Western Orbital

End of Stage Summary

Greater Cambridge Partnership

October 2017
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Greater Cambridge Partnership

October 2017

This document has 29 pages.

This document and its contents have been prepared and are intended solely for Greater Cambridge Partnership’s information and use in relation to the Western Orbital project.

Document history

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1. Introduction

The purpose of this report is to summarise the work undertaken as part of the wider Western Orbital (WO) project in response to the Greater Cambridge Partnership (GCP) Executive Board instruction to provide further assessment of:

- Park and Ride at Junction 11
- Park and Cycle at Junction 12
- M11 Junction 13 slip roads
- M11 as a ‘Managed Motorway’.

It is intended to identify areas for further work as part of the development of the project. It presents a summary of the work undertaken to review the potential to facilitate an orbital bus route, Park and Cycle at Junction 12 and additional Park and Ride at Junction 11; this includes a consideration of wider strategic issues.

The main driver for considering a WO bus service is to improve the accessibility, by public transport, to the west of Cambridge (to support additional jobs, retail, Energy Centre and Data Centre, Sports Centre and residential land uses), including: North West Cambridge and the University facilities in West Cambridge; the Science Park and Chesterton Station to the north (which is to support an additional 13,600 – 27,600 jobs); as well as the substantial expansion on the Cambridge Biomedical Campus.

With the above in mind it is considered that there may be potential to support some bus provision along an on-line orbital route. Analysis using updated strategic modelling will inform a recommendation on the proposed level of frequency and commercial viability of potential on-line orbital bus services.

A policy review has been undertaken which considers the National, Regional and Local policy relevant to the WO project. The review has found that the project is well aligned with wider strategic planning and transport objectives, with the project developing potential schemes to provide road users in Cambridge with an alternative mode of travel to the private car. It is considered that it has the potential to improve access to services and jobs in keys areas of employment and better connect existing and future housing areas by sustainable modes of travel.

2. Orbital Bus Route

2.1 Smart Motorways

The consideration of an orbital bus route is centred on the expected growth in housing, jobs and services in west/ south-west Cambridge. There is potential to operate bus services that would run on-line on the M11 between J11 and J13, with provision of potential priority measures reviewed within this report.

Pertinent to the on-line running of a bus service is consideration of the potential change in conditions on the M11 from other highway interventions. For example it is understood from discussions with Highways England that there is an intention to implement a Smart Motorways Programme (SMP) along the corridor, which could have implications for a WO scheme.

A review has been undertaken to consider how a SMP could change traffic conditions in the corridor and how it could affect any WO proposals. A qualitative review of completed and proposed SMP schemes in the UK has been undertaken within this context. The potential impact of an SMP scheme on the M11 and an on-line orbital scheme has been considered.

The review found that, whilst there were no examples that were directly comparable to the M11 in terms of number of lanes, there was some information that could provide an indication of the potential implications for an on-line bus service. With the information from the review in mind, it is considered that SMPs could reduce the number of collisions, as well as improve journey times. Road users have generally reported an average daily saving of up to two minutes per journey for a return journey in peak periods, and improvements to journey time reliability.

The review suggests that in general journey times reduce, with any increases being due to the implementation of a reduced speed limit. However, the key impact which may complement an on-line WO scheme is that in general journey time variability reduces, suggesting that an on-line bus journey time could be more reliable
with an SMP in operation. However, it will be important to keep in mind the impact of junction constraints within the study area. A review of Traffic Master data\(^1\) indicates that the largest change in average speed between the peak periods (08:00-09:00, 17:00-18:00) and the inter-peak (10:00-11:00), when the network is likely to be free-flowing, is at the junction approaches. As part of a SMP there would be no public transport priority over general traffic, and therefore any junction delays would hold up potential WO bus services.

Traffic flows along the SMP schemes reviewed have generally increased, which in the context of the M11 could increase pressure on local junctions. Further analysis on potential impact of SMP on the local junctions would allow this to be better understood. It is however pertinent to note that some form of junction improvements are likely to be included as part of the SMP scheme in any case.

