC with the affected land owner as Dame Mary Archer Way is currently in the control of CUH Trust and is not a Public Highway.
- 4.8.10 However, it is considered that the new link has the opportunity to substantially improve sustainable access to the CBC site for employees and may reduce the demand for car parking on site. Recent CBC travel plan surveys indicate that about 28% percent of CBC employees regularly travelled to work by bus in 2015 and 33% by bike, so there is likely to be demand from within the site. If the same mode share applies to the 6000 new employees at CBC, this would potentially create additional demand for 1680 bus trips per day and 1980 cycle trips (each way).
- 4.8.11 The routing of buses and location of bus stops within the CBC site require futher discussion with CBC partners. As a result of current CBC and AZ (Astra Zeneca) expansion proposals which are clustered around the south and western edges of the CBC site, there are opportunities for moving away from a single bus station at the Hills Road (eastern) frontage which is further from the new development areas and moving towards a more distributed bus strategy within the Addenbrooke's site with on-street stops in key areas. The proposals for an off-road bus link at the south western edge of the site would not prevent this and offer relatively direct access to the main circulation route for buses within the Addenbrooke's site.

4.9 TRANSPORT IMPACTS

4.9.1 The transport modelling using the county Council's strategic CSR1 model as used for the Park and Ride study in Chapter 3 above also included several options for bus priority, with bus speed assumptions altered in either one or two directions to represent the potential on-highway or off-highway bus link enhancements. The model results relative to the 2026 Do Minimum scenario indicate that a two direction off highway bus link would increase patronage by about 50% whereas the on-highway westbound option would offer 30-36% increase in patronage, assuming a 10 minute bus frequency.

4.9.2 Table 4-3 below shows the likely journey time savings to the CBC campus centroid (taken as the junction of Keith Day Road with Robinson Way). This is compared with potential journey time savings to the Hills Road/Addenbrooke's frontage. The range of options are then evaluated against the existing bus journey times on A1307 without the improvement proposals in place. For options 2 and 3 it is assumed that the westbound section of on-highway bus lane east of Granham's Road is also included.

SCENARIO	ROUTE DIST M TO CBC CENTRE	2WAY JT (s) TO CBC	BUS JT SAVING PER BUS (s) CBC VERSUS EXISTING A1307	ROUTE DIST M TO HILLS RD	2WAY (s) TO HILLS RD	BUS JT SAVING PER BUS (s) TO HILLS RD VERSUS EXISTING A1307	TOTAL COMBINED JT SAVINGS	RANK
Off-highway Opt1	1998	223	206	2398	246	131	338	1
Off-highway Opt2	2347	300	130	2747	364	14	144	4
Off-highway Opt3	1970	252	178	2370	315	62	240	2
On-highway WB only	1770	329	101	1370	299	78	179	3
A1307 existing (peak)	1770	430	0	1370	377	0	0	6
Worts Causeway existing	2772	385	45	2372	355	22	68	5
On-highway WB EB via Worts Causeway	1770	310	120	1370	280	97	217	3

Table 4-3 Journey time calculations for the on-highway and off-highway options

4.9.3 This indicates that the Option 1 off highway link is likely to offer the most pronounced journey time improvements, with over 3 minutes saving for every two way bus movement between the Babraham Road Park and Ride site and the Addenbrooke's site. Option 3 offers the next best option with almost 3 minutes saving and the on-road option offers a 2 minute saving for buses routed via Worts Causeway.

4.9.4 It should be noted that the above analysis is based on a free flow average speed equivalent to the speed limit and assumes that there are no delays due to other vehicles, traffic signals, pedestrian crossings or junctions en-route. Such disruptions vary per journey but are more likely to affect the on-highway option.

- 4.9.5 Clearly the above analysis is focussed on improving bus access and reducing delays for buses travelling only to the CBC site. However, all of the current services operating to Addenbrooke's from the Park and Ride and the Stagecoach Gold service also currently continue onwards to the city centre of Cambridge. The off-road routes would be less helpful to the current service routing if the buses need to travel north to the existing bus station at the Hills Road frontage.
- 4.9.6 However local bus operators have been engaged in discussions to understand whether they would be prepared to use a new bus only road if it became available in the future and how the bus services would adapt. The operators indicated that they could see a commercial case for using the new CBC bus link road if it was available as it increases onward routing options, especially if coupled with the additional A11 Park and Ride option.
- 4.9.7 The new link creates the opportunity for service routing to be revised to a more efficient onward route, either via the CGB busway to the station (although this would require single deck buses) or through the CBC site, via Dame Mary Archer Way and Robinson Way, passing the Astra Zeneca (AZ) development and using Long Road junction to regain the existing routing on Hills Road. Further discussions with bus operators are required to understand the likely onward routes and wider opportunities for improving journey times to the City Centre and rail station.

4.10 POTENTIAL SCHEME OPTION COSTS

- 4.10.1 High level cost estimates have been provided for each of the bus priority options considered within this study. At this early stage a substantial contingency is included to allow for potential unknown risk items in the absence of detailed surveys of ground conditions, ecology phase 2 surveys and topography for example. The resulting high level cost estimate of the proposed scheme has been produced as set out in Table 2-1Table 4-4 below:

COST ELEMENTS Q4 2016	ON HIGHWAY WB BUS LANE	OFF HIGHWAY OPTION1	OFF HIGHWAY OPTION 2 + ON-HIGHWAY WB BUS LANE HINTON WAY TO GRANHAMS ROAD	OFF HIGHWAY OPTION 3 + ON-HIGHWAY WB BUS LANE HINTON WAY TO GRANHAMS ROAD
Total Construction Cost Estimate	£3,784,000	£7,678,000	£4,090,000	£4,458,000

Table 4-4: P&R to CBC bus link On-highway and Off-highway Option Cost Estimates

4.11 COSTING ASSUMPTIONS

- 4.11.1 A high level appraisal of average land values per hectare has been provided by rural surveyors Carter Jonas Ltd. At this stage the land value has been applied to the permanent works areas only and no allowance has been made for additional temporary land or compensation for construction access or Crop Loss. All land area values are assumed based on vacant possession.
- 4.11.2 Additional allowances have been made for specific higher value anticipated risk items such as utilities diversions. An Optimism bias of 44% is also included to allow additional contingency for unforeseen items such as environmental mitigation, property blight and use of CPO powers if required. The full extent of environmental mitigation is also to be determined further studies are required to fully understand the specific requirements for the preferred scheme option.
- 4.11.3 The above costing assessment is based on 2016 Q4 prices with no up lift for inflation to account for construction occurring in the future, since the year of construction is unknown at this stage.

4.12 ADVANTAGES AND DISADVANTAGES

- 4.12.1 Of the off highway options, Option 1 is likely to be more effective than Options 2 and 3 in terms of journey time savings, with more than a 3 minute time saving for bus journeys from the Park and Ride site to CBC site in comparison with the A1307 existing route. Although the on highway option with eastbound routing via Worts Causeway offers a similar journey time saving to off-highway Option 3 and is more efficient than Option 2.
- 4.12.2 However, the off-highway Option 1 offers slightly less value for money in comparison with the on-highway option when eastbound bus routing via Worts Causeway is taken into account for the existing route. The total capital cost of the on-highway scheme is expected to be substantially less than the Off-highway Option 1 scheme due to the requirement for additional traffic signals, land transfers, utilities risks and potential requirement for the use of statutory powers to secure new access rights for the off-highway option. From an environmental point of view both options are likely to have mitigation requirements. However further studies are required to ascertain the extent and cost of these and the cost allowances may require adjustment once further information becomes available.
- 4.12.3 The on-highway option is also likely to be more complex in terms of utilities impacts, and there are strategic gas and water mains located close to the Granhams Road junction which would require diversion or protection to facilitate the works. However budget estimates would need to be obtained from statutory undertakers. This may also increase the complexity and cost of the scheme, although a risk allowance has been included at this stage.
- 4.12.4 From a construction point of view the off-highway options would cause less disruption to the already congested network on A1307 as the route is off-line and the majority of the construction work could be undertaken at any time of year. The on-highway option would need to be undertaken in off-peak conditions, ideally during school holidays when traffic flows are significantly lower. The on-highway works are also in closer proximity to residential dwellings than the off-highway options. A suitable construction compound could be erected for the off-highway options with hoarding for noise and dust mitigation.
- 4.12.5 From a maintenance and whole life cost point of view, the off-highway option would have a more significant increase in the area of highway to be maintained at public expense. The on-highway option, simply increases the width of existing infrastructure so does not require new maintenance operations to be carried out.

- 4.12.6 A scoring matrix has been used to prioritise the options in terms of cost and benefits covering a range of factors. Each factor was given a score of 1-5 with 5 offering most significant contribution towards meeting an objective and a score of 1 representing the lowest level of contribution. The following Table 4-5 compares the On Highway option with the off-highway Options in terms of their contribution towards meeting City Deal and A1307 study objectives. This indicates that off-highway option1 scores highest in terms of supporting the objectives but when cost is taken into account, Option 3 is seen as the best value option. The on-highway option is slightly more advantageous than the off-highway Option1.

SCENARIO	ECONOMIC GROWTH	EASE OF MVT	CONGESTION	STREETSCAPE	CAPACITY	SAFETY	CONNECTIVITY	SCORING	RANK
Off-hwy Opt1	5	5	5	1	5	5	4	30	1
Off-hwy Opt2	3	1	3	2	3	1	1	14	5
Off-hwy Opt3	4	3	4	3	4	4	3	25	2
On-hwy WB only	1	2	1	5	1	2	5	17	4
On-hwy WB only (EB via Worts Causeway)	2	4	2	4	2	3	2	19	3

Table 4-5 P&R to CBC Bus Link Option Scoring against City Deal objectives

- 4.12.7 The above assessment requires refinement as the current matrix assumes all objectives have equal weight. So the strategic importance of the objectives relative to each other in the context of this study could be defined with input from stakeholders. A similar review considering environmental factors has been carried out as shown below and this suggests that the off highway schemes are preferable.

SCENARIO	JT SAVING	AIR QUALITY	NOISE	LVIA	ARCHAEOLOGY	HERITAGE	ECOLOGY	CONSTRUCTION	MAINTENANCE	ENV SCORING	RANK
Off-hwy Opt1	5	5	5	1	1	3	3	5	1	32	2
Off-hwy Opt2	1	3	3	2	2	5	5	3	3	32	2
Off-hwy Opt3	2	4	4	3	3	4	4	4	2	35	1
On-hwy WB only	2	1	1	5	5	1	1	2	5	24	4
On-hwy WB (EB via Worts Causeway)	4	2	2	4	4	2	2	1	4	27	3

Table 4-6 Babraham Road P&R to CBC Bus link option Environmental Scoring.

- 4.12.8 In terms of meeting City Deal and A1307 study objectives the shorter off-highway route Option3 scored highest. Option 3 also scored highest in terms of environmental factors. The analysis was based on an un-weighted scoring system, with no input from external stakeholders such as bus operators and CBC land owners. It is therefore recommended that further engagement with key stakeholders is necessary to make a fully informed view of the proposals.

- 4.12.9 The extent and cost of environmental mitigation is also unknown at this stage, although allowances have been made for arboricultural mitigation and archaeology. Further detailed analysis is required and further data collection in the form of a tree condition survey of the affected trees, a phase 1 ecology survey and desktop heritage assessment are recommended.
- 4.12.10 The off-highway option would offer journey time benefit to buses and ambulances in both directions, so would potentially offer benefits at any time of day whereas the on-highway option is westbound only, so would be of more limited benefit but would help to address the AM peak hour when inbound traffic flows are the most heavily congested. Buses already have the option to route via Worts Causeway to avoid congestion in the eastbound direction.
- 4.12.11 The scheme costs for the On-highway option and Off-highway Options 2 and 3 are very similar. The longer off-highway Option 1 route has a higher cost than all of the other options due to the more extensive land take requirement and the need for two signalised junctions. However, Option 1 offers the most strategic benefit with more pronounced journey time savings and bus operators were also more supportive of Option 1 in early informal discussions. Option 3 also carries higher utilities risks than Option 1 as it close to strategic gas and water main connections. The on-highway option is likely to have more environmental impact than the off-highway options due to the loss of street trees and verges as well as increased vehicle emissions and noise closer to residential properties, although there are archaeology and ecology risks applicable to the off-highway options which may also add cost.
- 4.12.12 The on-highway option would cause more significant disruption to the operation of the A1307 during construction, whereas the off-highway option could be constructed offline. However, the on-highway option is likely to be preferable in terms of highway maintenance. It is also possible that some elements of the on-highway solution would still be required for implementation in addition to the off-highway option for example to improve pedestrian and cycle access to the park and ride it would be beneficial to include the proposed on-highway cycleway on the north side of Babraham Road as well as the off-highway link. This would further increase the cost of the solution.
- 4.12.13 A preferred options test should also be run in the new CSR2 model when it becomes available in early 2017 with the City Deal Foundation Case as the baseline scenario. This will check the validity of the previous results and understand the interaction of the proposed A1307 preferred option package components.
- 4.12.14 It should be noted that the assessment set out above does not take into account any future opportunities for wider connectivity with the Cambridgeshire Guided Busway or for revised service routing. This requires discussion with bus operators. The off-highway option offers increased opportunity for existing busway services to further divert to serve the Babraham Park and Ride site via the newly created bus link. This may allow the existing Park and Ride services to alter their routing to serve A11 Park and Ride, without the need for changes to the vehicle type to single deck buses to facilitate onward access to the City centre using the Guided busway.
- 4.12.15 Initial discussions with existing service operators indicated that there would be commercial interest in both the on-highway and off-highway options. The on-highways options offer support to existing service routing. However the longer of the off-highway routing is considered to offer more strategic opportunities for wider connectivity and better synergy with other schemes such as the western orbital scheme and the Cambridge Guided Busway. However further discussions with bus operators will be required to understand service changes and a viability assessment will need to be carried out to capture the likely extent of revenue streams and feasibility.

4.12.16 In July 2016 Go Whippet launched Route U (for Universal), running from Madingley Road Park-and-Ride via West Cambridge to Addenbrooke's Hospital and subsidised by the University of Cambridge. This service runs every 15 minutes on weekdays and will be rerouted by the end of 2016 via the southern section of The Busway between Cambridge railway station and Cambridge Biomedical Campus. For this service Go Whippet will add seven Volvo/Wright Eclipse single-decker buses, with Universal branding and fitted for use on The Busway, to the four operating on Route C.

4.13 RECOMMENDATIONS

4.13.1 At present the cost benefit case for selecting a preferred option is not clear for this section of route with on-highway and off-highway options scoring well in different categories although the initial journey time analysis indicates that the longer off-highway option is more effective with a 3-4 minute journey time saving between Hinton Way and CBC as a conservative estimate, albeit at higher cost. Therefore the current preferred strategy includes both the on-highway westbound bus lane option and off-highway Option 1 scenario.

4.13.2 It is recommended that further consultation and technical work is undertaken to investigate environmental and utilities risks on these two options as well as engaging with stakeholders such as landowners and bus operators to inform the final decision.

4.13.3 Despite this initial discussions with bus operators indicated that there would be commercial interest in the on-highway or off-highway option, with the longer Option 1 CBC link of most interest as it is able to unlock more opportunities and offers improved connectivity and accessibility of the CBC campus. The bus operators were also clear that their preferred option at this stage would be for the off-highway option 1 coupled with the A11 Park and Ride strategy to enable more flexibility of routing and linkage of services at the Cambridge for example to Trumpington or the rail station. Therefore at this stage the current indicative bus strategy envisaged is shown below in Figure 4-7. However further discussions with the operators would be required to firm up the strategy and the viability of re-routing bus services and new services.

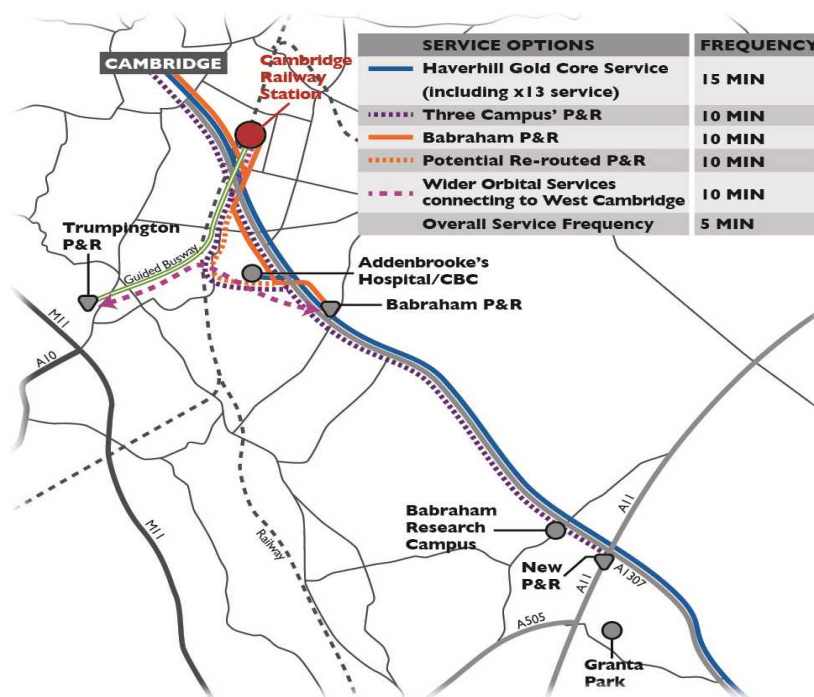


Table 4-7 Proposed indicative bus strategy.

5 HINTON WAY TO A11 BUS PRIORITY

5.1 KEY ISSUES

- 5.1.1 The section of the A1307 between Hinton Way and A11 is currently congested in the morning peak hours with westbound traffic flows of about 800-1000 vehicles per hour. Queues at the Hinton Way roundabout are often lengthy and exceed the available queue storage capacity within the existing two lane approaches. Queues often extend back to Wandlebury Country Park to the east of Hinton Way. Bus journey times can also be affected by the queues at this roundabout as the bus has no priority over other traffic heading west. The Hinton Way roundabout is also classified by CCC as an accident cluster site, with more than 6 accidents occurring in the last 5 years.
- 5.1.2 Recent traffic surveys were undertaken at the Hinton Way junction in October and November 2016 by Intelligent Data and these included queue length surveys. Traffic flow diagrams showing AM and PM peak hour traffic are enclosed in Appendix G. Observed queue data was collected at the same time as the turning counts and this showed that queues were generally more prevalent in the AM peak period on the east arm of the junction. However, over the three survey days the observed maxima varied considerably.
- 5.1.3 During the public consultation, several respondents suggested making geometrical changes to the roundabout or offering a signalised layout to improve the flow of traffic and management of congestion. An ARCADY capacity model of the roundabout was created to understand the extent to which the existing roundabout geometrical design contributes to delays at the junction and test alternative layout options. The ARCADY results for the 2016 base year are summarised below and compared with the queue length data for 18th and 19th October surveys.

NOVEMBER 2016 BASE MODEL	AM PEAK				PM PEAK			
	Queue (PCUs)	Delay (s)	Ratio of Flow to Capacity	Observed Average Queue Length (PCUs)	Queue (PCUs)	Delay (s)	Ratio of Flow to Capacity	Observed Average Queue Length (PCUs)
1 Cherry Hinton Rd (N)	5.8	46.91	0.89	2.6	1.1	6.13	0.53	6.0
2 A1307 (SE)	13.0	47.92	0.97	10.3	0.8	3.69	0.45	1.4
3 Hinton Way (SW)	3.2	44.84	0.79	4.0	0.2	3.27	0.15	1.2
4 A1307 (NW)	1.0	4.67	0.49	3.1	1.3	4.96	0.56	0.8

Table 5-1 Model results and Queue length validation

- 5.1.4 The model results indicate that the existing geometry is unlikely to be the main source of congestion and delays at this junction as the model does not replicate the observed maximum queue lengths. This suggests that the capacity issue may relate to the onward capacity of the downstream network and it is likely that the queues on the east arm of the junction in the AM peak hour (for traffic travelling westbound towards Cambridge) are caused by traffic blocking back through the junction. At present, buses have no priority on approach to the roundabout and therefore need to sit in the westbound traffic queues along with other traffic. There is subsequently a significant opportunity for improving bus journey times by allowing buses to bypass the congestion at this roundabout.

5.2 ENVIRONMENTAL CONSTRAINTS

5.2.1 Environmental constraints affecting this section of route are shown in Figure 5-1 below.

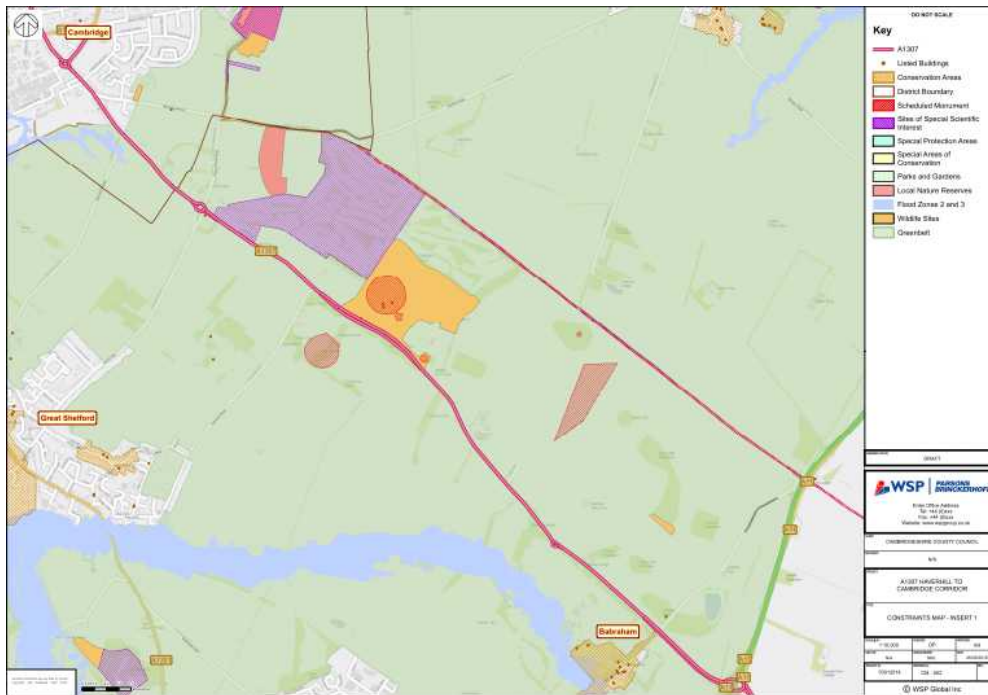


Figure 5-1 Environmental Constraints West of A11

- 5.2.2 This section of the A1307 passes through the Gog Magog hills which are elevated areas of ground that form an important part of the historic landscape and have ecological and visual significance. There are scheduled Ancient monuments on both sides of the road within 200m of the edge of carriageway and the land on the north side of the A1307 at Wandlebury Country Park is a designated wildlife site.
- 5.2.3 Part of the golf course west of Wandlebury is also designated as a SSSI (Site of Special Scientific Interest). West of the A11 junction the route is within the South Cambridgeshire Greenbelt and development is very sparse with open views across the arable landscape. Parallel with the A1307 there is also a scheduled Roman Road approximately 1km to the north of the route.
- 5.2.4 Due to the historic nature of the landscape surrounding this section of A1307, there is significant risk of affecting the setting of the two scheduled ancient monuments if trees are removed alongside the road or major changes to the landscape are proposed. Therefore off-road routes involving the creation of a new busway have been discounted for this section of the route. Where possible the works proposed would be confined to within the extents of public highway to minimise impact on the landscape. There are also listed buildings on the south east corner of the Hinton Way roundabout which need to be considered in terms of impact of junction changes on their setting.
- 5.2.5 It is recommended that a Phase 1 heritage assessment is undertaken and that Historic England should be consulted on the preferred option proposals prior to developing a major scheme business case. A Landscape and Visual Assessment would also be required to understand the visual impact of the proposed works on the setting of the heritage assets; additional landscape mitigation may be required in the form of new tree planting or careful choice of materials.