The number of collisions on the sections of schemes analysed reduces, indicating that SMPS in general are seen to improve safety on the roads. A reduction in the number of incidents by 35%, as experienced in other Post Opening Project Evaluation (POPE) examples would result in a reduction in incidents from 1.52 to 0.99 accidents per mile per year along this stretch of the M11.

2.2 J11 Priority Options

A high-level review of Traffic Master data at J11 indicates that typically there is slow moving traffic on the southbound approach to the junction from the M11 in the AM peak. Subsequently, any on-line bus service would likely be delayed as it is held within general traffic queues. In the PM peak, there is also an indication of slow moving traffic on the M11 northbound carriageway, which appears to reduce the average speed of vehicles on the northbound on-slip. Therefore, options for providing priority to public transport services have been considered at J11. A total of 9 options are included in the review which considers the cost and deliverability of each option. Table 1-1 summarises this review:

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\(^{1}\) Database of GPS derived journey times
<table>
<thead>
<tr>
<th>Proposal</th>
<th>Description</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Construction Cost Estimate</th>
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<tbody>
<tr>
<td>1A</td>
<td>Dedicated bus-only slip road and segregated bus lane adjacent to the M11 southbound carriageway</td>
<td>Segregated bus lane away from the existing M11 carriageway and junction. Minimised land required. Bus priority provided at the J11 interchange. Minimised impact on utilities and drainage by providing an area of separation.</td>
<td>May cause confusion for road users and result in accidental use. Bus lane required to be located close to the M11 at the accommodation bridge. Reconstruction of the accommodation bridge southbound verge abutment required. Bus lane merge on the A1309 could result in conflict with road users.</td>
<td>£5.1M</td>
</tr>
<tr>
<td>1B</td>
<td>Dedicated bus-only slip road and segregated bus lane adjacent to the M11 southbound carriageway avoiding the accommodation bridge</td>
<td>Segregated bus lane away from the existing M11 carriageway. Retains existing accommodation bridge. Bus priority provided at the J11 interchange. Minimised impact on utilities and drainage.</td>
<td>May cause confusion for road users and result in accidental use. Bus lane cuts through environmental earthworks bund. Significant impact on Country Park. Bus lane merge on the A1309 could result in conflict with road users.</td>
<td>£5.2M</td>
</tr>
<tr>
<td>1C</td>
<td>Dedicated bus-only slip road and segregated bus lane across open land to the A1309 at the Addenbrooke’s Road junction</td>
<td>Segregated bus lane away from the existing M11 carriageway. Bus lane aligns directly west to link with the A1309 at the existing Park and Ride site, avoiding J11 and the accommodation bridge. Minimised impact on utilities and drainage.</td>
<td>May cause confusion for road users and result in accidental use. Bus lane cuts through environmental earthworks bund. Significant impact on Country Park. Greater impact of the Trumpington Meadows residential development.</td>
<td>£4.5M</td>
</tr>
<tr>
<td>1D</td>
<td>Dedicated bus-only slip road on the M11 J11 southbound exit slip road and segregated left turn lane</td>
<td>Segregated left turn bus-only lane at J11 to provide priority for buses onto the A1309. Reduced length of bus lane provision therefore lower cost of provision. Minimised impact on the local area and reduced land requirements compared with other options.</td>
<td>Bus only exit slip road lane confusion and potential misuse by other road users. Short length of bus lane could result in buses having to queue on the slip road. Will impact on existing carriageway drainage and signing along the exit slip road.</td>
<td>£1.1M</td>
</tr>
<tr>
<td>1E</td>
<td>Dedicated bus-only slip road lane the full length of the M11 J11 southbound exit slip road and segregated turn lane</td>
<td>Segregated left turn bus-only lane at J11 to provide priority for buses onto the A1309. Lower cost of proposal with works only along exit slip road. Minimised impact on the local area and reduced land requirements. Longer length of bus lane than provided with Proposal 1D reduces potential for bus delays.</td>
<td>Bus only exit slip road lane confusion and potential misuse by other road users. Impacts on existing carriageway drainage and signing along the exit slip road.</td>
<td>£3.4M</td>
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<tr>
<td>2</td>
<td>Provision of a shared use left turn/bus lane on the A1309, with dedicated bus lanes around the J11 interchange to the J11 northbound entry slip road.</td>
<td>Widening of the carriageway can be achieved within the existing highway land. Provides the addition of a left turn lane on the A1309 approach to J11. Bus priority signals provided on the J11 gyratory.</td>
<td>Shared left turn lane and straight ahead bus lane may lead to delays to buses. Possible widening works required over the M11 southern bridge requiring alterations over the bridge deck. Bus priority signals on the J11 gyratory may cause delays to other road users.</td>
<td>£2.9M</td>
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<td>3</td>
<td>Provision of a segregated bus lane located west of the A1309 Hauxton Road crossing through the J11 interchange with a proposed bridge crossing over the M11</td>
<td>Segregated bus lane along the A1309 and through M11 J11. Priority signalised crossings through the centre of J11 to link to the northbound entry slip road. Uses a new crossing of the M11 therefore does not affect existing J11 structures.</td>
<td>Two crossings of the J11 gyratory carriageway in close proximity could have a negative impact on traffic flows around the interchange. Opposing nearside bus flow on the A1309 could lead to dazzle from vehicle headlights and require anti-dazzle fencing. Higher costs associated with providing a bespoke structure for the bus lane.</td>
<td>£11.2</td>
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<tr>
<td>4A</td>
<td>Provision of a segregated bus lane located west of the A1309 Hauxton Road and through Trumpington Meadows crossing the M11 via the existing accommodation bridge</td>
<td>Segregated bus lane with no impact on the operation of the J11 interchange. Utilises the existing accommodation bridge structure to cross the M11.</td>
<td>Opposing nearside bus flow could lead to dazzle from vehicle headlights and require anti-dazzle fencing. Significant impact on Country Park. May require a separate structure to maintain the bridleway over M11. Requires a separate northbound bus lane entry slip road onto the M11 north of J11.</td>
<td>£9.1M</td>
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<td>4B</td>
<td>Provision of a segregated bus lane along the south of Trumpington Meadows Country Park crossing the M11 via the existing accommodation bridge</td>
<td>Segregated bus lane with no impact on the operation of the J11 interchange. Route is away from the M11 and A1309 carriageways. Utilises the existing accommodation bridge structure to cross the M11.</td>
<td>Significant impact on Country Park and permissive rights of way that run through it. May require a separate structure to maintain the bridleway over M11. Requires a separate northbound bus lane entry slip road onto the M11 north of J11. Greater impact of the Trumpington Meadows residential development with the bus lane run along the southern edge of the site.</td>
<td>£7.5M</td>
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2.3 J13 Priority Options