- 5.2.6 The Cambridgeshire wildlife trust and Natural England should be consulted on the proposed preferred option and a Phase 1 ecology study should be carried out prior to the submission of a major scheme business case. Ecology mitigation may be required where the affected verges are considered to have habitat potential for protected species.

5.3 HINTON WAY ROUNDABOUT SIGNALISATION OPTION

- 5.3.1 A potential signalised layout to replace the Hinton Way roundabout has been considered in response to comments from members of the public. The sketch below in Figure 5-2 shows an indicative layout for a four arm signalised crossroads junction.

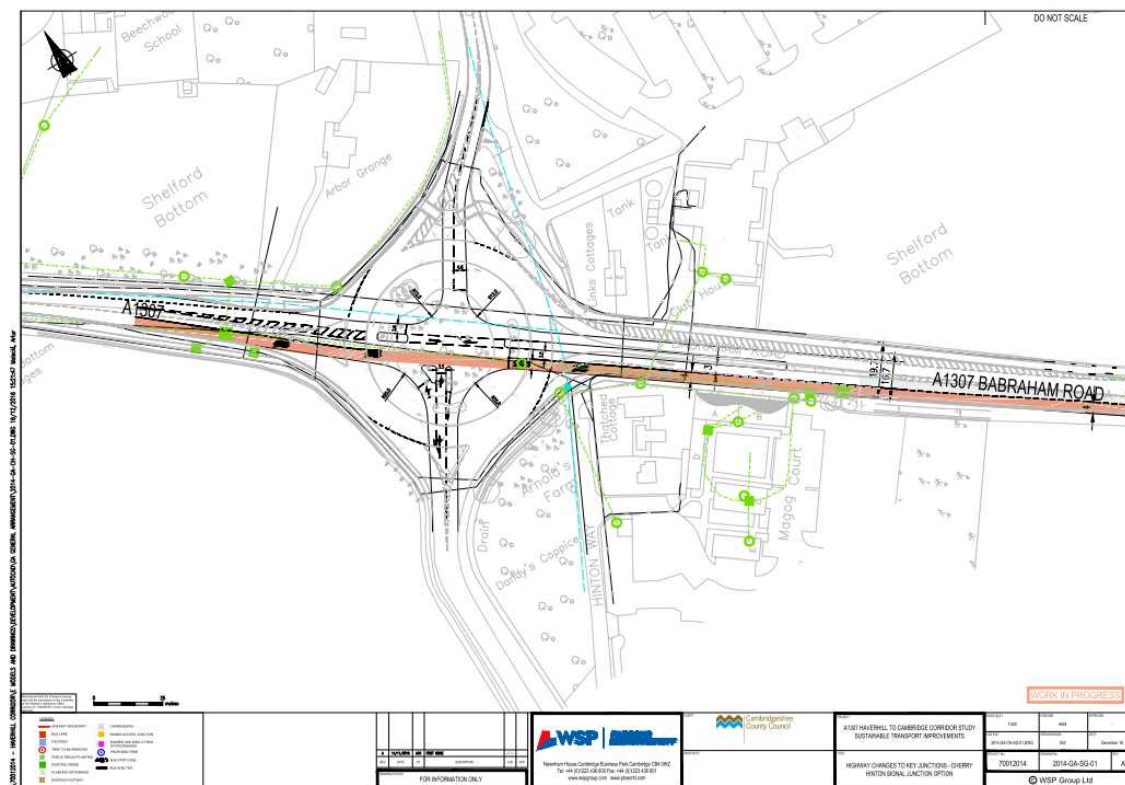


Figure 5-2 Hinton Way roundabout signalised crossroads layout option

- 5.3.2 The above layout would potentially help to improve bus journey times by providing dedicated bus lanes running westbound through the junction coupled with a signal controlled bus gate but this would increase delay to other traffic.
- 5.3.3 The modelling results indicate that the current junction layout does not cause a capacity issue and queue lengths on the westbound approach in the AM peak hour are most likely driven by other external factors. Therefore, conversion of the roundabout to a signalised layout is unlikely to solve the downstream network capacity issue and may increase queue lengths on the east arm of the junction in the AM peak hour.
- 5.3.4 It is also clear from this drawing that the removal of the roundabout would have a significant landscape impact as the raised green island would need to be removed and this contains several mature trees in the north west quadrant of the island which are visually appealing and in view of a listed building. The trees may have habitat potential for protected species, although efforts would be made to avoid removal of the trees.

5.4 CENTRAL RESERVE BUSWAY AND 'HAMBURGER' JUNCTION

- 5.4.1 As an alternative to the above that requires less change to the roundabout geometry, a central section of busway running through the roundabout island could be installed to offer a segregated access route for buses to bypass other traffic. Entry to the busway would be controlled by a signalised bus gate and this would require stop lines within the circulatory carriageway as well as on the A1307 approach arms.
- 5.4.2 Busway sections in the central reserve of the A1307 on the approaches would be needed to align the buses with the central corridor through the middle of the roundabout.
- 5.4.3 The option shown in Figure 5-3 below is assumed to operate in a westbound direction only for consistency with other bus priority measures along the route. As well as offering clear priority for buses, this option could enhance safety at the roundabout with the introduction of signals and may also assist buses turning right into the Babraham Park and Ride site as they would already be in the centre of the carriageway on approach.

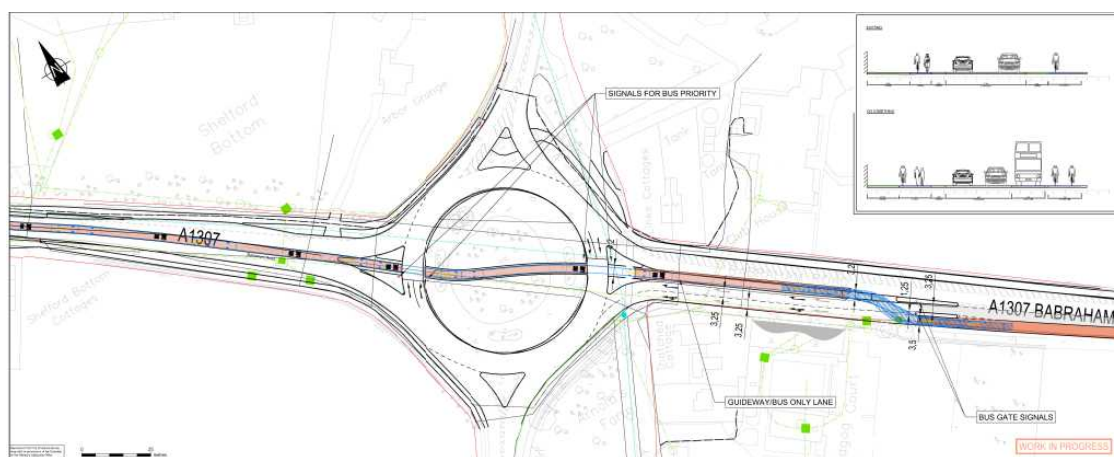


Figure 5-3 Hinton Way Central Reserve Busway with 'Hamburger' roundabout option

- 5.4.4 In comparison with the signalised crossroads layout this option requires slightly less changes to the central island of the Hinton Way roundabout but would still require removal of some vegetation. This option is likely to increase queue lengths for other traffic when the bus gate is activated allowing buses to enter the central reserve safely. However, with a 10 minute bus frequency in one direction, this would only be activated 6 times per hour, so would not cause a significant additional delay to other traffic. The signalised bus gate would also assist with preventing bus lane evasion.
- 5.4.5 This option is likely to offer better value for money when coupled with the A11 Park and Ride proposals as more buses will use this section of road.

5.5 ON-HIGHWAY WESTBOUND BUS LANE OPTION

- 5.5.1 To enhance bus priority and improve journey times, an on highway bus lane could potentially be added to the A1307 from Babraham Research Campus (BRC) to Hinton Way. This would enable buses to bypass some of the AM peak hour congestion on approach to Cambridge. This proposal would be implemented in the westbound direction only as PM peak outbound congestion heading east is less of a problem on this stretch of the road.
- 5.5.2 The proposed scheme option layout is shown in Appendix D but an extract showing the principle of the scheme is shown below in Figure 5-4:

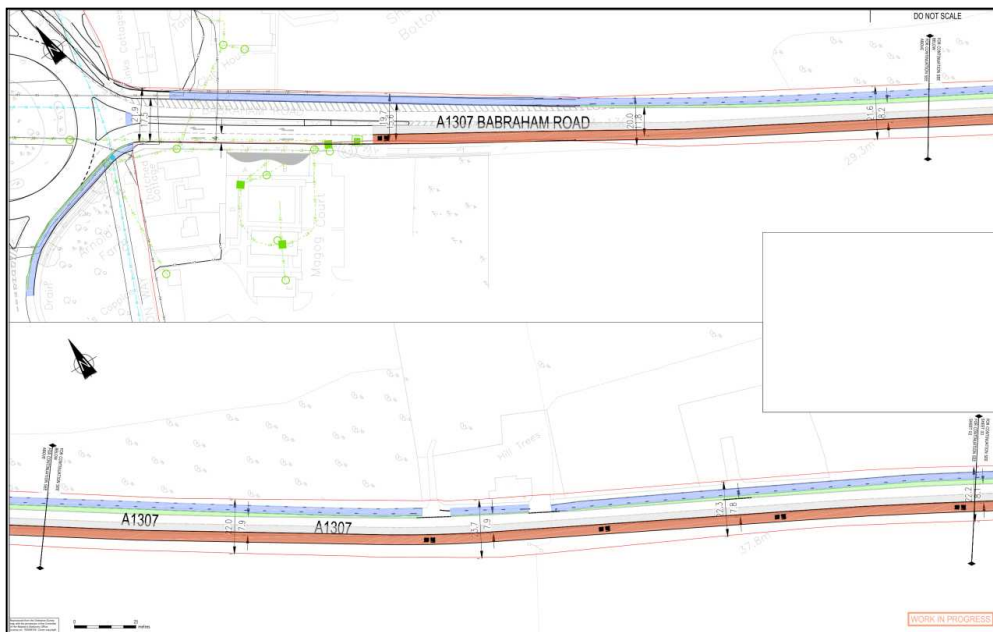


Figure 5-4 Hinton Way to BRC Bus lane option extract

- 5.5.3 The majority of this section has sufficient highway land available to accommodate carriageway widening on the south side of A1307 to enable a 4m wide bus lane to be added to the existing layout, without a requirement to acquire additional private land. This would not reduce capacity for other vehicles but would add capacity for buses to flow freely alongside the queues.

5.6 THE GOG FARM SHOP JUNCTION OPTIONS

- 5.6.1 The preferred option includes the creation of a staggered layout to The Gog Farm shop access junction and enlargement of the central main carriageway splitter island on the eastern approach to this junction seeking to influence reduced speeds on the downhill section to improve road safety at the junction with Haverhill Road. The proposed layout is shown below in Figure 5-5.



Figure 5-5 Junction improvements in the vicinity of The Gog Farm Shop access

5.6.2 The staggered layout option requires purchase of additional land which would require negotiation with the affected landowners to the south of A1307. However, if the land cannot be obtained, the proposed enlargement of the central splitter island is envisaged to provide some safety improvement to users and reduced crossing widths for pedestrians.

5.7 CYCLEWAY IMPROVEMENTS

5.7.1 In the northern verge there is an existing shared surface footway/cycleway route which is generally at least 2m wide between Hinton Way and Wandlebury Country Park site access. However, crossing facilities at the Hinton Way roundabout (to the south and east arms) could be improved via the addition of new cycle lanes and central traffic island. Some sections on approach to Wandlebury are constrained by verge levels with the cycleway elevated approximately 1m above the main carriageway. However, where possible, the cycleways are proposed to be widened to 3m.

5.7.2 Beyond Wandlebury heading east towards Babraham, there is a gap in the cycleway network passing the Copley Hill Business Park where cyclists are forced to use the main carriageway or verge for a short section. However, the cycleways continue further east connecting with Babraham Research Campus. The missing section is therefore proposed to be joined up with a new section of cycleway added within the northern verge as illustrated below in Figure 5-6.

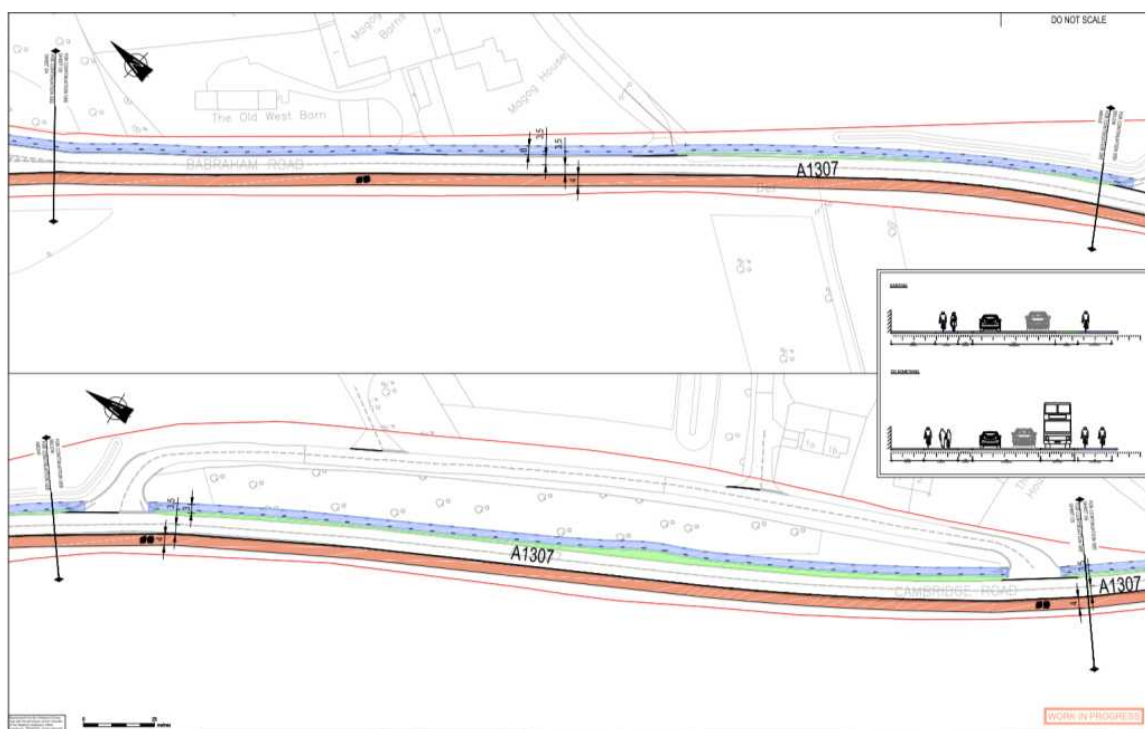


Figure 5-6 Wandlebury to BRC Proposed cycleway enhancements (extract)

5.7.3 Babraham Research Campus (BRC) have recently constructed a new cycleway through the northern boundary of their site, as shown in Figure 5-7 below, which will allow cyclists and pedestrians to avoid the A1307 and divert through the village of Babraham where traffic flows are generally low in speed and volume, so would be more attractive to cyclists than continuing alongside the A1307 carriageway. Within Babraham village the route also offers opportunities to connect to the footpath route crossing A11 which is also proposed to be upgraded to cycleway status as part of the A1307 preferred option scheme (further details are provided in chapter 6).

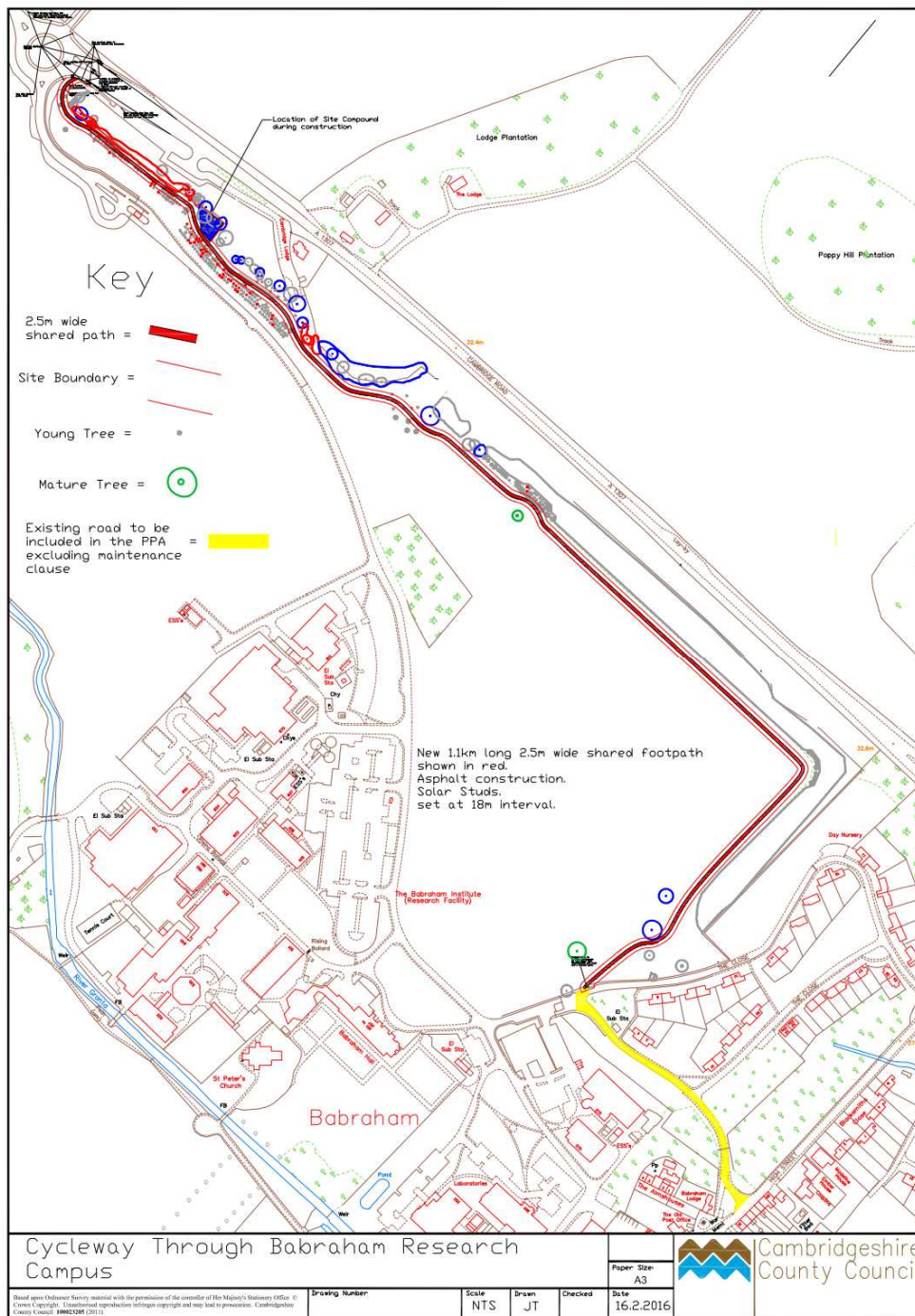


Figure 5-7 Babraham Research Campus Cycleway

5.8 TRANSPORT IMPACTS

- 5.8.1 The modelling suggests that the geometrical layout of the Hinton Way roundabout is not the source of capacity issues. This is likely to be related to onward network capacity constraints with traffic blocking back into the junction from Addenbrooke's. The best solution would therefore allow the bus to bypass the congestion on approach to the roundabout and allocate priority to the bus through the roundabout.
- 5.8.2 Of the options considered in this report, the Hamburger arrangement offers the most effective bus priority. However the introduction of signals and bus gates to make this operationally possible would increase delay to other traffic on A1307 and also requires landscape changes to the roundabout and removal of vegetation.

5.9 POTENTIAL SCHEME OPTION COSTS

- 5.9.1 High level cost estimates have been provided for each of the bus priority options considered within this study. At this early stage a substantial contingency is included to allow for potential unknown risk items in the absence of detailed surveys of ground conditions, ecology phase 2 surveys and topography for example. The resulting high level cost estimate of the proposed scheme has been produced as set out below in Table 5-2

COST ELEMENTS Q4 2016	ON HIGHWAY WB BUS LANE PLUS CYCLEWAYS	SIGNALISED CROSSROADS PLUS ON-HIGHWAY WB BUS LANE + CYCLEWAYS	'HAMBURGER' LAYOUT WITH CENTRAL RESERVE BUSWAY + CYCLEWAYS
Total Construction Cost Estimate	£3,836,000	£6,110,000	£5,190,000

Table 5-2: Hinton Way roundabout Option Cost Estimates

5.10 COSTING ASSUMPTIONS

- 5.10.1 A high level appraisal of average Land Values per hectare has been provided by rural surveyors Carter Jonas Ltd. At this stage the land value has been applied to the permanent works areas only and no allowance has been made for additional temporary land or compensation for construction access or Crop Loss. All land area values are assumed based on vacant possession.
- 5.10.2 The full extent of environmental mitigation is also to be determined. Further studies are required to fully understand the specific requirements for the preferred scheme option.
- 5.10.3 The above costing assessment is based on 2016 Q4 prices with no up lift for inflation to account for construction occurring in the future, since the year of construction is unknown at this stage.

5.11 RECOMMENDATIONS

- 5.11.1 The Park and Ride study indicated that the proposed A11 Park and Ride site would maximise patronage if coupled with improved priority for public transport to improve journey times for bus between the Park and Ride site and Cambridge. To enhance bus movement and minimise journey times a westbound bus lane is proposed. This is only of benefit in one direction. However, journey time data on bus travel indicates that the morning inbound movement of traffic tends to be slower moving than the out bound PM peak eastbound movement.