A high-level review of Traffic Master data at J13 indicates that during both the AM and PM peaks the average speed of vehicles on the northbound off-slip are lower than when the network is free-flowing (during the inter-peak period). This would likely lead to slower journey times and reduced reliability for any M11 on-line bus services. Options have been considered which provide bus priority at the junction, a summary of which are included in Table 1-2.

The suitability of the J13 options have a close inter-relationship with another GCP scheme, the Cambourne to Cambridge Better Bus Journeys project. The review of options indicates that whilst there is potential to provide priority measures at J13, the most suitable is reliant upon the alignment of the Cambourne to Cambridge Better Bus Journeys route.
<table>
<thead>
<tr>
<th>Proposal</th>
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<th>Strengths</th>
<th>Weaknesses</th>
<th>Construction Cost Estimate</th>
</tr>
</thead>
</table>
| 1       | Proposed priority bus lane northbound along M11 hard shoulder merging into A1303 Madingley Road with signalised bus priority junction | • Utilisation of existing assets with reduced construction costs utilising existing hard shoulder lane.  
• Minimised land requirement on the M11 northbound off-slip to provide bus lane.  
• Bus priority provided at the junction with the A1303.  
• No structural works required to existing footbridge south of J13.  
• Minimised impact on utilities and drainage within the verge of the M11 and the M11 J13 exit slip road. | • Hard shoulder strengthening works may be required.  
• Additional land take to provide emergency lay-bys due to loss of hard shoulder refuge.  
• Narrow width of the hard shoulder provides minimum width of bus lane.  
• Unfamiliar arrangement - additional signing for new use of hard shoulder.  
• Additional traffic light phase to the A1303 junction may increase congestion.  
• Loss of vegetative screening to Rectory Farm. | £850K |
| 2       | Proposed priority bus lane northbound along the M11 hard shoulder, merging with traffic lanes at the A1303 Madingley Road junction | • Utilisation of existing assets with reduced construction costs utilising existing hard shoulder lane.  
• Minimised land requirement on the M11 northbound off-slip to provide bus lane.  
• Bus lane will not impact on existing signal phasing at the J13.  
• No structural works required to existing footbridge south of J13.  
• Minimised impact on utilities and drainage with the verge. | • Hard shoulder strengthening works may be required.  
• Additional land take to provide emergency lay-bys due to loss of hard shoulder refuge.  
• Narrow width of the hard shoulder provides minimum width of bus lane.  
• Unfamiliar arrangement - additional signing for new use of hard shoulder.  
• Merging of eastbound buses into the J13 slip road lane.  
• Loss of vegetative screening to Rectory Farm. | £750K |
| 3       | Proposed dedicated off-line bus lane northbound along M11 merging onto A1303 Madingley Road with signalised bus priority junction | • Desirable width bus lane separated from the main M11 carriageway by the existing hard shoulder.  
• Maintains a hard shoulder for emergency use.  
• Bus priority provided at the junction with the A1303. | • Earthworks widening required with potential requirement for land purchase.  
• Significant impact on existing traffic signs and infrastructure within verge.  
• Potential reconstruction of Coton footbridge verge pier and revetment slope.  
• Impacts negatively on the safe refuge provided by the hard shoulder.  
• Additional traffic light phase to the A1303 junction may result in congestion.  
• Loss of vegetative screening to Rectory Farm. | £4.1M |
| 4       | Proposed dedicated off-line bus lane northbound along M11 merging with traffic lanes at the A1303 Madingley Road junction. | • Desirable width bus lane separated from the main M11 carriageway by the existing hard shoulder.  
• Maintains a hard shoulder for emergency use.  
• Bus priority provided at the junction with the A1303. | • Earthworks widening required with potential requirement for land purchase.  
• Significant impact on existing traffic signs and infrastructure within verge.  
• Potential reconstruction of Coton footbridge verge pier and revetment slope.  
• Impacts negatively on the safe refuge provided by the hard shoulder.  
• Merging of eastbound buses into the J13 slip road lane.  
• Loss of vegetative screening to rectory farm. | £4.0M |
| 6A      | Link to the proposed Cambourne to Cambridge Busway over M11 south of J13 and north of existing M11 pedestrian overbridge. | • Segregated bus-slips providing connection to the proposed A428 Cambourne to Cambridge busway.  
• Provides direct link to and from the West Cambridge development.  
• No impact on the existing J13 interchange signal arrangement or traffic flows. | • Reliant on the A428 Cambourne to Cambridge busway being constructed.  
• Significant earthworks required with requirement for land purchase.  
• Removes the existing Coton footbridge.  
• Close proximity of the bus-only exit slip road to J13.  
• Severs development land and a designated wildlife site east of the M11. | £3.7M |
| 6B      | Link to proposed Cambourne to Cambridge Busway over M11 south of J13 with southbound slip road linking to the South of Ada Lovelace Road | • Segregated bus-slips providing connection to the proposed A428 Cambourne to Cambridge busway.  
• Provides direct link to and from the West Cambridge development.  
• No impact on the existing J13 interchange signal arrangement.  
• Existing Coton footbridge can be retained.  
• Reduced impact on earthworks compared to Proposal 6A. | • Northbound bus lane is reliant on the A428 Cambourne to Cambridge busway infrastructure being constructed.  
• Close proximity of the bus-only exit slip road to J13.  
• Severs land and create land parcels south of West Cambridge development. | £3.5M |
| 7A      | Priority bus lane from westbound A1303 Madingley Road along M11 southbound on-slip | • Bus lane providing priority access from west Cambridge to the M11 southbound carriageway.  
• Widening of the A1303 earthworks required to accommodate the bus lane.  
• Relocation and/or protection of numerous statutory undertakers plant  
• Limited benefit as A1303 left turn carriageway lane is already provided.  
• Hard shoulder strengthening works may be required  
• Additional land take to provide emergency lay-bys due to loss of hard shoulder refuge.  
• Narrow width of the hard shoulder provides minimum width of bus lane. | | £200K |
| 7B      | Priority bus lane from A1303 Madingley Road southbound along existing M11 merging with southbound off-slip at J12 | • Bus lane providing priority access from west Cambridge to a bus lane along the M11 southbound carriageway hard shoulder.  
• Widening of the A1303 earthworks required to accommodate the bus lane.  
• Relocation and/or protection of numerous statutory undertakers plant  
• Limited benefit as A1303 left turn carriageway lane is already provided.  
• Hard shoulder strengthening works may be required  
• Additional land take to provide emergency lay-bys due to loss of hard shoulder refuge.  
• Narrow width of the hard shoulder provides minimum width of bus lane. | | £200K |
2.4 Environmental Considerations

A high-level environmental review has been undertaken on the potential on-line orbital scheme to identify any major constraints within the appropriate area of search, which is based on an on-line alignment on the existing M11 carriageway. The qualitative assessment considered:

• Air quality;
• Archaeology;
• Ecology;
• Landscape;
• Noise; and
• Water.

The review did not identify any environmental constraints that would preclude the operation of on-line orbital bus services. It has been noted however, that more detailed environmental assessment would be required as part of the approvals process for any works at J11 and J13.

2.5 Planning Assessment

To assess the acceptability of the principle of the development, the key paragraph is paragraph 90 of the Nation Planning Policy Framework (NPFF), which sets out certain circumstances where development is ‘not inappropriate’ development in the Green Belt. The on-line route option for the scheme could be predominantly delivered without requiring any further land outside of the M11 boundaries and may not need planning permission, other than areas where junction improvements are proposed. In the event that the on-line route is not able to meet the transport objectives of the scheme or is not deliverable, then an off-line route could be considered as a suitable alternative, having regard to paragraphs 87 & 90 of the NPPF.

2.6 Orbital Route Summary

The work undertaken on the orbital route indicates that whilst the provision of an on-line route is feasible, with associated priority measures at each junction, it is inter-related with other strategic schemes such as the Highways England SMP and the GCP Cambourne to Cambridge Better Bus Journeys project. Updated strategic modelling, allowing further analysis of the potential demand for an orbital bus route, including the potential impact of the inter-related schemes, would inform the development of the project through the next work phase.
3. J12 Park and Cycle

3.1 Concept

The concept of a Park and Cycle site is centred on providing a formal location for commuters to park their cars in a location outside of the centre of Cambridge, in order to cycle the remainder of their onward journey. Whilst there are examples of locations where commuters can park and cycle (such as at existing car parks, train stations or Park and Ride sites), there is not an example of a dedicated Park and Cycle site for commuters within the UK.

Therefore, in considering how a dedicated Park and Cycle site might operate, reference has been made to other cycle parking facilities around the UK to gain an understanding of what facilities may be important for commuter cycle parking. A review of different cycle parking facilities has been undertaken, including cycle hubs, and cycle parking at existing Park and Ride sites. Reference has also been made to Cycle Hire schemes to consider whether a hire model could be applicable to the Park and Cycle concept.

In the context of a Park and Cycle site, located at Junction 12, it is considered more suitable to follow the transport interchange concept, whereby facilities are focussed on cycle parking (racks/ lockers) rather than a destination concept (with associated facilities such as a shop and changing facilities). The review indicates that typically Park and Cycle facilities at locations where there is interaction with other modes of transport implement a monthly charge for use of the cycle parking facilities; up to £10 a month. In the case of the facilities around Cambridge, the standard Park and Ride parking charge of £1 is also applicable, though it is understood that this parking charge is being removed. A common feature of these sites is the provision of lockers, which users acquire use of as part of the monthly charge. In terms of the potential for a cycle hire facility at Junction 12, it is considered that a Brompton style hire2 would be most suitable, as this would allow users to hold the bike at their place of employment (regardless of facilities at the employer site) and return the bike at the end of the day.