- 5.11.2 The bus lane would be used by up to 6 Park and Ride buses per hour (assuming current P&R service frequency is maintained for the proposed site) and 4 buses per hour on the various 13/13A/13B/13C and X13 routes. This gives a combined service frequency of 10 buses per hour. Each bus is capable of carrying at least 70 passengers, therefore the proposal would provide capacity for about 700 trips per hour. Taxis, emergency service vehicles, private shuttle bus services and National Express coaches would also be able to use the proposed bus lane.
- 5.11.3 However if the westbound bus lane is found to be under-utilised throughout the rest of the day, the proposed on-highway bus lane could be offered to other road users on a part time basis during off-peak conditions which may enhance access to Cambridge, Addenbrooke's hospital and key employment sites along the corridor for business users, visitors and shift workers.
- 5.11.4 Widening of the existing A1307 carriageway within Highway verge land to the south of A1307 is proposed and this would create a new 4m wide on-highway westbound bus lane between the proposed A11 SW Park and Ride site and Hinton Way roundabout, offering bus priority for Park and Ride users all the way to Cambridge. The preferred option also includes the creation of a staggered layout to The Gog Farm Shop access junction and enlargement of the central main carriageway splitter island on the eastern approach to this junction seeking to influence reduced speeds on the downhill section to improve road safety at the junction. The staggered layout option requires purchase of additional land which would require negotiation with the affected landowners to the south of A1307. However, in the event that the land cannot be obtained, the central island enlargement alone may offer some mitigation in terms of improving highway safety.
- 5.11.5 In response to public consultation comments about the queue lengths on the westbound approach to Hinton Way roundabout (200m east of Babraham Road Park and Ride bus access), this junction has been modelled to test the geometrical capacity and several layout options have been considered (such as signalisation and a 'Hamburger' arrangement with a central signalised bus link through the roundabout island running east-west connecting to a central two way busway via a signalised bus gate. However, the model of existing capacity indicates that any capacity issues, queues and delays experienced at this junction are unlikely to be related to the existing geometry and are more likely to be related to onward queues blocking back into the junction.
- 5.11.6 A signalised layout is therefore unlikely to solve the problem and would be expensive and disruptive to install. From a maintenance point of view, new signals would have more onerous whole life cost implications for the Local Highway Authority, and to convert the roundabout would require detector loops installed within the carriageway. Major geometrical changes would be required to the central island which would be expensive and disruptive and would also potentially have ecological impacts as mature trees within the island may be lost.
- 5.11.7 The Hamburger arrangement is therefore considered to offer an improvement with less landscape impact, although the solution would still be reliant on traffic signals and the proposed works to create a new section of busway through the island are costly. It may that a more cost effective variant of this option can be developed as the scheme progresses. However, improved cycle and pedestrian facilities are proposed to be integrated with the existing layout of the roundabout to ease crossing movement on the south and east arms of the junction.
- 5.11.8 West of Hinton Way cycleways continue on the north side to Wandlebury Country Park. These existing routes are suitably wide and of good quality. However, some localised improvements are proposed to the east of Wandlebury to create a consistent shared surface route of 3m-3.5m width where possible in the northern verge and join up with the Babraham Research Campus cycleway Scheme which has recently opened.

6 BRC TO GRANTA PARK CYCLEWAYS

6.1 EXISTING CONDITIONS

6.1.1 The presence of the A11 strategic trunk road running north south between Babraham Village and Great Abington evidently causes severance issues for local residents in the two villages and workers at BRC (Babraham Research Campus) and Granta Park as very few travel by non-car modes between the two areas despite geographic proximity.

6.1.2 The A11 junction is a major grade separated trunk road junction which is intimidating for cyclists and there are no pedestrian footways within the junction, except on the bridge decks. Vehicles approach and circulate at relatively high speed on all arms and there have been several slight severity accidents at this interchange in the last 5 years. This does not offer an attractive route for cyclists and pedestrians to cross the A11 currently and it would be undesirable to attract more vulnerable users to the junction. Therefore a segregated off-road route is required in this instance which enables cyclists and pedestrians to cross the A11 in relative safety and comfort.

6.1.3 A Greenways study considering cycle accessibility through the rural area surrounding the A11 junction was completed by Nigel Brigham & Associates in 2016. The route shown below in Figure 6-1 Figure 6-1 Suggested Cycleway Routing taken from Linton Greenways Study was recommended for cyclists in the report.



Figure 6-1 Suggested Cycleway Routing taken from Linton Greenways Study

Source: Nigel Brigham & Associates, 2016

6.1.4 The recommendations of the Linton Greenways study included four potential options for crossing the A11 of which the option to use an existing stepped footbridge over the A11 or to divert cycles via an existing underpass where the River Granta crosses under the A11 would potentially be accessible options for A1307 users, so have been considered in more detail.

- 6.1.5 These two options connect well with the existing research campuses. However, the A11 footbridge is only 476m south of A1307 whereas the River Granta underpass is a further 419m south of the footbridge (a total of 895m away from the study area).

6.2 A11 FOOTBRIDGE

- 6.2.1 The A11 footbridge, depicted below in Photo 6-1 , is a bespoke structure with stepped access to the bridge deck elevated above the A11 corridor which is within a cutting. On the west side of the bridge the deck soffit level is approximately 4m above the surrounding ground levels on the public footpath. To the east of the A11 the level difference is approximately 2.5m above the footpath.



Photo 6-1 A11 Existing Stepped Footbridge.

- 6.2.2 The steps include cycle gullies. However, the structure is not considered to be compliant with the equalities Act 2010 as it has no ramped access of suitable gradient, so mobility impaired users would be unlikely to be able to gain access using the stairs.
- 6.2.3 It is envisaged that a 1:21 (or shallower) gradient ramp could potentially be added to replace the stairs and this would enable mobility impaired users to access the bridge. This would also be easier for cyclists to use. However, modifications would be required to the bridge parapet to improve its suitability for cyclists. At present the parapet is too low at 1.5m for cyclists and the space between handrails on the bridge deck narrows to approximately 1.8m for a short section at each end, although for the majority of its length the bridge is 2.2m wide between parapets. It may be possible to increase the parapet height for example by adding mesh screens on top of existing or replacing the parapet with a taller edge protection with similar appearance.

- 6.2.4 Further work is required to consider the structural feasibility of the works required to install the ramps and due to the bespoke design of the bridge with steps integrated within the structure. From a user point of view an online ramp option is likely to be preferred. However, to minimise impact on farming operations (and avoid clashing with an existing mature tree on the west side of A11) the ramps could be perpendicular to the bridge deck either within A11 Highways England land or within private land. Because the A11 is in a cutting at the footbridge, only a short ramp on the east side is required so the addition of a perpendicular ramp would have a maximum diversion length of 136m at a 1:20 gradient. For the majority of users this would still be more convenient than use of the underpass which would add a further 283m to the journey.
- 6.2.5 The proposed footbridge option is shown below in Figure 6-2. This would also offer better synergy with the proposed Park and Ride preferred option and new cycleways could be created to connect the bridge with the P&R. However further discussions are required with affected landowners on each side of the A11 to understand their views on upgrading the existing footpaths to cycleway status and adding ramps and Park and Ride options.

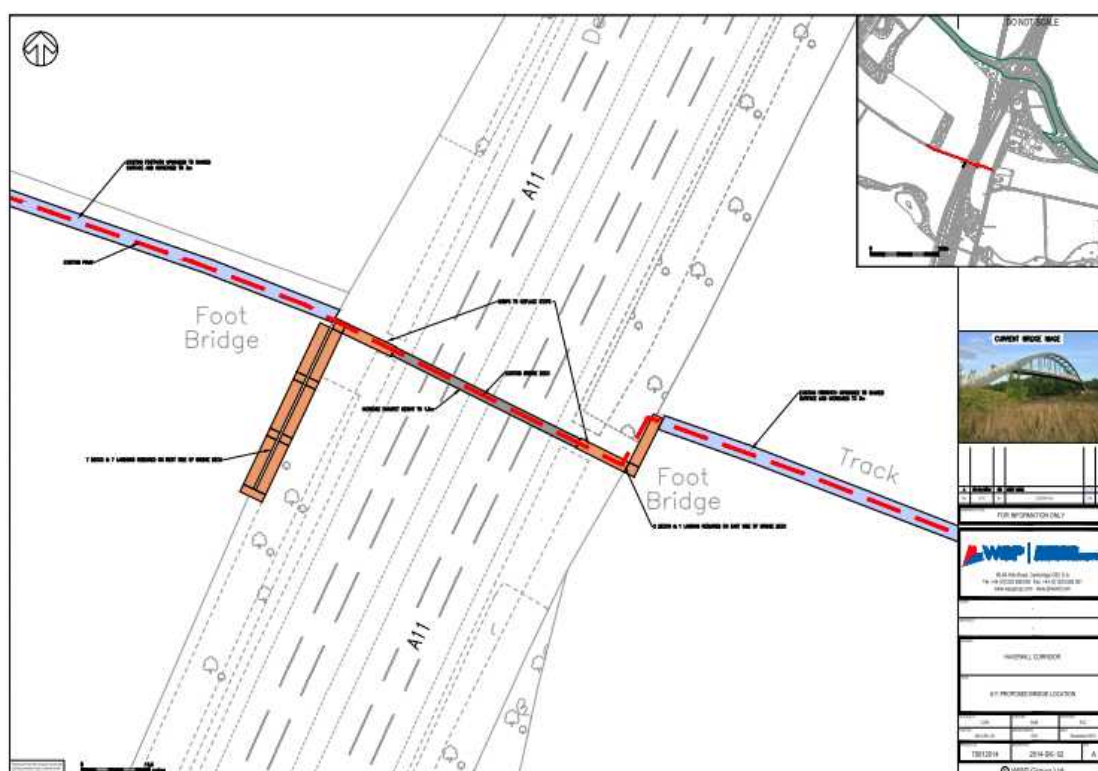


Figure 6-2 Proposed ramped structure appended to existing A11 footbridge.

- 6.2.6 In the event that modification of the existing structure is not feasible, the option to replace the current bridge with an entirely new structure has been considered. However, this would require extensive works within the A11 trunk road corridor, to demolish and replace the existing bridge. This would have a very high capital cost in the region of £2-3m and would require a temporary closure of the A11 during the works. It would therefore be more cost effective to progress alternative diversion routes such as the A11 underpass options.

6.3 ENVIRONMENTAL CONSIDERATIONS

- 6.3.1 An extract from the Environment Agency Flood Map is shown below in Figure 6-3. This indicates that the proposed cycleway via A11 footbridge route is generally well separated from areas at risk of flooding, with the majority of the route in flood zone 1.

6.3.2

However at the eastern edge of the alignment where it re-joins the A1307, the River Granta passes under High Street in Great Abington so a short section of the route is within Flood Zone 2. However this section of route is an on-highway signed route with no carriageway works or removal of verges proposed, so should not have an impact on the flood plain, Figure 6-3

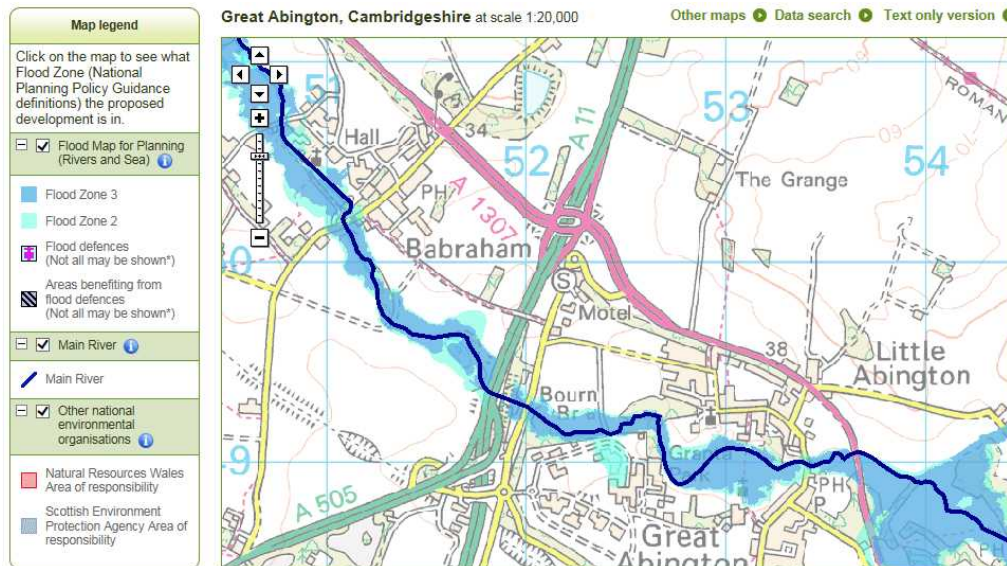


Figure 6-3 Environment Agency Flood Zone Mapping Extract

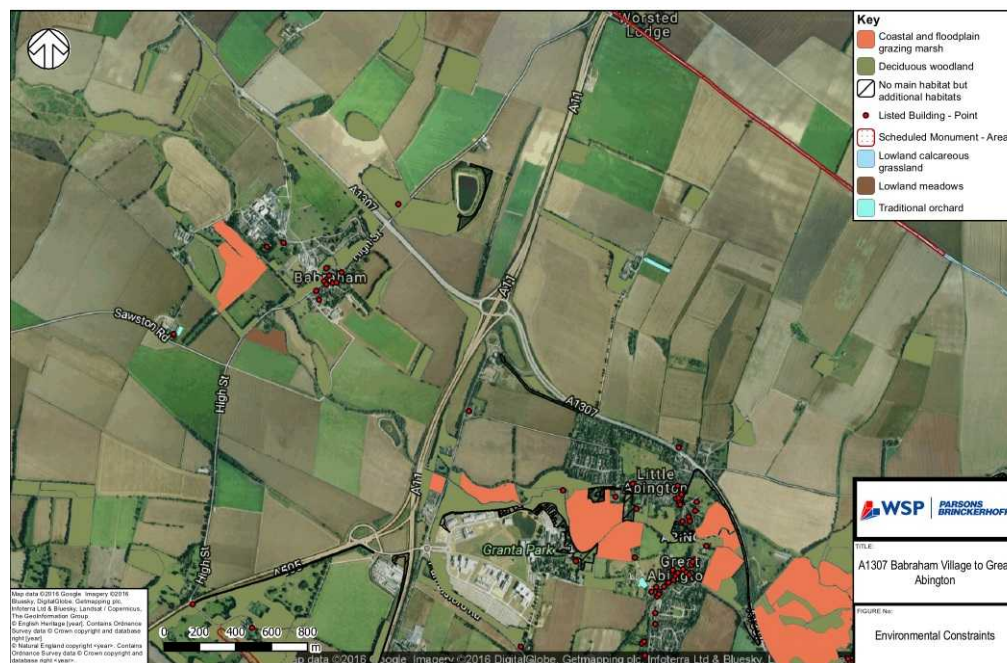


Figure 6-4 Environmental Constraints in the vicinity of BRC and Granta Park

6.3.3

As shown in Figure 6-4 above, the routes between Babraham village and Granta Park are relatively free of environmental constraints as the surrounding landscape is largely arable fields. There are several listed buildings in Babraham village and Great Abington. However the proposed cycle routes would be adequately separated from these. If lighting is required, this could be LED solar lighting embedded in the path surface rather than intrusive lighting above the ground as this area is relatively unlit during hours of darkness.

6.4 PROPOSED GREENWAY OPTIONS

A11 UNDERPASS

- 6.4.1 An alternative route was also identified in the Greenways document crossing under the A11 at an existing underpass where the River Granta passes under the A11 depicted in Photo 6-1 and 6-2 below.
- 6.4.2 The underpass is also located over 900m south of the A1307 and this is significantly further from the route than the A11 footbridge, so would be of less benefit to A1307 corridor users, although could offer an additional route option which provides level access for mobility impaired users in the event that the proposal to add ramps to the existing A11 footbridge is not feasible, albeit the diversion distance may not be compatible with the Equalities Act 2010. This may however, offer a more direct route to Granta Park for cyclists.
- 6.4.3 Improvements to cycle accessibility over the existing A11 footbridge are likely to be complex and costly, two alternative route options are considered utilising an existing underpass structure approximately 430metres to the south. The assessed route options are illustrated in Figure 6-5 & Figure 6-6 below.

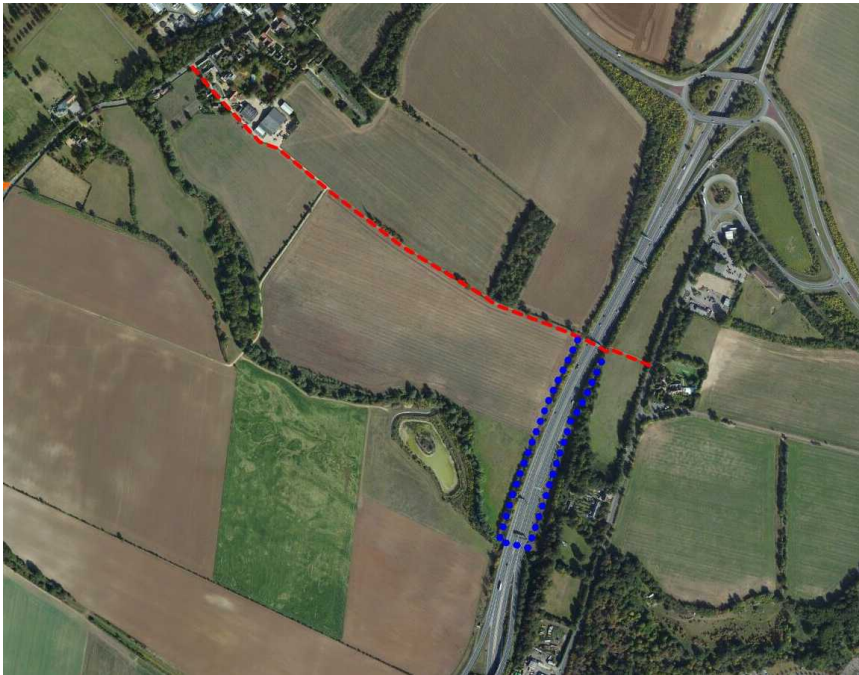


Figure 6-5 Proposed Option Route 2 via A11 Corridor

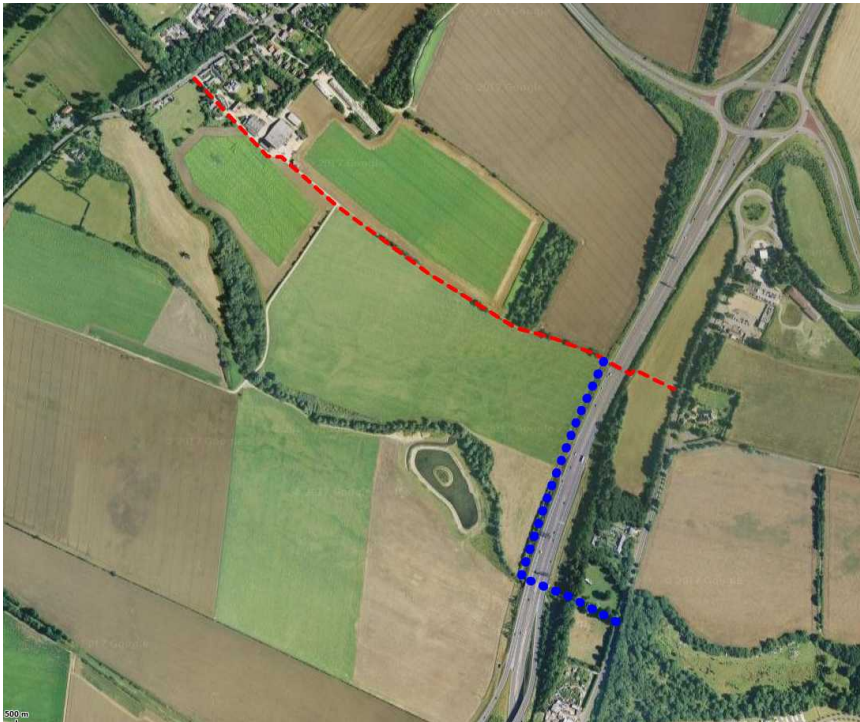


Figure 6-6 Proposed Option Route 3

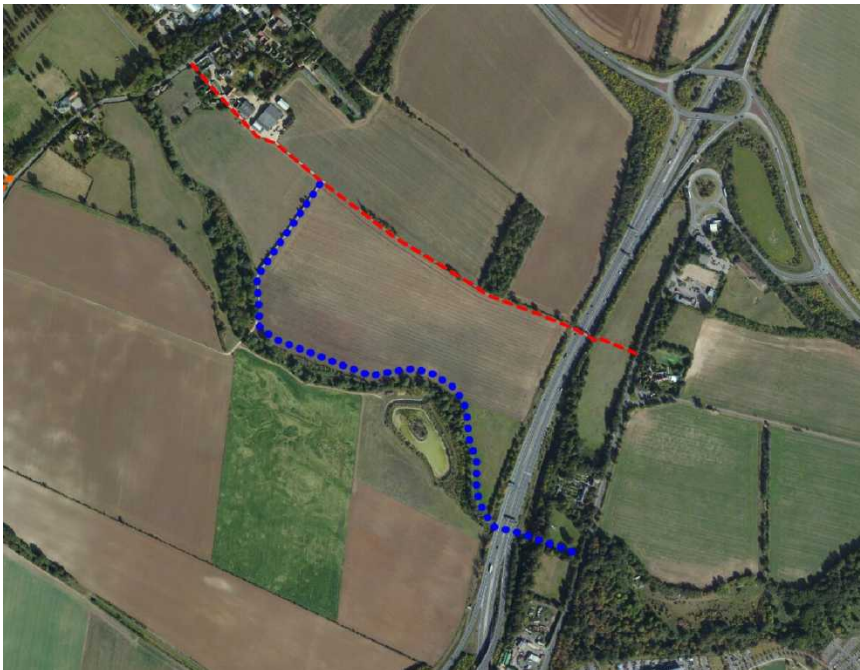


Figure 6-7 Proposed Greenway Option route 4 via River Granta

6.4.4

The proposals generally consist of creating a 3-3.5m wide path surface either along the existing footpath route connecting with the existing A11 footbridge or alongside the River Granta and crossing under the A11 via the existing underpass.



Photo 6-2 A11 River Granta Underpass (West elevation)



Photo 6-3 A11 Underpass North embankment

Photo 6-4 A11 Underpass East elevation

- 6.4.5** A site visit was undertaken to walk the proposed option routes, measure the available headroom clearance within the underpass and determine the viability of the proposals.
- 6.4.6** Approaching from the northwest side along the River Granta, the north embankment passing through the underpass levels out to form a level access measuring 6.4m in width up to the top of river channel. This area is generally flat and surfaced in modular concrete paving creating an erosion resistant surface that is potentially suitable for vehicles – we believe this is to provide access for maintenance access both sides of the underpass. To the west side, the underpass has a minimum headroom of 2.8m at the abutment, increasing to 3.5m mid span, decreasing to 1.8m and 3.5m respectively to the eastside. Typically the LHA would seek a minimum clearance of 2.3m headroom for a public footpath and 2.8m for a public bridleway, so this is slightly deficient.
- 6.4.7** The approach route for Option 2 follows the A11 highway corridor that benefits from a substantial landscape and maintenance easement to both the east and west side. To the east side, a 5m wide maintenance track with direct access to the A11 approximately 160m south of the footbridge providing direct access to the underpass. To the west side a grassed service margin of up to 5m wide between the embankment and landscaped buffer offers potential for construction of a cycle route



Photo 6-5 A11 East side maintenance track



Photo 6-6 A11 West side maintenance track

- 6.4.8** The Option 3 route takes a route from the footbridge to the west side of the A11 directly south to the underpass, then due east linking directly to Bourn Bridge Road and Granta Park beyond. This alternative route is of equal journey distance for cyclists with an origin/destination of Granta Park, reducing the on-highway journey by over 400metres each way.
- 6.4.9** Option 4 offers a more direct east-west route for users, following the River Granta. However this is reliant upon private third party land that is currently mixed use for arable and woodland copse, and is within a greater extent of flood plain requiring the construction of a substantial length of flood resistant surfacing that will also be required to accommodate agricultural traffic and flooding
- 6.4.10** The passage through the underpass measures approximately 42metres; and being a secluded area with low light levels towards the centre of the underpass, the installation of lighting and CCTV would be required to improve safety and accessibility. This would require a power and data supply to be connected in a relatively isolated location.
- 6.4.11** Additionally, as illustrated in the EA flood mapping depicted in Figure 6-3 above, the alternative routes via the A11 underpass route follows alongside the river and passes through an area designated as Flood Zone 2 & 3 which is at risk of flooding. The proposed route via the underpass may therefore be inaccessible during wetter periods in the year. The River Granta is a Main River and further investigation, including dialogue with the Environment Agency and Highways England, would be required to ascertain the frequency, depth and velocity of flood flow through the underpass to identify the number of occasions this route will be impassable. This therefore presents a risk to the viability of this route being available all year.
- 6.4.12** The installation of adequate edge protection may be required through the underpass as to the eastside users will be directed toward the mid-span area to achieve adequate headroom. Elsewhere the route through the underpass could be taken closer to the north abutment to increase the separation distance to the river. Any works within 9m of the River Granta would require consent from the Environment Agency.

6.5 A1307-PAMPISFORD ROAD-HIGH STREET JUNCTION

- 6.5.1 Beyond the A11 crossing to the east, the route would be via on road signed routes through the village of Great Abington in low traffic routes connecting with A1307 at Linton Road. A new section of shared surface cycleway/footway 3-3.5m wide would also be installed along the west side of the carriageway connecting with the Pampisford Road junction where a new crossing point (either via and uncontrolled raised pedestrian island or toucan crossing). This crossing point would also potentially assist bus users accessing bus stops close to the High Street junction.
- 6.5.2 A signalised layout as shown below in Figure 6-8 at the staggered Pampisford Road junction with A1307 and Hildersham High Street has also been considered, seeking to enhance crossing safety for bus users, cyclists and pedestrians. Anecdotal evidence suggests that there have been two recent fatal accidents on A1307 in the vicinity of Great Abington in November/December 2016. However, the accidents are very recent and the details have not yet been published.
- 6.5.3 The revised staggered layout with traffic signals and raised pedestrian islands may help to slow vehicles on approach. However the current evidence base in respect of recent accidents for this junction requires updating to understand if there may be a business case to support the full extent of proposed changes. Further detail of turning movements and vehicle speeds at this junction are also required to enable more detailed modelling. In the event that the fully signalised layout cannot be justified in highway safety and capacity terms, a more simple and cost effective arrangement with raised crossing islands for pedestrians could be considered instead.

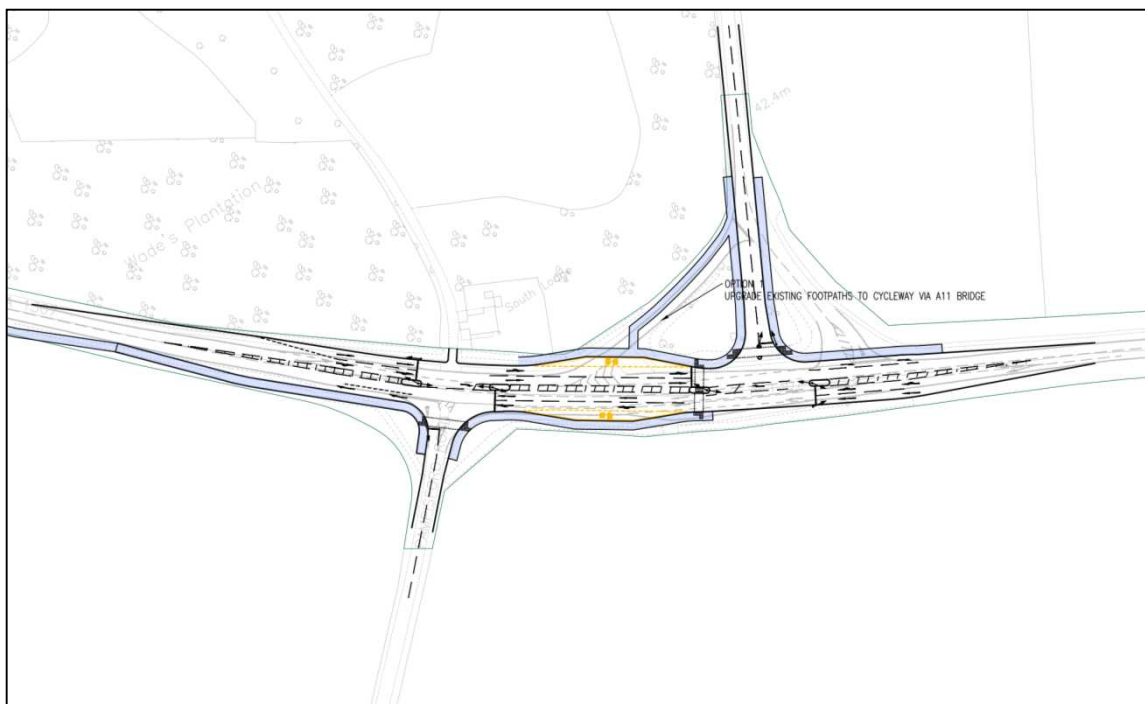


Figure 6-8 Pampisford Road/High Street junction staggered signalised layout option

6.6 A1307 PEDESTRIAN CYCLE BRIDGE OPTION

6.6.1 In response to options identified in the Linton Greenways study (Nigel Brigham & Associates, 2016) the viability of installing a pedestrian cycle bridge over the A1307 between the Linton Road junction and the High Street Hildersham junction has been considered.

6.7 GENERAL DESIGN CRITERIA

6.7.1 The Design Manual for Roads & Bridges BD60/04 provides guidance on the minimum design constraints for the construction of bridges over public highway:

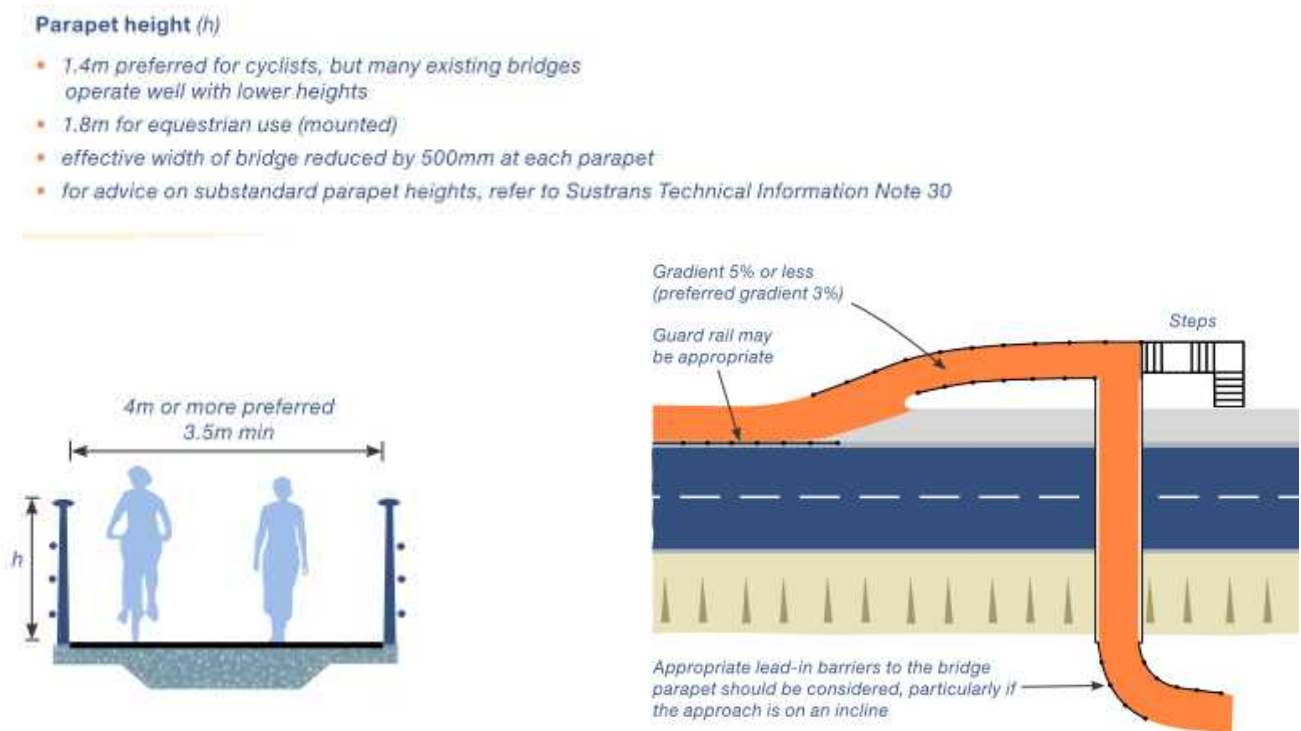
- Min soffit clearance = 5.7m
- Edge clearance to carriageway kerbline = 4.5m
- Structures with less than 4.5m edge clearance require additional collision impact protection

6.7.2 The Dept for Transport BD29/04 provides guidance on the design of approach ramps

- For straight ramps of gradient steeper than 1:20, horizontal landings to be provided at height intervals of not more than 650mm
- For straight ramps of gradient equal to 1:20, horizontal landings to be provided at height intervals of not more than 2.5m
- For straight ramps of gradient less than 1:20, no horizontal landings are required
- Landing length = 2.0m

6.7.3 For cycle bridges with containment parapets, Sustrans Design Manual for Cycle-friendly Design 2014, and Sustrans guidance on Bridges and other Structures (Feb 2015) recommends a clear width between handrails of 3.5metres to allow cyclists to pass safely between the parapets/handrails.

Figure 6-9 Extract from Sustrans Design Manual



- 6.7.4 Applying a 1:20 gradient with landing platforms require any new structure over the A1307 to have approach ramps with a minimum overall length of 118m, and clear width between handrail of 3.5m, and overall external width of approximately 4.0m.
- 6.7.5 Applying Sustrans design criteria for a desirable gradient of 3%, equates to a ramp length of 188m on each side of the bridge. Therefore the bridge option would potentially increase distance of travel by upto 376m in total if the bridge is not positioned with straight ramps on the key desire line for users.

6.8 LOCAL CONSTRAINTS

- 6.8.1 The preferred location of a new cycle crossing is located on the existing desire line between Linton Road, Great Abington, and the Pampisford Road/ High Street junction near Hildersham.
- 6.8.2 The A1307 currently benefits from a pedestrian footway to the northern verge leading from High Street to the village of Linton. This route extends approximately 250m west of High Street before crossing to the southern verge of the A1307 at an uncontrolled pedestrian crossing. The footway then continues west to Linton Road. The footway measures approximately 1.2m wide.
- 6.8.3 The local topography generally rises steeply from the back of the existing southern verge, and falls away from the northern verge. A residential dwelling and associated private gardens and woodland form the northern boundary of the A1307 to the west of High Street.
- 6.8.4 The northern verge measures approximately 8.5m at the Linton Rd junction, reducing to 3.5m where adjacent to the woodland boundary. The southern verge measures approximately 14m reducing to 5m at the uncontrolled pedestrian crossing. The highway verge is lined with a mix of mature trees and hedgerow.
- 6.8.5 The existing Pampisford Road/High Street junctions with the A1307 are subject to review as part of the wider corridor study to improve junction safety, seeking to create safer pedestrian access to the bus stops located to both sides of the A1307.

6.9 ASSESSMENT OF BRIDGE OPTION

- 6.9.1 The local constraints and existing desire lines confine any new route to within the existing highway corridor.
- 6.9.2 Whilst adequate space is available to accommodate a new structure within the southern verge, additional third party land would be required to the northern verge in order to achieve 4.5m clearance to the carriageway.
- 6.9.3 BD29/04 guidance also recommends the introduction of a change of direction on ramps for every 3 m rise in elevation. However to avoid increasing the existing travel distance, in-line straight approach ramps are deemed to be desirable, requiring the introduction of cycle chicanes to reduce the speed of cyclists and improve safety of all users.
- 6.9.4 Reducing the ramp gradient to the Sustrans desirable of 3% would mitigate the requirement for chicanes and intermediate level platforms, however this would substantially increase the ramp length from 131m to 188m.
- 6.9.5 An indicative layout is illustrated in Figure 6-10 and Figure 6-11 below to depict the possible extents of structure based on the DfT design guidance.

6.9.6

Whilst this achieves a grade separated cycle crossing over the A1307, it would require acquisition of third party land to the north side, including land attached to a private residential property, and woodland to achieve the minimum standard of cycleway path width along the northern highway verge.

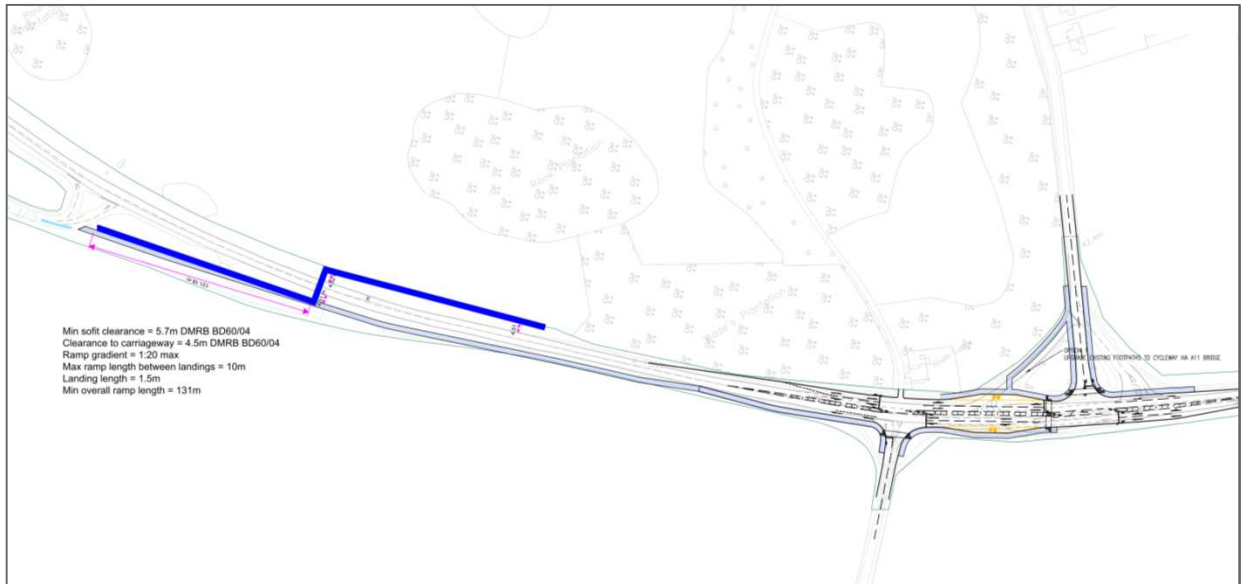


Figure 6-10 Bridge Option location plan

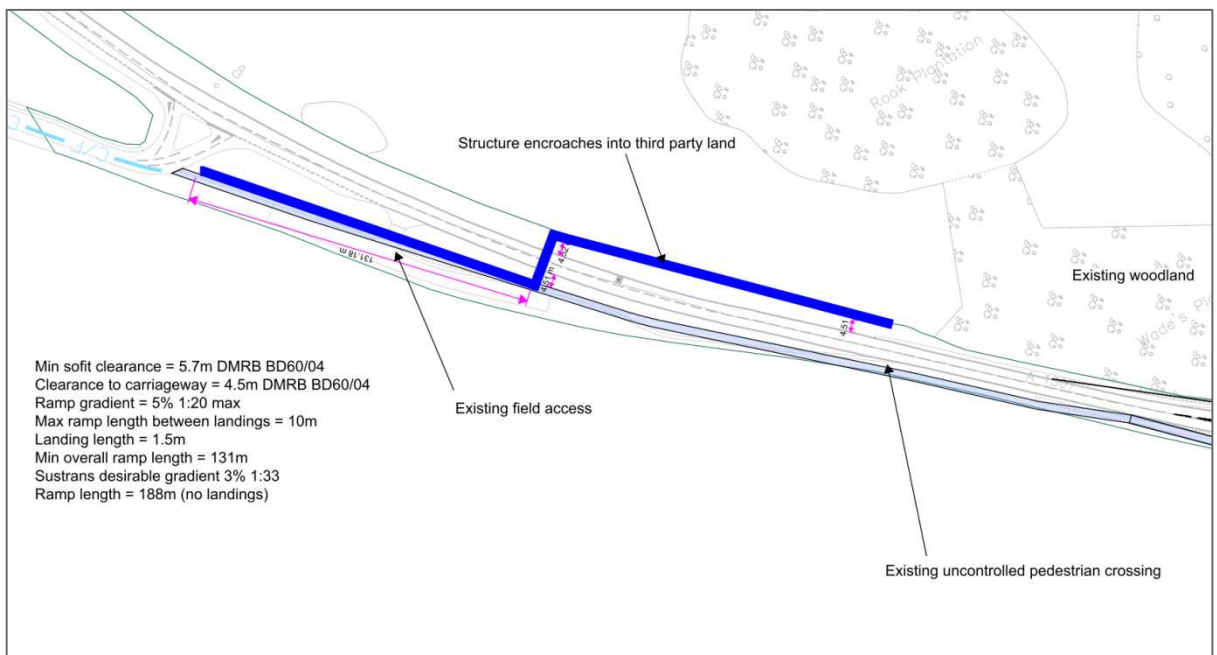


Figure 6-11 Bridge Option location plan detail

6.9.7

Additionally, the crossing does not provide any benefit for pedestrians wishing to cross the A1307 at the Pampisford Road, High St junction for access to the existing bus stops.

6.9.8

Based on previous experience, the estimated capital cost for the design and installation of a cycle bridge at this location is likely to be in the order of £2m, representing a substantial investment.

6.10 ALTERNATIVE OPTIONS

- 6.10.1 Having reviewed the safety enhancements proposed for the Pampisford Road/High Street junction with the A1307 comprising of the introduction of a signalised staggered junction incorporating signal controlled pedestrian crossing points; an extract of drawing 2014-GA-BRC-01-04 is illustrated in Figure 6-12 E below.

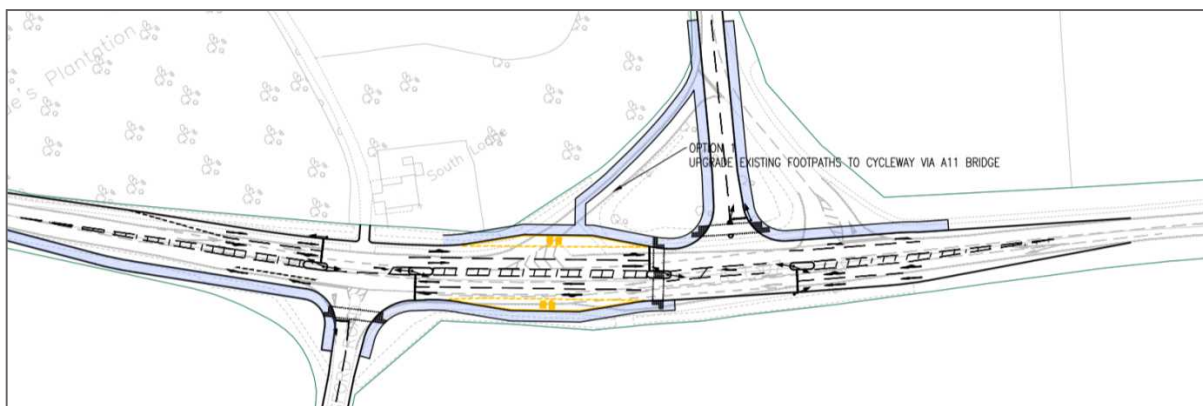


Figure 6-12 Extract from Pampisford Road-High St Junction improvements

- 6.10.2 The introduction of signal controlled crossings at this location presents an opportunity to make provision for a Toucan pedestrian / cycle crossing with minimal additional capital investment.
- 6.10.3 To create a contiguous link to Linton Road, the southern verge of the A1307 would require widening to create sufficient width for a shared pedestrian/cycleway as illustrated in Figure 6-13 below. Some earthworks may be required to address the rising ground level to the south; however this avoids conflict with private residential property and woodland to the north verge.
- 6.10.4 The route maintains the existing cycle desire line without additional travel distance and integrates the A1307 cycle crossing with the pedestrian crossing and access to the bus stops without the requirement for additional infrastructure. This route offers greater accessibility for all users, particularly mobility impaired users who may struggle with the inclines on the ramp approaches to the bridge.

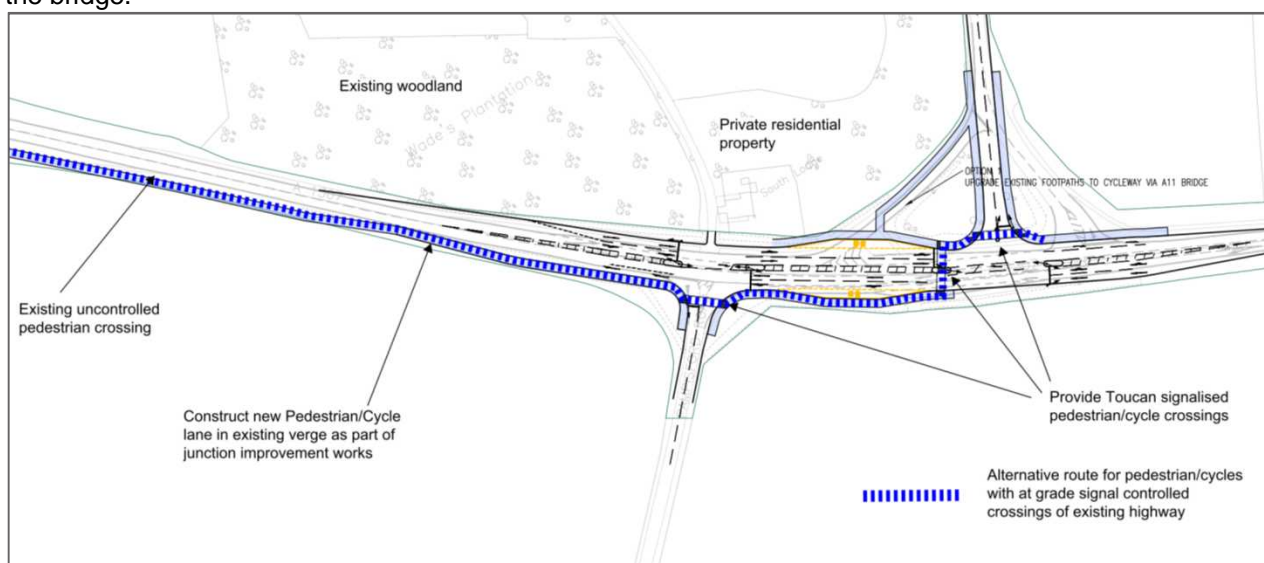


Figure 6-13 Illustrative proposed cycle link

6.11 POTENTIAL SCHEME OPTION COSTS

COST ELEMENTS Q4 2016	ADD RAMPS TO A11 BRIDGE AND CREATE CYCLEWAY ROUTE TO A1307	NEW A11 CYCLE BRIDGE (INCLUDING DEMOLITION OF EXISTING)	A11 UNDERPASS UPGRADE AND CREATE NEW CYCLEWAY ROUTE TO A1307
Total Construction Cost Estimate	£2,529,600	£4,678,000	£2,606,000

Figure 6-14 High level costs for BRC to Granta Park cycleways

6.12 COSTING ASSUMPTIONS

- 6.12.1 A high level appraisal of average Land Values per hectare has been provided by Rural surveyors Carter Jonas Ltd. At this stage the land value has been applied to the permanent works areas only and no allowance has been made for additional temporary land or compensation for construction access or Crop Loss. All land area values are assumed based on vacant possession.
- 6.12.2 Additional allowances have been made for specific known risk items such as utilities diversions. However, these allowances are arbitrary based on experience at other sites but are not based on firm quotations from utilities companies at this stage. The full extent of environmental mitigation is also to be determined. An arbitrary allowance for tree works and landscaping has been included at present but further studies are required to fully understand the specific requirements for the preferred scheme option.
- 6.12.3 The above costing assessment is based on 2016 Q4 prices with no up lift for inflation to account for construction occurring in the future, since the year of construction is unknown at this stage.

6.13 RECOMMENDATIONS

- 6.13.1 Both the existing footbridge and underpass structures for segregated crossing of the A11 have accessibility limitations which need to be addressed in order to improve accessibility for cycles and other types of NMUs other than able bodied pedestrians. The river underpass is located within the functional floodplain and has a headroom constraint and the footbridge has a width restriction and has stepped access only. There are cycle gullies on the footbridge, but these are not of use to people with mobility issues, so an equalities compliant ramp could be added to improve access for all.
- 6.13.2 The footbridge route is currently the preferred option as it offers the shortest diversion distance from A1307 and is already a well-used route with existing public right of way status. However, a structural assessment of the footbridge is required to ascertain the feasibility of adding ramps.
- 6.13.3 At this stage it is also recommended that the underpass route should be further investigated and discussed with landowners and local flood authorities in parallel. CCTV and lighting could be added to make the underpass more attractive.
- 6.13.4 The proposed routing through private land requires further discussion with affected landowners and additional routes to the north may be required to provide potential connectivity with the A11 Park and Ride preferred option. Highways England would also need to be consulted in relation to the use of the A11 maintenance access routes and highway verges for cycle use.
- 6.13.5 The proposed changes to the junction of Pampisford Road with High Street and A1307 also require a more detailed review once updated accident data is published and additional data on traffic speeds and turning movements may need to be collected if the accident review concludes that a signalised crossroads would assist with addressing safety issues.
- 6.13.6 The option to install a new cycle bridge at the A1307 has been considered but discounted due to poor viability, diversion length away from the desire line for some users and the requirement for acquiring third party residential property land. Therefore the recommendation prior to further safety review is for an at grade signalised crossing as part of the staggered junction layout to assist bus users and cyclists crossing close to their desire line. This improvement should be coupled with a new section of shared surface cycleway linking Pampisford Road and Linton Road in the western verge of the A1307.

6.14 ADDITIONAL GREENWAY OPTION ROUTE VIA A505

- 6.14.1 The project delivery team was asked to explore the proposals set out in the Greenways Review document to modify the existing Granta Park junction with the A505 to create a segregated cycle lane through the existing A505 underpass.
- 6.14.2 A site visit was undertaken to understand the existing layout and assess the route and constraints.
- 6.14.3 The existing highway measures 6.1m kerb to kerb within the underpass. The overall width between abutments measures 10.5m, with vehicle containment barriers within the verge creating a max of 1.25m clear space between barrier and abutment as illustrated in Figure 6-17 below.

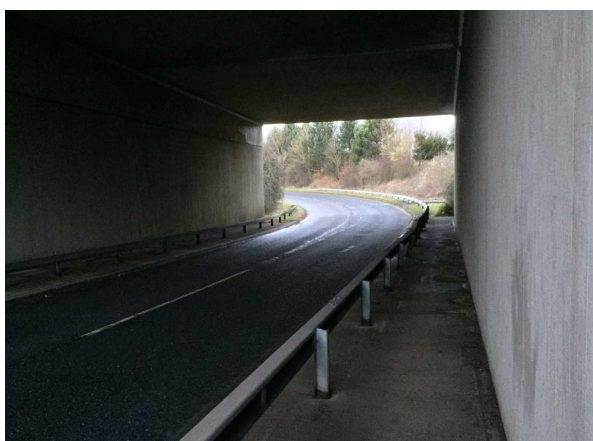


Figure 6-15 Underpass – east verge looking north

Figure 6-16 Underpass north elevation

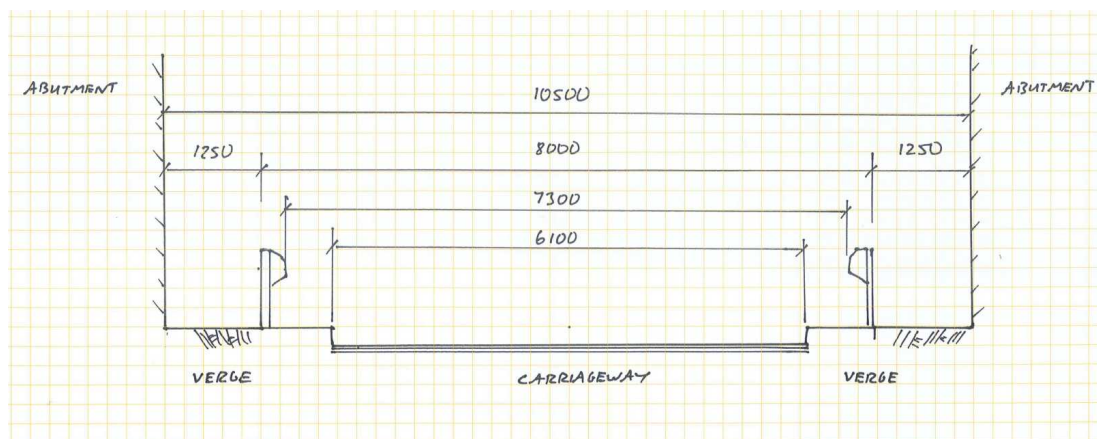
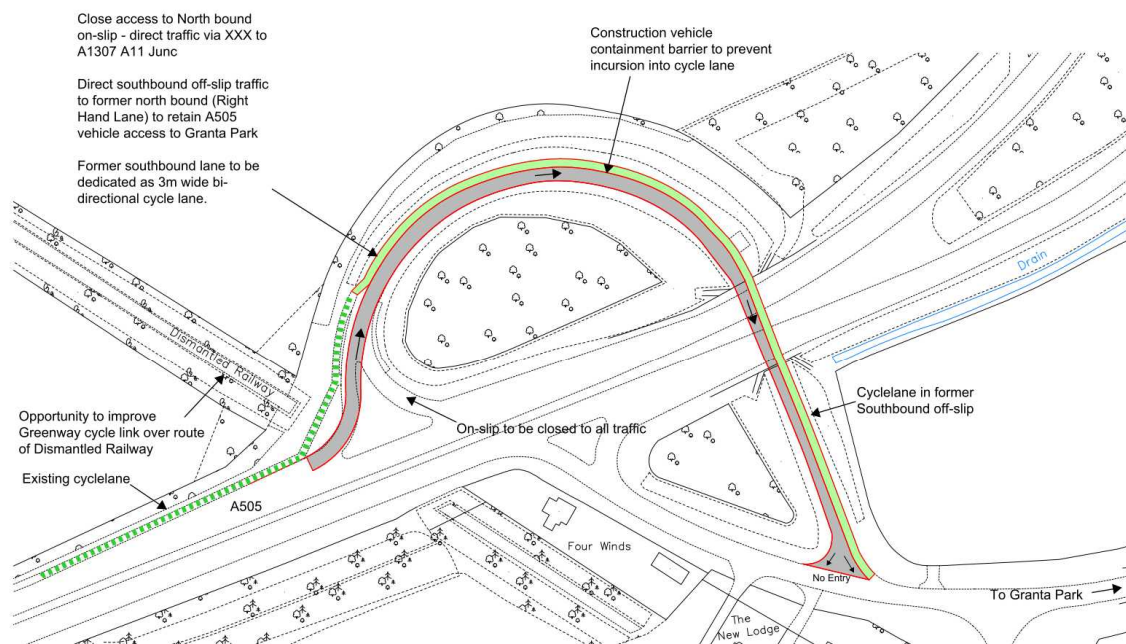


Figure 6-17 A505 underpass dimensions

- 6.14.4 Currently cyclists share the road space in unsegregated cycle lanes. The road follows a tight radius with vehicle speed restricted by the change in direction.
- 6.14.5 The northbound carriageway forms the on-slip to the A505, directing motorists north to the A11. There is no provision for right turn exit manoeuvres at the junction with the A505.
- 6.14.6 It was noted during the site visit that the southbound vehicle protection barrier on the entry to the underpass was damaged with evidence that it had been struck by a vehicle.

- 6.14.7 The existing provisions for cyclist are on highway to both sides of the carriageway in the direction of vehicle traffic. Cyclists travelling westwards are required to cross the slip road approximately 50m from the junction with the A505, at a point where vehicles entering the exit slip road may be travelling at speed. The stopping sight distance is only 75m measured from OS mapping.
- 6.14.8 To improve provisions for cyclists and reduce the risk of potential conflict between motor vehicles and users of the cycleway by way of provision of a segregated cycle path and closure of the northbound entry slip lane; in view of the existing constraints, the suggested option comprises of the introduction of a 3m wide cycle path over what is currently the southbound off-slip lane, and transfer the south bound traffic to the former northbound lane as illustrated in Figure 6-18 below:



GA-BRC-09 A505 junction Cycle Link

Figure 6-18 A505 Cycle Link option

- 6.14.9 This arrangement allows cyclists to travel east-west without having to cross the exit slip lane, and created continuity with the onwards routes to the west.
- 6.14.10 To provide a safe environment for cyclists, it is recommended that the cyclelane is segregated from the vehicle lane with a kerb and vehicle containment protection barrier to reduce the risk of vehicle incursion into the cyclelane.
- 6.14.11 As this option closes the northbound entry slip to all traffic, motorists will need to follow a diversion route in order to join the A11 at the A1307 Fourwentways junction as illustrated within Figure 6-19 below.

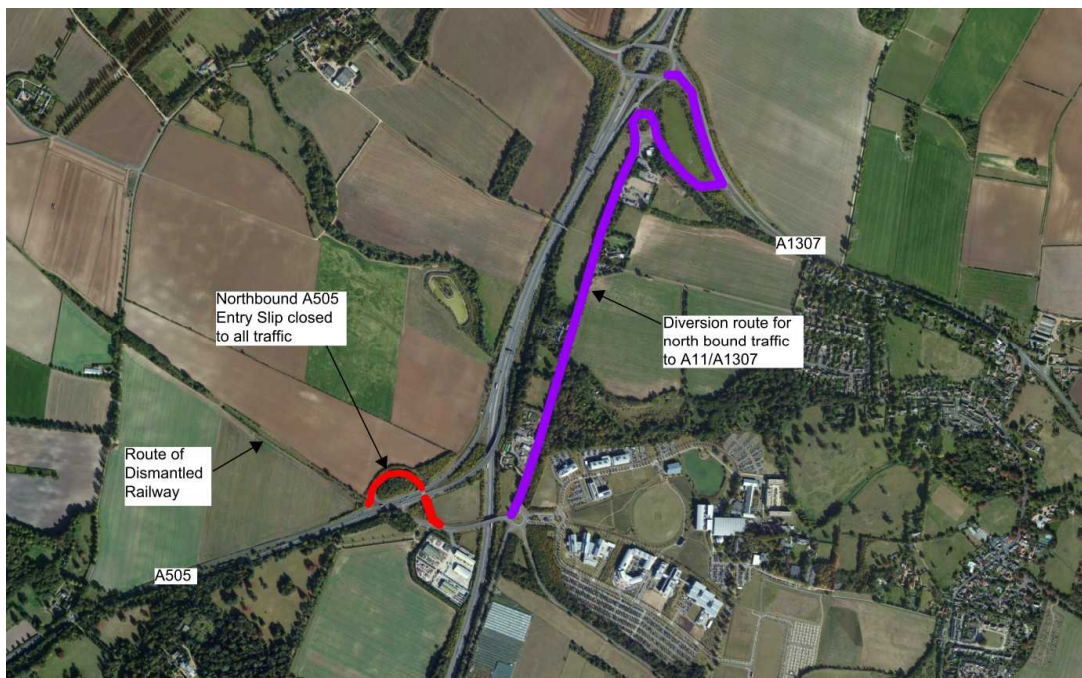


Figure 6-19 Northbound vehicle diversion route

- 6.14.12 This diversion is not considered to add significantly to the travel distance from Granta Park to Fourwentways, however journey time may be increased due to the lower speed road environment, negotiating the junction with the A1307, and Fourwentways roundabout.

RECOMMENDATIONS

- 6.14.13 Whilst this option seeks to improve connectivity for cyclists, linking Granta Park with the A505 and Sawston cycle routes, it falls outside of the areas under consideration for implementation of the strategic cycle routes along the A1307 corridor, and therefore should be implemented under a future A505 corridor study.

7 LINTON TO HAVERHILL

7.1 KEY ISSUES

- 7.1.1 The proposals through Linton Village seek to improve journey times for bus services and improve facilities for public transport users, pedestrians and cyclists, especially in relation to access to the school site.
- 7.1.2 Consultation feedback focussed on poor journey time reliability, particularly in the AM peak hours in a westbound direction, and delays to bus services through the section of A1307 to the south of Linton, with the Village College and High Street junctions being cited as a main source of congestion.
- 7.1.3 There are pinch points on approach to the Village College where buildings are close to the edge of the carriageway and the available public highway land narrows considerably, so that the main carriageway is 6.1m wide.
- 7.1.4 The route passing through Linton has a relatively poor accident record with several serious accidents at the west end of the village, especially on the dual carriageway section in the five year period 2011-2015 as shown below in Figure 7-1 below:

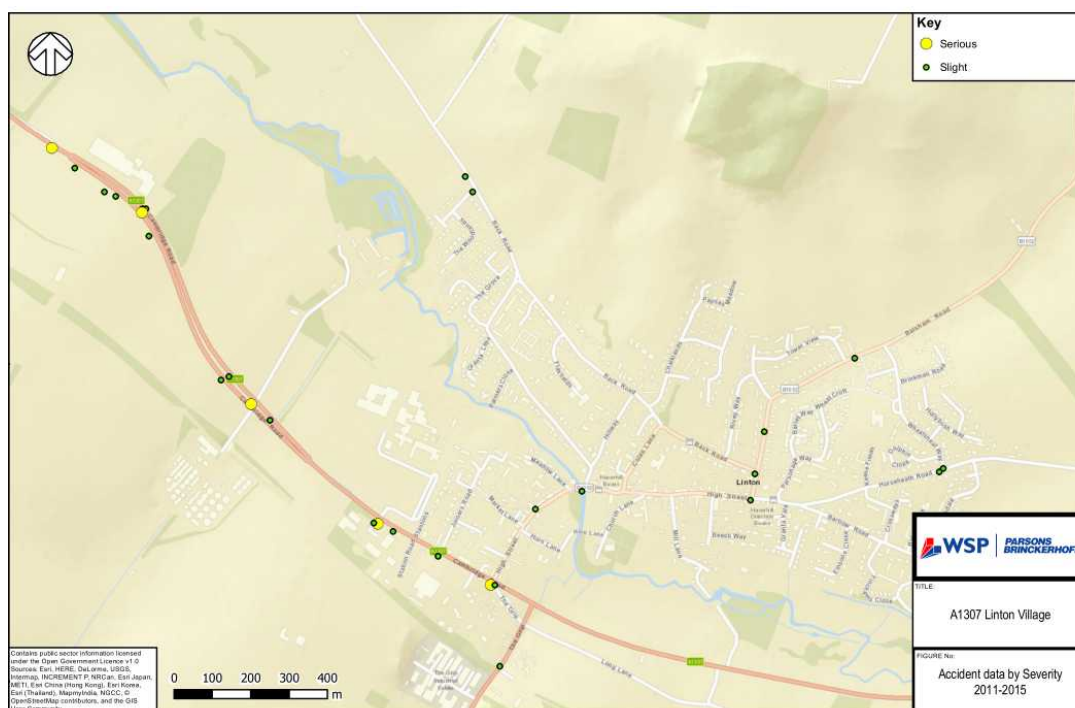


Figure 7-1 Linton area accidents by Severity 2011-2015

7.2 LINTON VILLAGE COLLEGE JUNCTION

- 7.2.1 In response to consultation comments regarding capacity at the Linton Village College junction, the existing signalised layout has been tested using a Linsig model. New Traffic surveys were undertaken in October 2016 and queue lengths observed as well as pedestrian movements (although pedestrian phases are not currently integrated within the signal plan).

7.2.2

The signal plan for the existing controller was requested from CCC and the relevant Linsig phasing parameters supplied. The 2016 base year model results are summarised below in Table 7-1 Linton Village College Linsig results for 2016 base year model (school peak hour)

	2016 AM PEAK (08:00-09:00)			2016 PM PEAK (17:00-18:00)		
	DoS (%)	MMQ (PCU)	Delay (s/PCU)	DoS (%)	MMQ (PCU)	Delay (s/PCU)
Linton Village College	59.9	3.1	78.1	60.8	3.1	78.1
A1307 Cambridge Road South	98.5	52.2	64.0	49.2	10.5	18.6
Industrial Estate	5.3	0.2	69.4	22.9	1.0	73.6
A1307 Cambridge Road North	50.4	11.5	16.5	83.2	28.7	26.1

Table 7-1 Linton Village College Linsig results for 2016 base year model (school peak hour)

7.2.3

The junction is currently operating close to its theoretical capacity in the AM peak hour with 98.5% degree of saturation and mean maximum queue lengths of upto 52 vehicles. This causes delays of about one minute per vehicle during the busiest hour for school pupil arrivals (8am-9am). The flows on A1307 are highest in the 7.30am-8.30am hour but there are less turning movements into the village college at this time of day. A sensitivity test was carried out for the busiest hours with LINSIG results as follows:

ARM	2016 AM PEAK (07:30-08:30)			2016 PM PEAK (16:30-17:30)		
	DoS (%)	MMQ (PCU)	Delay (s/PCU)	DoS (%)	MMQ (PCU)	Delay (s/PCU)
Linton Village College	49.1	2.4	72.7	60.8	3.1	78.9
A1307 Cambridge Road South	102.3	71.3	103.0	51.2	11.0	19.2
Industrial Estate	4.4	0.2	69.4	17.5	0.7	72.1
A1307 Cambridge Road North	52.3	12.1	16.7	86.5	31.6	28.9

Table 7-2 Linton Village College Linsig results for 2016 base year model (A1307 peak hour)

7.2.4

The junction could potentially be upgraded to MOVA signal control to optimise capacity, seeking to minimise delays on all arms by detecting queue lengths and allocating green time to the arms with the longest stationary queues. This is a relatively simple upgrade to the controller specification to enable adaptive control. There are already queue detector loops in the junction approaches so the upgrade could be installed with minimal disruption to A1307 traffic. MOVA is capable of offering a 10-13% improvement in junction efficiency and reduction in delays.

7.2.5

A roundabout option illustrated below in Figure 7-2 was tested as an alternative for the Linton Village College junction but it was found to offer only a minor improvement in capacity terms at a very high cost of £895,675 (excluding utilities) therefore a MOVA signal controller upgrade was considered to be a more cost effective solution at a substantially cheaper cost of £40-£60K which would offer similar capacity benefit to the roundabout junction without the disruption of a major change to the layout of the road.

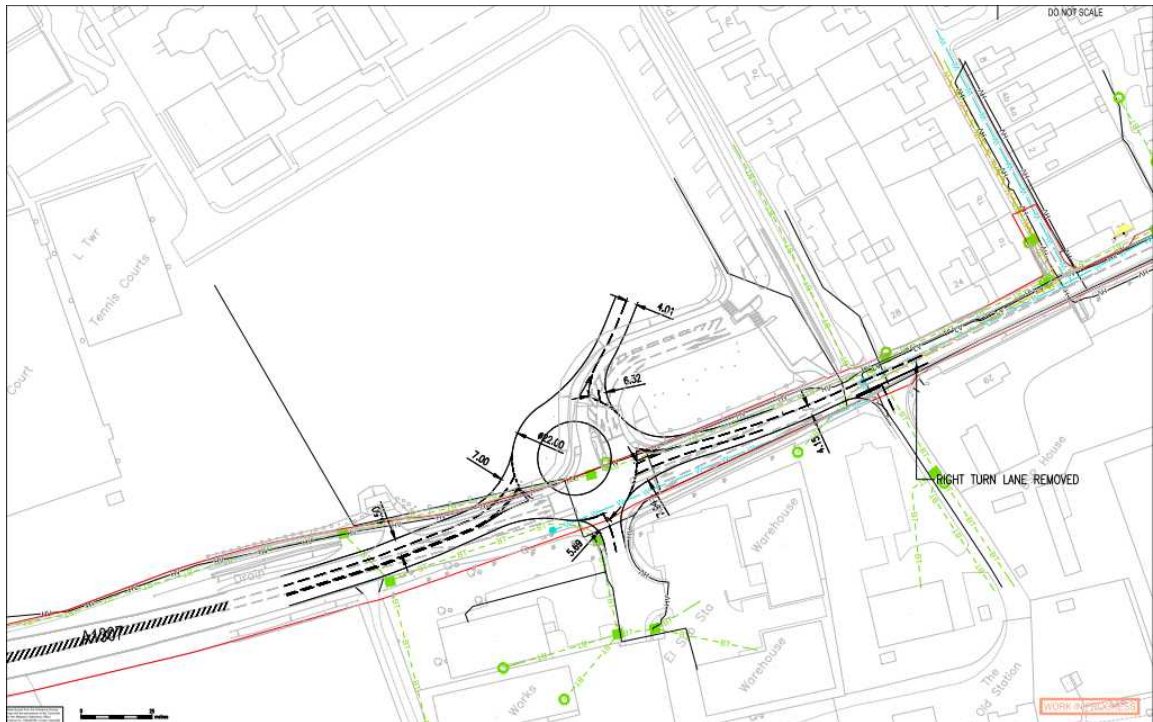


Figure 7-2 Alternative Roundabout layout option for Linton Village College junction

7.2.6

A Junctions 8.0 ARCADY model has been prepared for the roundabout junction option using the proposed geometry show above.

7.2.7

A further assessment for the 2016 AM and PM Peak school periods has been carried out, using survey data collected on 18th October 2016.

NAME	2016 AM PEAK (08:00-09:00)			2016 PM PEAK (17:00-18:00)		
	Max RFC	Max Delay (s)	Max Queue (PCU)	Max RFC	Max Delay (s)	Max Queue (PCU)
Linton Village College	0.12	3.90	0.13	0.17	5.67	0.20
A1307 East	0.84	14.17	5.16	0.42	3.85	0.72
Industrial Estate	0.01	7.10	0.01	0.03	4.28	0.03
A1307 West	0.32	2.56	0.47	0.53	3.61	1.12

Table 7-3 ARCADY results for school peak hour roundabout option at Linton Village College Junction

7.2.8

A sensitivity test was also carried out using the AM and PM periods with the highest surveyed total junction flows. The results are shown in Table 7-4 ARCADY results for roundabout option at Linton Village College Junction (busiest hours) below.

NAME	2016 AM PEAK (07:30-08:30)			2016 PM PEAK (16:30-17:30)		
	Max RFC	Max Delay (s)	Max Queue (PCU)	Max RFC	Max Delay (s)	Max Queue (PCU)
Linton Village College	0.10	3.91	0.11	0.16	5.83	0.20
A1307 East	0.87	17.16	6.40	0.44	3.96	0.77
Industrial Estate	0.01	7.40	0.01	0.03	4.31	0.03
A1307 West	0.34	2.59	0.50	0.55	3.80	1.23

Table 7-4 ARCADY results for roundabout option at Linton Village College Junction (busiest hours)

- 7.2.9 Operationally the roundabout is shown to offer improved capacity for general traffic on A1307, with queue lengths reduced to 6-7 vehicles in the AM peak hour on the A1307 East arm and RFCs of 0.87 in the busiest hour (7.30am-8.30am). This would potentially offer an improved situation for vehicular traffic on A1307 but at a very substantial cost.
- 7.2.10 The MOVA signal upgrade is comparatively cheaper and requires minimal disruption during installation. The capacity benefit of the MOVA upgrade would be almost equivalent to the roundabout option and retaining a signalised layout is also helpful in terms of facilitating safer pedestrian crossing movement and flexibility for bus or cycle priority to be added if required.
- 7.2.11 A roundabout would require more land take within the school site which would reduce the available playing field area and there are significant level differences to be overcome which requires substantial earthworks. There are also trees on the approaches which may be affected by the earthworks within the Root Protection Areas.
- 7.2.12 A roundabout layout is also more challenging for pedestrians and cyclists to negotiate whereas sustainable travel to school needs to be encouraged and the current signalised layout supports non-car access more effectively. The ride quality for bus user may also be affected by the introduction of a roundabout.
- 7.2.13 The existing signalised layout can also accommodate additional bus laybys on the A1307 approaches which may allow express buses to stop on the main road, rather than turning into the school site to help reduce bus journey times to central Cambridge.

7.3 LINTON HIGH STREET JUNCTION

- 7.3.1 A LINSIG model of the High Street junction has been created and tests carried out for the base year scenario to understand how the introduction of a new signalised junction to replace the existing toucan crossings on A1307 would affect the operation of the route. This junction is already affected by traffic blocking back in the AM peak hour from the Linton Village College junction.
- 7.3.2 It is proposed that a signalised layout incorporating the existing pedestrian movements into the signal plan (as shown below in Figure 7-3) would improve opportunities for vehicles to exit from the High Street into A1307 but may increase delays for the mainline straight on movement.
- 7.3.3 The model assumes a staggered pedestrian crossing within the signal phasing on the A1307 to replace the existing toucan crossing. The model results below in Table 7-5 Linsig 2016 peak hour results for A1307 junction with High Street, Linton indicate that the junction has about 3% Practical reserve capacity in the base year of 2016, with mean maximum queue lengths of 32.5 pcus on the A1307 east arm. The model operates with 11.4% PRC in the PM peak hour and maximum queue on the A1307 West arm of 25 pcus.

	2016 AM PEAK (08:00-09:00)			2016 PM PEAK (17:00-18:00)		
	DoS (%)	MMQ (PCU)	Delay (s/PCU)	DoS (%)	MMQ (PCU)	Delay (s/PCU)
High Street (N) Left Right	83.9%	9.0	90.9	73.5%	5.4	89.6
A1307 (E) Right Ahead	86.7%	32.5	25.7	72.1%	8.6	20.4
A1307 (W) Left Ahead	45.6%	9.7	11.2	78.6%	25.3	16.4

Table 7-5 Linsig 2016 peak hour results for A1307 junction with High Street, Linton

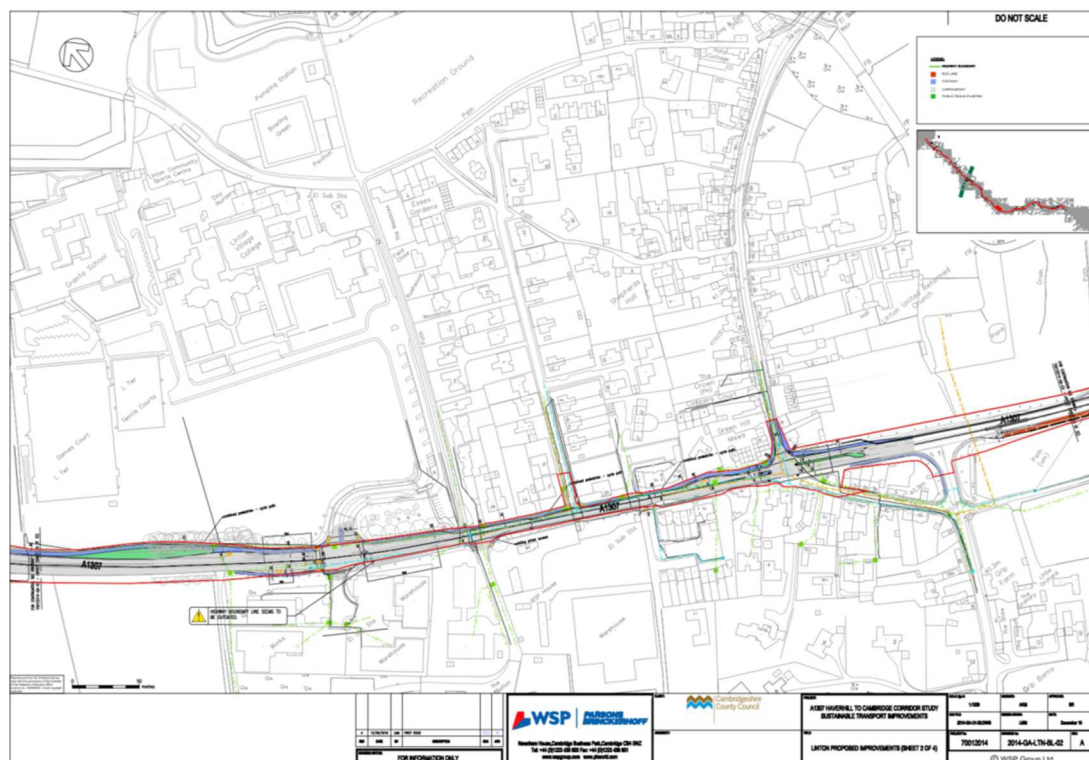


Figure 7-3 Proposed works to A1307 through Linton village

7.4 LINTON HIGH STREET PUBLIC REALM OPTIONS

- 7.4.1 The main High Street in the village centre has been considered for public realm improvements, seeking to improve the flow of buses through the village. This route is narrow and is already subject to a one way traffic flow restriction to ease the flow of vehicles given the narrow street layout and close proximity of building frontages.
- 7.4.2 There are limited opportunities for off street parking in the village. However, there is a small car park at the medical centre which is used as a central amenity for visitors. A slightly larger village car park in walking distance of shops and facilities would improve opportunities for achieving a sustainable solution in the High Street as this could potentially free up space which is congested by ad-hoc on-street parking.
- 7.4.3 A review of available opportunities for creating a new or enlarged car park indicates that there are currently not many options available. However, from a planning perspective, the current fire station arguably could be better relocated. Therefore in the event that Cambridgeshire Fire and Rescue were minded to relocate the fire station the existing fire station site could potentially be converted into a car park in the future.
- 7.4.4 At this stage it is considered that replacing the fire station with a village centre car park option is unlikely to be cost effective unless the fire and rescue service are considering relocation or consolidation of the fire station and have an alternative site available.
- 7.4.5 The revisions to the High Street proposed are shown below in Figure 7-4



Figure 7-4 Proposed Public Realm Enhancements within Linton High Street

- 7.4.6 Since the High Street in Linton is one way (westbound only), it is envisaged that the road carriageway could be narrowed to a minimum lane width of 3.5m-4m with wider footways on both sides. A minimal kerb upstand would be used and informal on pavement loading where there is sufficient width available. Adoptable materials would be used within the public highway, with some use of contrasting surfaces to assist visually impaired users and highlighted with conservation street furniture appropriate to the historic nature of Linton.

7.4.7 However, the aim of the scheme is to smooth the flow of buses through the street in the interests of rider comfort and narrow the kerb to kerb carriageway to allocate more space to pedestrians and avoid attracting additional strategic traffic to the route at peak times.

7.4.8 St John's Street in Bury St Edmunds (as shown in Figure 7-5 Example Public Realm scheme below) is an example of a similar concept and main carriageway width, albeit not on a main bus route and is located in Suffolk. The Gallery and Minster Place in Ely is also a helpful example of a one way bus route through a historic setting which is located in Cambridgeshire, so the materials used here may be more representative of the type of finish to be expected at Linton. However a materials palate would need to be agreed with the highway authority which is sustainable and suitable for bus use at the detailed design stage, taking into account maintenance issues.



Figure 7-5 Example Public Realm Scheme St John's Street Bury St Edmunds

7.5 LINTON WESTBOUND BUS LANES

7.5.1 Existing traffic queues on A1307 are prevalent in the vicinity of the High Street junction during the morning peak period from 7am to 9am with mean maximum queue lengths recorded in October 2016 of 44 vehicles in the westbound direction. Buses queue in mixed traffic on the approach to this junction and this can impact on bus journey times to Cambridge from Haverhill.

7.5.2 Due to the single lane approaches to the junction and residential property fronting the A1307, there is limited available highway land for widening from High Street to Linton Village College. The most practical option for improving bus journey times on this stretch of road is therefore to provide bus lanes on the wider section east of High Street where there is sufficient public highway land available to create additional carriageway space. The proposed layout is shown below in Figure 7-6.

- 7.5.3 These improvements would potentially enable buses to bypass queuing traffic and this may improve the commercial viability of running more frequent X13 services throughout the day as this would offer a more direct bus route to Cambridge from Haverhill. Increased X13 service frequency within the corridor would also enhance opportunities for mode shift away from private car travel, as well as supporting housing growth in Haverhill.



Figure 7-6 Proposed westbound bus lanes on approach to Linton High Street junction.

7.6 ENVIRONMENTAL CONSIDERATIONS

- 7.6.1 Linton is a historic village with many listed buildings and narrow streets. The housing is relatively high density with very limited off-street parking. The High Street in particular has a narrow one-way alignment and this becomes cluttered with parked cars.
- 7.6.2 The A1307 route is constrained by buildings close to the edge of carriageway close to the High Street. The conservation area also adjoins the north side of the A1307. Historic road layout and building frontages alongside the A1307 at the High Street junction create a pinch point and there is subsequently limited space for widening of footways and the main carriageway through the urban section passing High Street and the Village College.
- 7.6.3 The road is also flanked by mature trees and hedgerows which may have habitat potential for protected species and there are grazing marshes and deciduous woodland to the north of the A1307 at the south east edge of Linton as shown below in Figure 7-7:



Figure 7-7 Linton Area Environmental Constraints

7.7 POTENTIAL SCHEME OPTION COSTS

7.7.1 High level cost estimates have been provided for each of the bus priority options considered within this study. At this early stage a substantial contingency is included to allow for potential unknown risk items in the absence of detailed surveys of ground conditions, ecology phase 2 surveys and topography for example. The resulting high level cost estimate of the proposed scheme has been produced as set out in Table 7-6 High Level cost assessment of Linton Options below:

COST ELEMENTS Q4 2016	LINTON VC MOVA+ HIGH STREET SIGNALS+ BUS LANES	LINTON VC RBT+ HIGH STREET SIGNALS+ BUS LANES	HIGH STREET PUBLIC REALM SCHEME + X13 BUSES
Total Construction Cost Estimate	£3,324,000	£4,060,000	£4,160,000

Table 7-6 High Level cost assessment of Linton Options

7.8 COSTING ASSUMPTIONS

7.8.1 A high level appraisal of average Land Values per hectare has been provided by Rural surveyors Carter Jonas Ltd. At this stage the land value has been applied to the permanent works areas only and no allowance has been made for additional temporary land or compensation for construction access or Crop Loss. All land area values are assumed based on vacant possession.

7.8.2 The Linton High Street scheme costs also include and allowance for pump priming additional bus services from Haverhill to Cambridge on the X13 route, as well as provision of new bus shelters, raised kerbs to bus stops and RTPI along the route.

7.8.3 For consistency with other City Deal schemes an optimism bias of 44% is applied to cover unknown risk items such as ecological, arboricultural and archaeological works. Arbitrary utilities allowances are included. However, these allowances are based on experience at other sites but are not based on firm quotations from utilities companies at this stage. The full extent of environmental and utilities mitigation is also to be determined. Further environmental surveys are required to fully understand the specific requirements for the preferred scheme option.

7.8.4 The above costing assessment is based on 2016 Q4 prices with no up lift for inflation to account for construction occurring in the future, since the year of construction is unknown at this stage.

7.9 RECOMMENDATIONS

7.9.1 In the short term forecast horizon considered within the first tranche of the City Deal, the proposed preferred option package is likely to enhance bus journey times and improve access for pedestrians and cyclists, particularly to Linton Village College. The preferred option scheme therefore includes the High Street public realm enhancements, changes to Linton Village College and High Street traffic signals, as well as westbound bus lanes on A1307.

7.9.2 It is envisaged that the improvements to bus priority along the route coupled with substantial housing and employment growth would make it more commercially attractive to bus operators for providing increased frequency of buses, particularly the X13 service from Haverhill which offers the quickest and most direct service to Cambridge on A1307 but only operates at the start and end of the day.

7.9.3 However, in the longer term a strategy which alleviates traffic congestion on the A1307 through the village is likely to be required such as a bypass or short section of link road. Although as set out above this is beyond the funding and timeframe of this project.

8

LINTON TO HAVERHILL ROAD SAFETY

8.1 EXISTING ACCIDENT RECORD

8.1.1 The section of A1307 between Linton and Horseheath has a poor accident record with at least 20 personal injury accidents recorded in the five year period 2011-2015. This included two fatal accidents and 7 serious accidents. On review of the accident statistics, it is apparent that several of the recorded accidents involved only a single vehicle which suggests that the driver lost control. STATS19 Personal Injury Accident data by severity is shown in Figure 8-1 below.



Figure 8-1 Personal Injury accidents Linton to Horseheath 2011-2015

8.1.2 This section of route is geometrically composed of a series of gradual bends and there are very few junctions or delays on this stretch, except the Dean Road crossroads. Reviewing the accident data from the previous five years relating to the above accidents shows the following breakdown of accidents by severity – ref: Table 8-1 Accident Data Linton to Horseheath.

	SLIGHT	SERIOUS	FATAL
2015	5	1	0
2014	2	1	1
2013	2	1	0
2012	2	2	0
2011	6	2	1

Table 8-1 Accident Data Linton to Horseheath

8.1.3 The frequency and severity of accidents appeared to have reduced between 2012 and 2013 but has begun to increase again between 2013 and 2015. There are also anecdotal reports of additional accidents occurring during 2016 which are yet to be included in the published accident data. This suggests that some road safety enhancements are required to resolve the poor accident track record of this stretch of road.

- 8.1.4 Reviewing the background data in more detail, about 60% of the incidents listed above involved vehicles which were 'going ahead' rather than those at a junction or making a turning movement, although three accidents occurred at the Dean Road crossroads.
- 8.1.5 The recent accidents generally occurred in off-peak, overnight or inter peak hours, with relatively few in the AM or PM peak hours. Although only 27% were recorded in hours of darkness, 45% occurred in snow, wet or damp road conditions and 36% occurred during the weekend. Approximately half of the accidents involved only one vehicle which suggests that the driver may have lost control.
- 8.1.6 Whilst contributory factors are not included in the dataset, there is some evidence to suggest that inappropriate choice of speed for the road conditions may have contributed to 6 out of the 9 serious and fatal accidents. During the public consultation in summer 2016, several members of the public also indicated that they were concerned about road safety between Haverhill and Linton.

8.2 PROPOSED SPEED LIMIT REVIEW

- 8.2.1 Currently this section of route is subject to the National speed limit but it is possible that safety could improve with vehicles travelling at reduced speed during off-peak times of day. A speed management approach also appears to have some level of support from members of the public. However, additional data on observed average and 85th percentile speeds along this section is needed to inform a speed limit review.
- 8.2.2 It will be important to discuss the proposals with Cambridgeshire Police to understand whether they would be able to support a reduced speed limit from an enforcement point of view. Some changes to the road layout and additional enforcement measures would be required to make the current speed limit more self-enforcing.
- 8.2.3 The options available for speed reduction include:
- Red surfacing with painted roundels
 - Dragons teeth
 - Count down markers
 - Chevron arrows on bends
 - Interactive signs
 - More visible road markings giving the appearance of a narrower carriageway
 - Roadside Warning Signage to advise of hazards such as Bends and junctions
- 8.2.4 A combination of the above options are proposed for the section of A1307 from Horseheath to Linton, seeking to make the speed limit self-enforcing to influence driver behaviour towards a more appropriate choice of speed in accordance with the highway code. The speed limit review would also consider whether the current speed limit and safety measures requires a refresh to increase driver awareness (such as high collision warning signage) and the extent of enforcement measures required along the route if it were to be changed to a lower limit.
- 8.2.5 A more detailed review of the geometrical design of the Dean Road Crossroads (which has historically been an accident cluster site) would also be undertaken to identify any further measures which could help to reduce the frequency and severity of accidents in this location.
- 8.2.6 For the purposes of preparing a cost estimate, several measures taken from the above list of possible safety interventions are shown below. However, further technical work is required to refine the detail of the proposal.

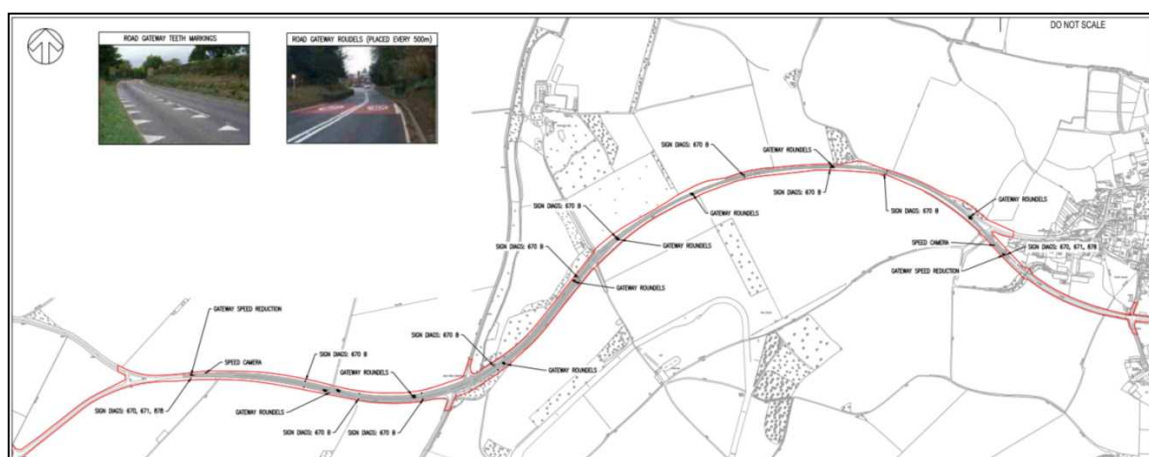


Figure 8-2 Speed limit review and indicative safety management measures

- 8.2.7** The preferred option for this section of the route is to introduce a speed limit reduction to 50mph, (subject to Police Authority and LHA approval) with changes to road markings and signage along the route to remind drivers of the proposed limit.
- 8.2.8** The types of measures proposed include 50mph roundels painted on the carriageway every 500m, dragons teeth on entry to the slower speed zone at each end and interactive signs with radar detectors to identify vehicles in excess of the speed limit and politely remind them of the speed limit with an illuminated LED sign.

8.3 TRANSPORT IMPACT

- 8.3.1** According to published road safety research available on the RoSPA website, for rural roads, for every 1mph average speed reduction, a 3% reduction in accident frequency is typically achievable.
- 8.3.2** A reduced frequency of accidents would also offer an economic benefit as traffic will be less disrupted by incidents on the local road network and there will be a reduced requirement to call upon emergency services in response to accidents, as well as a saving in human life cost if the accident severity can also be reduced.

8.4 STAKEHOLDER ENGAGEMENT

- 8.4.1** The proposals suggested above require the support of partner organisations involved in road safety. There is a risk that the observed speeds on the road may be higher than the existing speed limit at certain times of day.
- 8.4.2** A self-enforcing scheme is the ideal outcome, to minimise pressure on Police resources in relation to enforcement. However, any road side equipment for enforcement such as safety cameras or ANPR systems require maintenance and monitoring. This can instead place onerous requirements on the local highway authority. Therefore the specific detail of the scheme will require further development in association with Cambridgeshire Police and the Local Highway Authority.

8.5 POTENTIAL SCHEME OPTION COSTS

- 8.5.1 High level cost estimates have been provided for the speed management proposals. At this early stage a substantial Optimism bias of 44% is included to allow for potential unknown risk items in the absence of detailed surveys of ground conditions, ecology phase 2 surveys and topography for example.
- 8.5.2 A substantial commuted sum has also been included in the event that average speed cameras are required to support the enforcement of the scheme. The resulting high level cost estimate of the proposed scheme has been produced as set out in Table 7-6 High Level cost assessment of Linton Options below:

COST ELEMENTS Q4 2016	LINTON TO HORSEHEATH SAFETY SCHEME
Total Construction Cost Estimate	£2,070,000

Table 8-2 High Level cost assessment of Linton to Horseheath Safety Enhancements

9 CONCLUSIONS

9.1 SUMMARY

9.1.1 Feedback from the first round of public consultation in summer 2016 has been used to inform the prioritisation, development and selection of scheme options to take forward for further consideration. From a value management point of view, the relative scheme benefits and costs of competing options which affect a similar geographic area have been assessed, so that a single option is identified that is most likely to offer the best value for money.

9.1.2 The combination of potential options within the corridor has also been considered where relevant to determine whether an enhanced business case exists. However at this stage, cumulative effects of other transport schemes and opportunities beyond the A1307 study scope (Addenbrooke's hospital access to Haverhill) have not been taken into account. Wider consideration may further enhance the business case which is to be developed in the next stage of the project.

9.2 A1307 RECOMMENDED DRAFT PREFERRED OPTIONS

9.2.1 The draft preferred option report recommends the following scheme options are taken forward for further development and assessment. The preferred options drawings are provided in the Appendices of this report.

- **Addenbrooke's to Hinton Way** – Widening of the existing A1307 carriageway to create a new on-highway westbound bus lane between the existing Babraham Road Park and Ride site and Addenbrooke's hospital, coupled with widening of cycleways within the northern verge to improve connectivity to the Park and Ride site for non-motorised users. Junction improvements at Worts Causeway junction to create a bus only bypass lane and changes to Granhams Road junction to facilitate right turning movements.

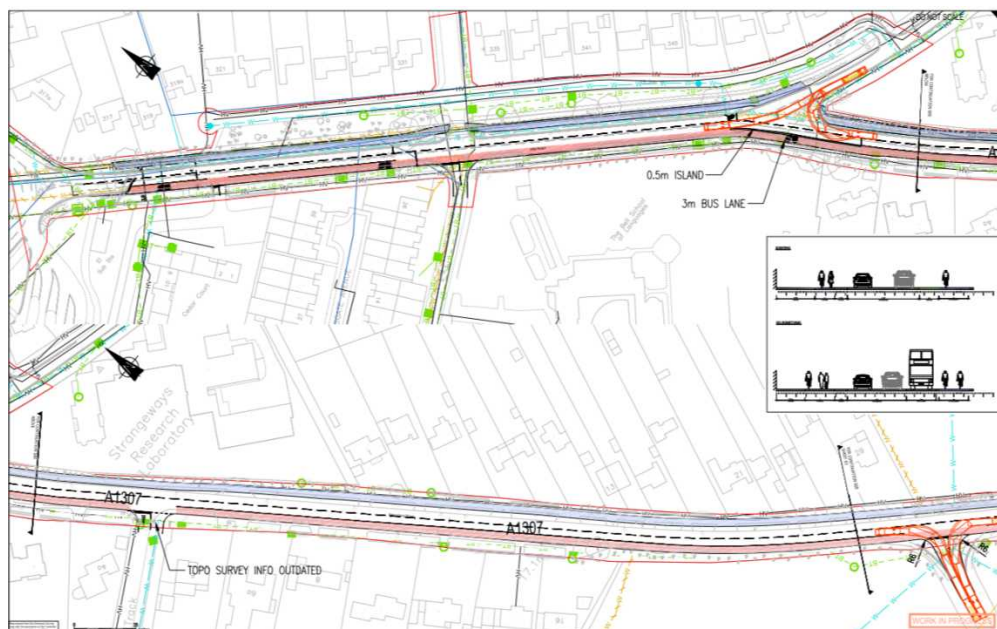


Figure 9-1 Westbound 'on-highway' bus lanes from Hinton Way to Addenbrooke's

→ Granhams Road junction to Hinton Way westbound bus lanes

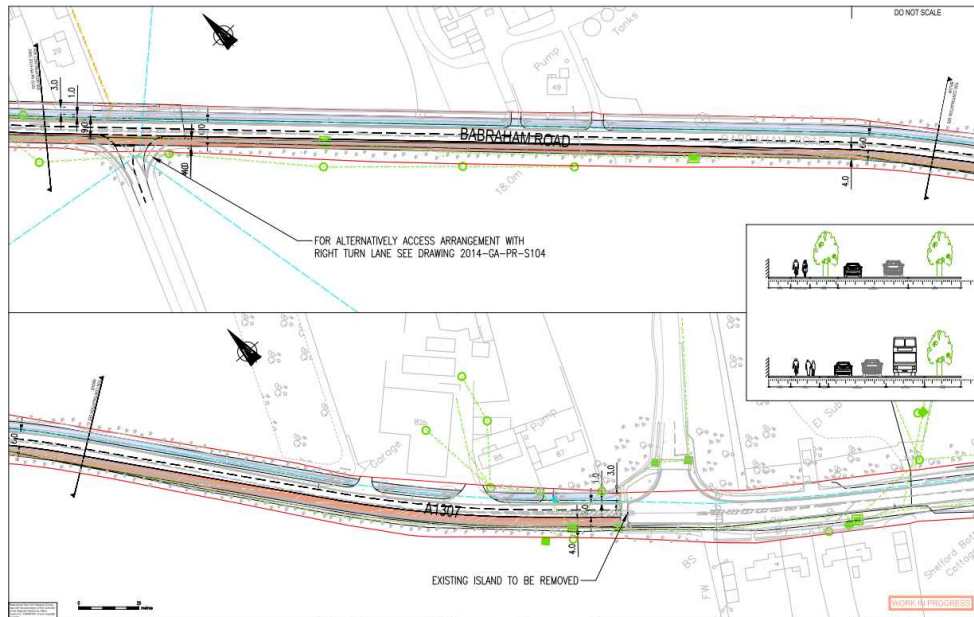


Figure 9-2 Westbound 'on-highway' bus lanes from Hinton Way to Addenbrooke's

→ CBC to Babraham Road Park and Ride off-highway bus and cycle link – a new bus only road could be created to improve bus connectivity with the CBC site and reduce bus journey times to Cambridge station and central Cambridge.

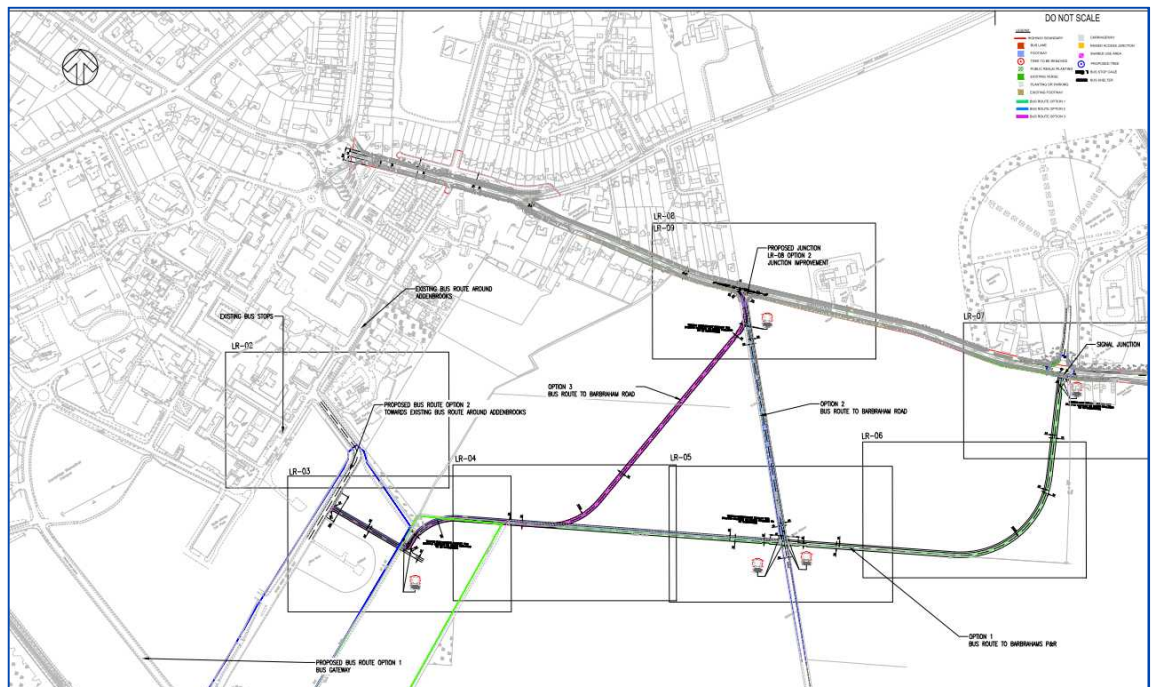


Figure 9-3 CBC to Babraham Park and Ride 'off-highway' bus link Options

- **Hinton Way Roundabout bus priority scheme** – install a section of busway within the A1307 central reserve on approaches to the junction and through the central roundabout island to create a ‘Hamburger’ bus priority scheme.

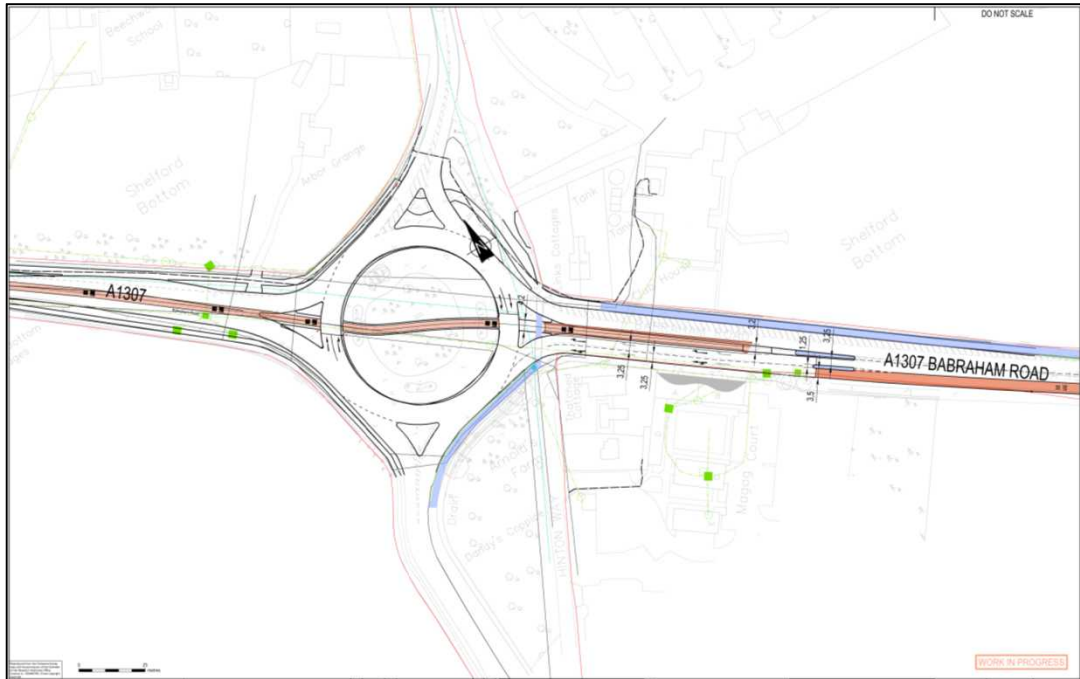


Figure 9-4 Hinton Way Roundabout ‘Hamburger’ Bus Priority Scheme

- **Hinton Way to Babraham Village** – Widening of the existing A1307 carriageway to create a new on-highway westbound bus lane from Hinton Way roundabout to Babraham Research Campus.

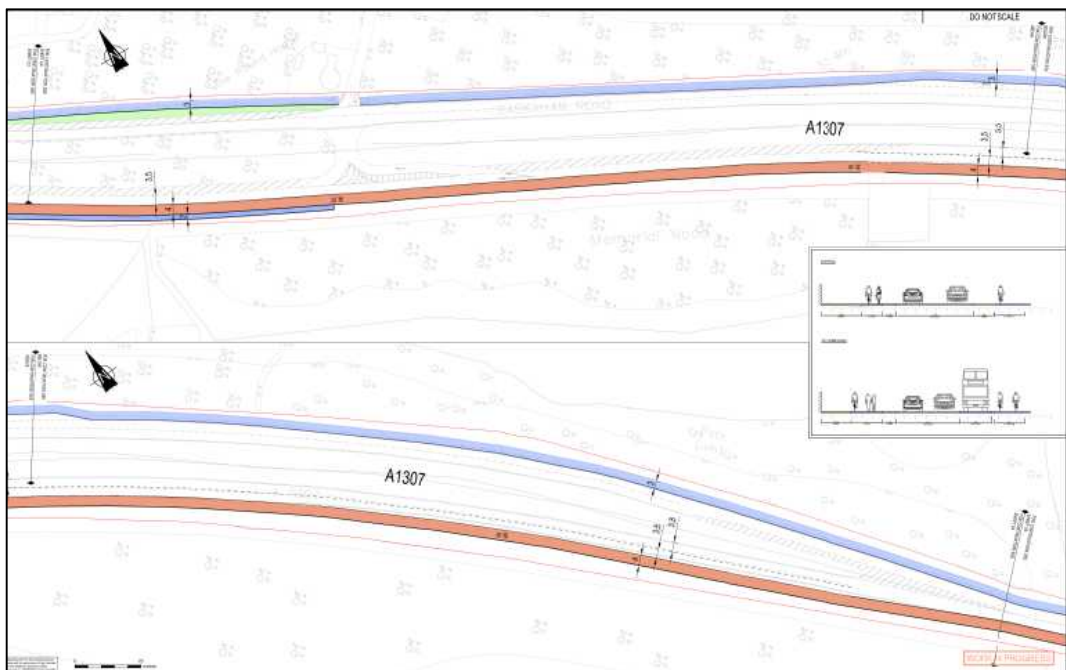


Figure 9-5 Hinton Way to BRC Roundabout Westbound bus lane

- **The Gog Farm Shop Junction safety Improvements** - Enlargement of the central island on approach to The Gog Farm Shop junction, seeking to improve road safety by creating a staggered layout and reducing vehicle approach speeds on approach.

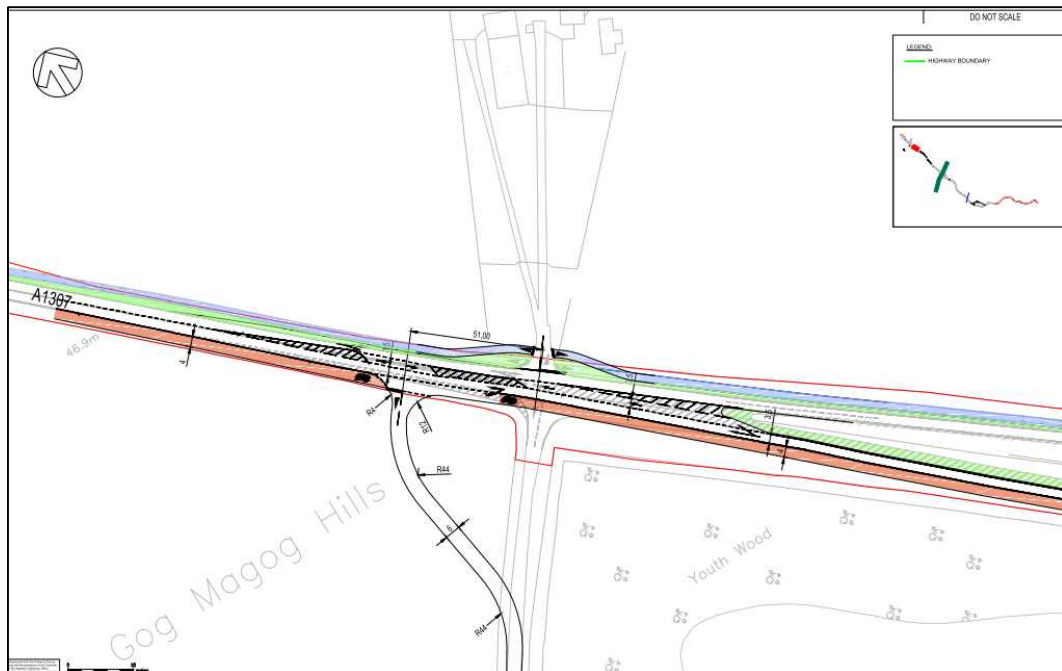


Figure 9-6 Westbound bus lanes, north verge cycleways and The Gog Farm Shop junction changes

- **A new Park and Ride site to the south of A1307 either west OR east of A11 junction** in addition to the existing Babraham Road Park and Ride facility a new site at the A11 junction would be added to enhance Park and Ride capacity. The existing facility would become more Addenbrooke's focussed with additional cycle parking capacity to support use of the facility as a Park and Stride location. Either option could potentially be coupled with junction improvements at Babraham High Street crossroads and/or A11 services access.



Figure 9-7 Proposed A11 SW Park and Ride Site

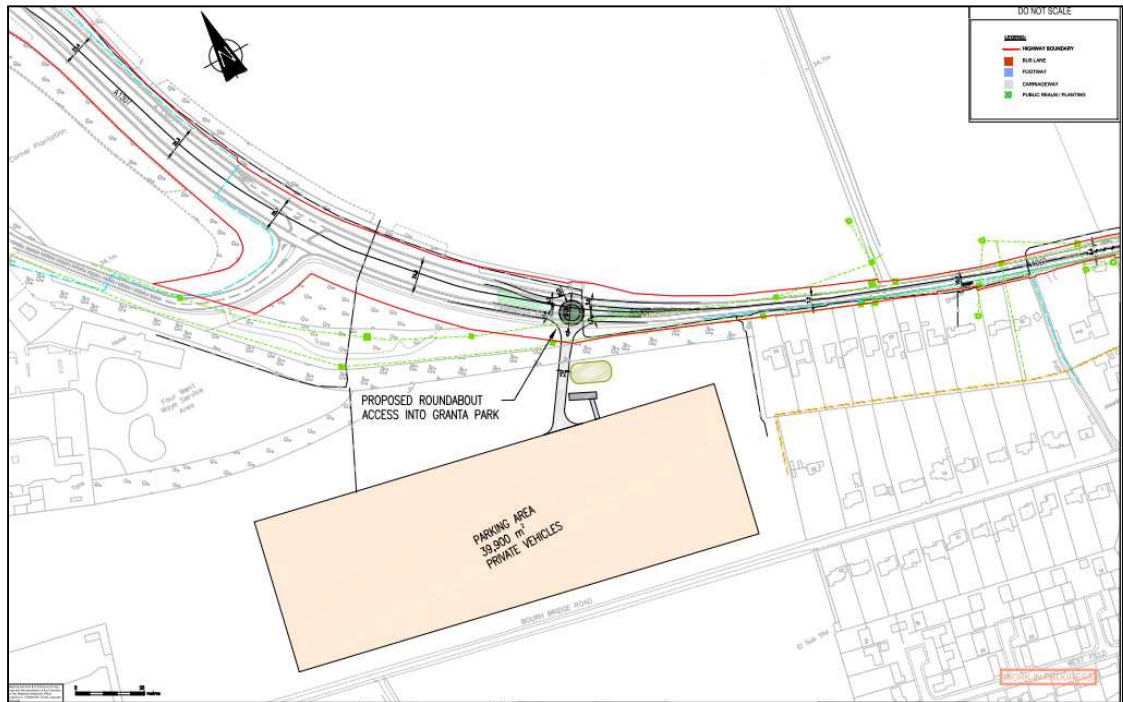


Figure 9-8 Proposed A11 SE Park and Ride Site

→ **Babraham Village and Granta Park to Linton** – Implementation of new cycleways along the existing public footpath alignment to enhance off-road cycle and pedestrian access crossing the A11, connecting the village of Babraham with Great Abington as well as key employment sites at Babraham Research Campus and Granta Park. Ramps could be appended to the existing stepped footbridge to improve access for all and equalities compliance. This could also potentially connect to the proposed A11 park and ride site.

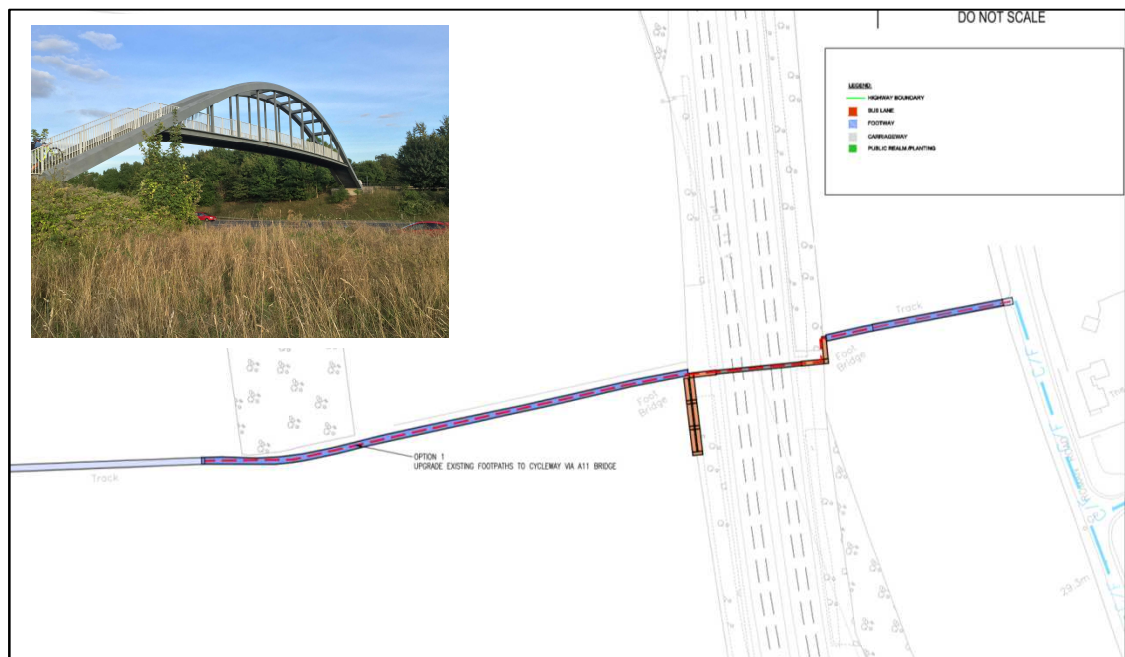


Figure 9-9 A11 Footbridge modifications to add ramps to the existing structure

Cycle route via A11 underpass A new cycle route via the underpass to the south of the A11 footbridge could be created, subject to landowner, EA and Highways England consent to dedicate new Public Rights of Way over the affected land alongside A11 and/or the River Granta.



Figure 9-10 A11 new cycle route options via the River Granta underpass

→ **Pampisford Road junction** – a new raised crossing point or signalised at grade crossing of the A1307 on a key desire line to facilitate pedestrian movement between Hildersham and Great Abington as well as safer access to bus stops and improved cycle connectivity towards Granta Park, BRC and Linton Village College. New cycleway from Linton Road Great Abington would also be added.

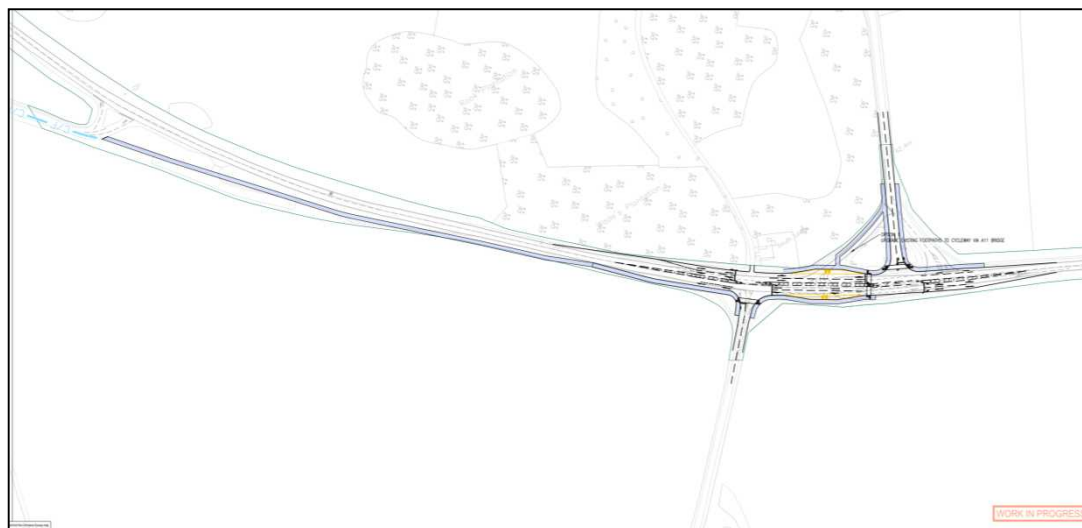


Figure 9-11 Linton Road to Pampisford Road crossing improvements and new cycleway

- **Linton Village** – Improvements to signal timings (via MOVA control) at Linton Village College access junction and the integration of traffic signals and pedestrian crossings at the High Street junction with A1307.

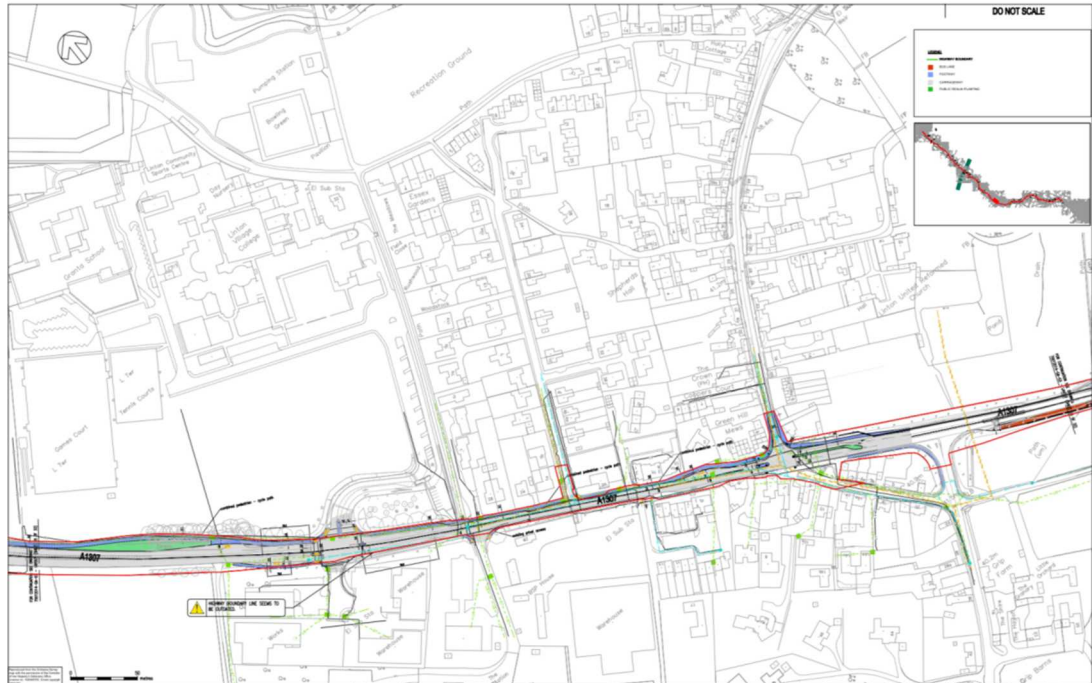


Figure 9-12 Linton Proposed Streetscape and Junction enhancements through A1307

- **Linton Westbound bus lanes** on A1307 approach to the High Street junction.



Figure 9-13 Westbound bus lanes on approach to Linton High Street junction

- **Linton High Street Public realm enhancements** for reducing congestion within the High Street, seeking to improve the flow of buses through the village centre.

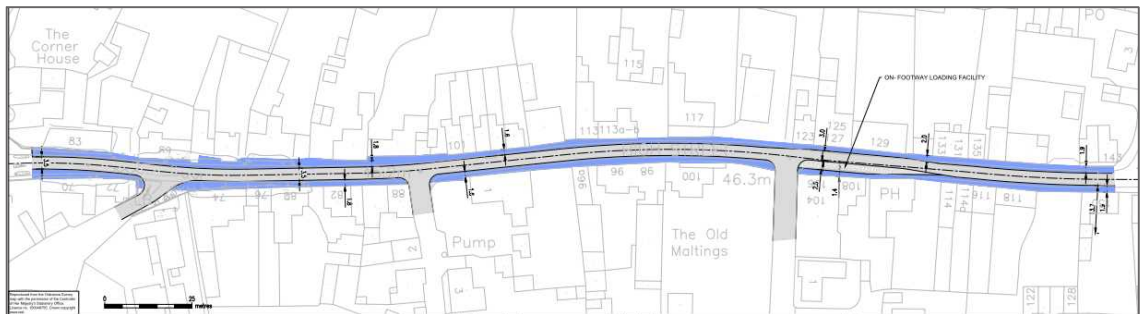


Figure 9-14 High Street Public Realm Enhancement Proposals

- **Linton to Horseheath safety management** – A review and refresh of the existing collision reduction measures and signage would be carried out and changes to Dean Road Crossroads seeking to improve safety at this junction.

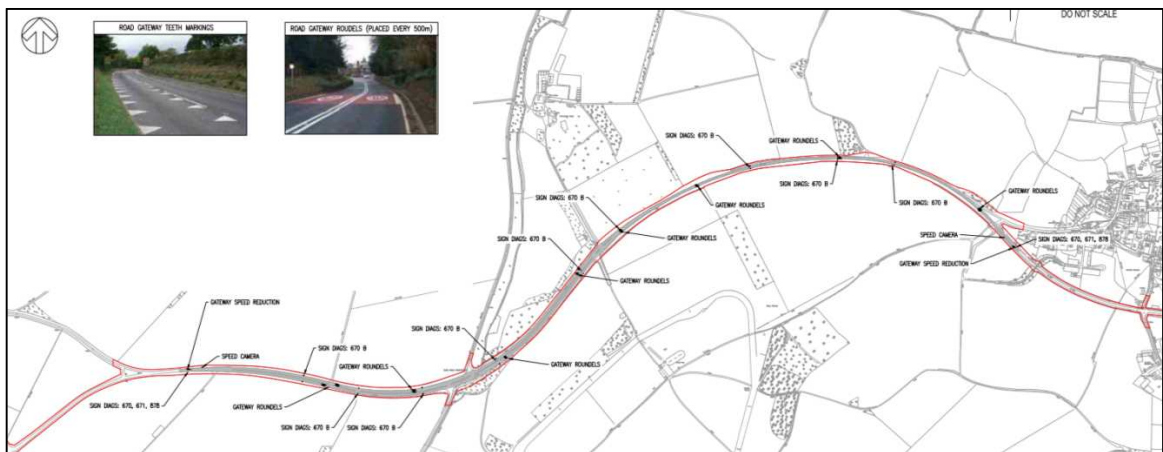


Figure 9-15 Safety Management Proposals Linton to Horseheath

- **Haverhill to Cambridge bus service improvements** –The proposed package of infrastructure measures from Haverhill to Cambridge is likely to make bus services more attractive and reliable. This in combination with the levels of housing and employment growth proposed for the corridor as part of the Local Plans should increase the viability of more frequent bus services between Haverhill and Cambridge, particularly on the current X13 most rapid and direct route. This would also facilitate mode shift away from the private car.
- The proposed additional Park and Ride site at the A11 junction will help to influence additional mode shift to Park and Ride and this is envisaged to be coupled with new frequent bus services on the corridor which would increase capacity.
- The on highway and off highway bus priority measures would also help to improve the image of public transport and increase the accessibility of the CBC campus. The new CBC off highway link in particular would also create new opportunities for more flexible onward routing to the rail station via the Cambridge Guided Busway or linkage with other wider initiatives such as the western orbital scheme or Trumpington Park and Ride.

9.2.2 At this draft preferred options stage, it is also recommended that more detailed discussions with key stakeholders (eg Landowners, Highways England, Environment Agency, Natural England, Historic England etc) are required to fully understand environmental, utility and operational effects prior to confirming the final preferred scheme option package ..

9.2.3 An overview of the proposed package of measures for the A1307 Corridor is provided below in Figure 9-16.

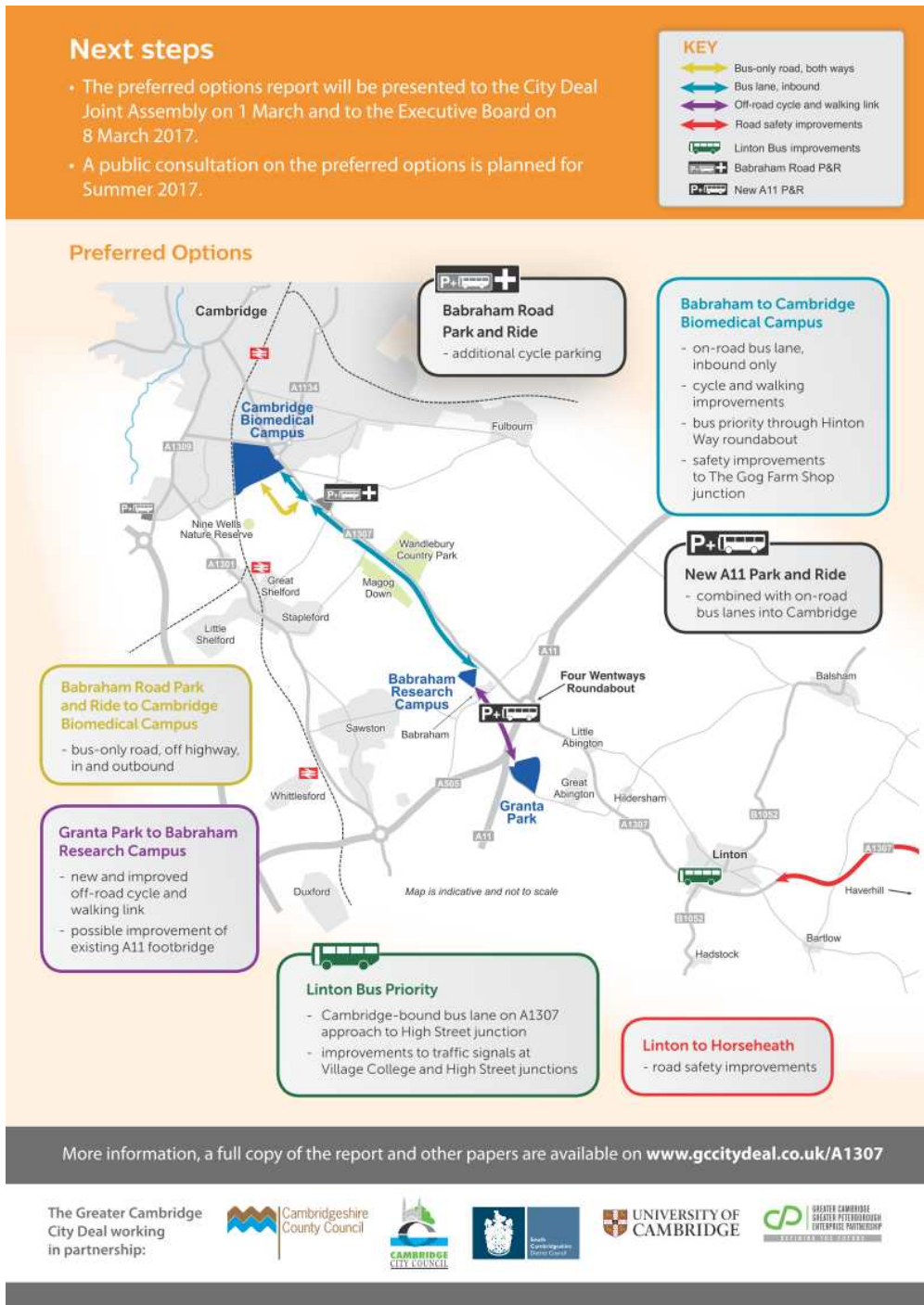


Figure 9-16 Route-Wide Strategy Overview for A1307

9.3 REASONS FOR RECOMMENDATIONS

- 9.3.1 During the Public Consultation there was generally a high level of support expressed for the proposed concept options presented to the public in June 2016, with 83.3% of respondents supporting or strongly supporting the concept of bus, cycling and walking improvements on the A1307.
- 9.3.2 The options which are considered to best meet the strategic objectives of the A1307 Study and the Greater Cambridge City Deal have been prioritised at this stage in order to maximise opportunity for securing funding. The requirement for schemes to be affordable within the first tranche of City Deal funding (with an upper limit of £39m available to the A1307 corridor) and the need for schemes to commence by 2020 are fundamental to the selection of options. The complexity and land take of the schemes has therefore been minimised where possible to enable rapid development and implementation.
- 9.3.3 The selected package of schemes therefore seeks to support economic growth within the corridor by facilitating sustainable travel links between the three research campuses which are currently experiencing significant employment growth. The study also takes into account increased travel demand generated by large scale allocated housing development at each end of the corridor.
- 9.3.4 Environmental concerns from members of the public were expressed around the extent of works within Greenbelt land and close to sensitive environmental landscapes such as the Gog Magog Hills, Wandlebury Country Park and Nine Wells Nature reserve. Therefore, the scheme options proposed generally focus on maximising improvements within the extents of available public highway land and only purchasing additional land where a suitable improvement cannot be achieved or where an off-highway option for cycle and pedestrian improvements would offer a safer alternative to an option within the public highway.
- 9.3.5 Stakeholder workshops have helped to inform the selection of preferred options. However further work with stakeholders is required to be undertaken in early 2017 to understand the views of bus operators, land owners and environmental groups, local Police and other interested parties before finalising the preferred options for input to a major scheme business case.

9.4 NEXT STEPS

- 9.4.1 The following steps will be taken prior to the development of a major scheme business case:
- Subject to Executive Board approval, a second round of public consultation is also expected to be held in Summer 2017 to share the preferred options schemes with members of the public. A similar programme of events is anticipated to the round 1 consultation.
 - Transport Modelling of the preferred option package will be undertaken using the new CSRM2 model when it becomes available. This would be based on the Greater Cambridge City Deal Foundation Case Scenario. This would check for consistent results with the CSRM1 outcomes presented in this report and potentially allow sensitivity testing for cumulative effects with other City Deal schemes (such as the City Access study) which may increase demand for park and ride, bus services and cycling in the A1307 corridor.
 - Further discussions will be held with relevant CCC officers and A1307 Project Board regarding the detail of the preferred options package to understand if any design development is required.
 - A Local Liaison Forum has been established in February 2017 seeking input from a wider group of external stakeholders and local residents to help shape the final package of preferred options.

9.5 SITE SPECIFIC IMPLICATIONS

Cambridge Biomedical Campus to Hinton Way

- The proposal involves the removal of sections of highway verge and works within tree root protection areas alongside the road. An arboricultural survey may be required to understand the condition of any affected trees and the feasibility of works within the RPAs.
- Phase 1 ecology habitat survey is recommended to check if any of the hedges or trees to be removed offer suitable habitat for protected species.
- Phase 1 heritage desktop assessment of proposed changes to the streetscape, given the context and surrounding historic landscape of City of Cambridge.
- Liaison with CBC sustainability team regarding their travel plan and consistency check against their draft document in January 2017.
- Landowner liaison with CBC landowners regarding bus link connection into the CBC campus
- Capacity testing of Addenbrooke's roundabout at Hills Road frontage to understand the need for upstream junction changes which may have a capacity impact on the corridor.
- Liaison with bus operators regarding proposed westbound bus lanes and to understand potential future re-routing of buses in response to the proposals.

Hinton Way to Babraham Village

- Ecology Phase 1 survey where land take removes verges or trees within the public highway or where third party land is required.
- Liaison with third party land owners around The Gog Farm Shop junction regarding the proposed junction changes.
- Ecology phase 1 of the highway verges proposed route for cycleways and widening to create bus lanes.
- Given that this section of the route passes Wandlebury Country Park and several listed buildings, a Phase 1 desktop heritage assessment is necessary.

A11 Park and Ride at Babraham Village

- Landowner liaison with third parties potentially affected by proposed works
- CSRM2 tests using the new model to understand patronage impacts of other City Deal studies.
- The proposal involves the removal of sections of highway verge and works within tree root protection areas alongside the road. An arboricultural survey may be required to understand the condition of any affected trees and the feasibility of works within the RPAs.
- Phase 1 ecology habitat survey is recommended to check if any of the hedges or trees to be removed offer suitable habitat for protected species.
- Phase 1 heritage desktop assessment of proposed changes to the streetscape, given the context and surrounding historic landscape of City of Cambridge.
- Liaison with Addenbrooke's sustainability team regarding their travel plan and consistency check against their draft document in January 2017.
- Capacity testing of Babraham High Street proposed roundabout junction
- Liaison with bus operators regarding proposed P&R facility and understand potential future re-routing of buses in response to the proposals.

Babraham Village and Granta Park to Linton

- Structural assessment is required to understand the feasibility and cost of installing additional ramps on the existing footbridge and whether the structure is suitable for additional loading or if the ramps need to self-supporting.
- Highways England and Landowner liaison regarding potential upgrade to the footpaths to cycleway status and connections to the proposed Park and Ride facility.
- Phase 1 ecology survey of A11 highway verge where the proposed ramps could be installed

Linton Village Proposals

- Liaison with utilities providers, Parish Council and emergency service reps regarding changes to the High Street.
- Liaison with Stagecoach regarding bus movement through the Village and the proposals for reconfiguring High Street public realm as well as bus lanes on A1307.

Linton to Horseheath Speed Management

- Discuss the speed management proposals with the Police liaison officer and CCC officers.
- Speed surveys along this section of route to understand the feasibility of 50mh limit and enforcement issues.

9.5.1 Local Liaison Forums are being established for consistency with other City Deal projects and it is likely that these will commence in February 2017 to enable local residents and key stakeholders to provide input to development of the preferred options.

10 SCHEME COSTS & BENEFITS

10.1 OVERALL SCHEME COST

- 10.1.1 Based on the preferred option package for the A1307 route as set out above in Section 9 of this report, the following summary of scheme costs shown in table 10-1 has been produced. At this early stage an 'order of magnitude' cost has been prepared. For consistency with other City Deal schemes, this includes a 44% optimism bias at this early stage prior to detailed design, with large value risk items (where known) included separately. Further work will be undertaken to refine these cost estimates as the study progresses to the next stage of scheme development.
- 10.1.2 Land values have been obtained from a high level review of third party land affected by the proposals produced by rural surveyors Carter Jonas Ltd. At this stage the overall scheme value includes both the on-highway and off-highway options for bus improvements at the Cambridge end of the A1307 route as it is possible that both of these options would be taken forward simultaneously. However, only one A11 Park and Ride site option is included as it is not likely that both would proceed.
- 10.1.3 The proposed scheme cost is very close to the £39m budget available for this project as part of the Greater Cambridge City Deal first tranche funding. It is envisaged that moving forward through the design process, with greater certainty on the preferred option scheme design and mitigation that a value management approach may lead to a total scheme value equivalent to the project budget.

COST ELEMENTS Q4 2016	TOTAL PREFERRED OPTION PACKAGE
Total Construction Cost Estimate	£38,945,600

Table 10-1 High Level Total Preferred Scheme Package Costs

10.2 KEY RISKS

- 10.2.1 Potential risks to the delivery of the preferred package of measures for the A1307 are envisaged at this stage to be as follows:
- Road safety impacts of the proposed scheme - A thorough highway safety review of all options is required prior to public consultation.
 - Objections to proposals located in the Green belt land or close to sensitive assets
 - Objections from affected landowners where their land is directly affected
 - Utilities risks where works require relocation or protection of below ground assets
 - Unknown extent of archaeology below ground assets
 - TPOs and ecology risks need more detailed review
 - Requirement to use statutory powers where third party land is required
 - Model results from the new CSRM2 model may lead to alternative conclusions
 - Objections from members of the public.

10.3 EMERGING STRATEGIC CASE

10.3.1 The emerging strategic case for the A1307 Scheme is informed by the available evidence base considering the existing and future transport situation. Additional travel demands within the corridor are likely to arise as a result of economic growth which the preferred scheme aims to address by influencing mode shift towards sustainable travel alternatives such as bus, park and ride, walking and cycling.

Scheme Aim

10.3.2 The strategic aim of the A1307 scheme is to achieve the objective of keeping traffic growth on the A1307 corridor similar to today's levels, whilst accommodating substantial employment growth at the three campuses as well as housing growth at the Haverhill and Cambridge ends of the route. It is clear that a significant mode shift away from private car is required to achieve this strategic aim.

Strategic Case for Intervention

10.3.3 The strategic case for an A1307 scheme is based on the analysis of the existing route performance, stakeholder feedback, and the growth aspirations of the corridor. The analysis has considered how an A1307 Improvement Scheme could positively contribute to growth along the corridor.

10.3.4 The A1307 is a significant growth corridor with the combined Local Plans for Cambridge City, South Cambridgeshire and St Edmundsbury planning for more than 4,000 new homes and 10,000 jobs in the A1307 corridor in the next 10 years with further growth planned beyond this period.

10.3.5 However, currently the A1307 route generally has a poor highway safety record, with several junctions classified as accident cluster sites due to the concentration of accidents on record within the last 5 years (e.g. at Hinton Way Roundabout, The Gog Farm Shop access, A11 services access junction).

10.3.6 The section of road between Linton and Horseheath has a high frequency and severity of speed-related accidents on the more open sections of road, with 20 accidents in five years of which two were fatal and 8 were serious. There have also been several serious and fatal accidents in 2016 to the east of A11, although the statistics have yet to appear in the published accident record data, so have not been assessed within this study.

10.3.7 The A1307 scheme would positively contribute to growth along the corridor by:

- Improving local sustainable transport links between homes and jobs;
- Improving road safety along the corridor by making changes to key junctions to reduce conflict or by reducing the speed of vehicles with appropriate enforcement where there have been speed-related accidents.;
- Support the delivery of job and housing growth along the corridor including important growth sites at Granta Park, Babraham Research Campus and the Cambridge Biomedical Campus; and
- Help address local transport issues for example bus reliability along the A1307 corridor.

Corridor Transport Intervention Package

- 10.3.8 The A1307 scheme seeks to provide a step change in bus services and infrastructure which would offer realistic alternatives to the private car for longer trips within the corridor; as well as improving opportunities for sustainable access for pedestrians and cyclists travelling shorter distances between key workplace and home locations along the corridor.
- 10.3.9 The proposals include a new Park and Ride site close to the A11 junction which would increase park and ride car parking capacity along the route by 1,000 vehicles and cycle parking at Babraham Road Park and Ride would also be increased by 30-40%.
- 10.3.10 The preferred option scheme includes a new bus only road between the Babraham Park and Ride and Cambridge Biomedical Campus that would provide a segregated traffic free route for buses (and emergency service vehicles) only with direct access into the heart of the CBC campus where substantial employment growth is occurring. This would reduce journey times for buses and increase opportunities for bus services operating on the A1307 to use the Cambridgeshire Guided Busway for more rapid access to the rail station and City Centre. This new link also offers potential connectivity with other City Deal schemes such as the western orbital scheme.
- 10.3.11 In relation to environmental considerations, and in response to public consultation feedback, the scheme seeks to minimise land take where possible, especially in close proximity to the sensitive ecological and Heritage assets on the route such as Wandlebury Country Park and Nine Wells Nature Reserve. The majority of the preferred scheme options are therefore proposed within the existing extents of public highway land, with only a small number of notable exceptions where it was felt that there were wider strategic connectivity or journey time benefits as a result of the additional land take which were likely to outweigh the cost and environmental impacts of the proposals.

10.4 HIGH LEVEL COST BENEFIT CASE

- 10.4.1 To understand the potential value for money that the preferred option package may deliver, a high level assessment of costs and benefits has been carried out. The early stage indicative assessment at this stage has focussed on benefits derived from potential journey time savings to bus users on the corridor.
- 10.4.2 It should be noted that for a robust assessment at this stage, the costs of safety and Cycling improvements are included in the cost element of the assessment only as they form part of the total scheme package costs but the benefits considered do not take into account the benefits that these may bring about (eg health benefits to cyclists and accident reduction cost and time savings).
- 10.4.3 It is envisaged that including these benefits would increase the BCR value. The mode shift and patronage assumptions are based on the Local Plan growth expectations for the corridor, rather than standard NTEM growth. However, the Cambridge Central Access study and additional effects that this and other City Deal schemes may bring about in relation to mode shift from car to bus are not currently taken into account.
- 10.4.4 The results of the high level value for money assessment suggest that the scheme would be likely to offer a medium level value for money (in the range 1.5-2.0 BCR).
- 10.4.5 The data used at this stage is taken from the early stage CSRM1 modelling work and observed data set out above which will be updated in the next stage of work when the CSRM2 model is available. Moving forwards, the updated modelling will be used to inform the development of an outline business case.