3.2 Stakeholder Engagement

A business user survey was undertaken to gauge the potential uptake of a Park and Cycle site at J12. The survey utilised the business mailing list of Travel for Cambridgeshire, a sustainable travel membership association in Cambridge. The results of the survey indicated that the response to the concept is mixed, with more respondents overall saying they would not use the site. However, when the home/ work post-codes of the respondents are taken into account, the proportion of respondents within the potential ‘target catchment’ who stated they would use a facility was higher. The survey suggests that the design will need to be carefully developed, and complemented by improved cycle routes and appropriate facilities, potentially coupled with vehicular parking restrictions within employment locations. The results indicate that there is a high propensity to cycle within Cambridge and such a facility, potentially as part of a network of sites, could lead to an increase in the number of commuters parking at radial locations and cycling to the city centre.

A workshop was also convened to discuss the feasibility of a Park and Cycle site at J12 with key stakeholders attending including Parish Councillors (from Barton, Coton and Grantchester), specialist interest groups (including Cambridge Cycling Campaign and South Newnham Neighbourhood Forum) as well as representatives from Cambridgeshire County Council and South Cambridgeshire District Council.

Three key themes were discussed relating to the demand for Park & Cycle sites, facilities required at Park & Cycle sites and the potential locations in the Barton area. In terms of the concept of a Park and Cycle, it was felt that the site should be screened such that it is not visually obtrusive within the rural setting. It was felt this could be achieved through landscaping and planting. Furthermore, attendees did not believe showers, toilets, changing rooms, street lighting and maintenance were required and that asphalt surfacing should not be used to form the car park surface. In terms of location, with reference to the plan provided below, sites 3 and 5 were favoured above 1, 2 and 4 due to the proximity to the village and access to onward cycle links.

3.3 Potential Park and Cycle Users

The potential demand associated with a dedicated Park and Cycle site has been considered with reference to a combination of survey data, Census data and National Trip End Forecast Model growth rates. Cycle surveys

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2 Public rental scheme of a fold-up bicycle, stored in fixed lockers.
undertaken at Trumpington Park and Ride, and Madingley Park and Ride indicate that between 5-14% of users of the Park and Ride sites use it as a park and cycle facility.

In terms of the potential catchment area, Census 2011 data, with specific reference to travel to work data has been utilised. A desktop review of journey route options between census wards was undertaken to determine how many users may be passing through M11 J12, and survey data was used to determine how many may potentially use a car parking facility along the route. Using the cycle surveys from the existing Park and Ride sites it has been estimated that between 110-225 users could potentially use a Park and Cycle site at J12. This could potentially increase up to 150-300 users in the future when growth in housing, jobs and services is taken into consideration.

3.4 Park and Cycle Site Review

Five sites close to J12 have been identified as potential locations, it is considered that a site close to Junction 12 of the M11 would provide a suitable option to commuters who could park at Junction 12 and be within comfortable cycle distance from employment areas in central Cambridge. These locations are shown in Figure 1-1.

![Figure 1-1 Potential Park & Cycle Locations](image)

A comparative review of the sites was undertaken to determine their feasibility for use as a Park and Cycle site; this included a consideration of the engineering feasibility, environmental review and transport planning objectives. The review found that on balance, sites 1 and 5 are most suitable for further consideration. They provide an option west of the M11 (which provides potential benefit to J12 due to early interception of vehicles) and an option east of the M11 (which provides potential benefits to cyclists due to its closer proximity to the city and avoidance of crossing the M11).

3.5 Layouts and Access

Potential indicative layouts have been developed, with the size and facilities proposed being informed by the user surveys, community engagement activities, potential access considerations and site constraints detailed above. The construction cost of such a facility has been estimated at £1M, assuming the maximum number of spaces. Access options have been considered, with priority junctions being the preferred option at this stage due to the low vehicular flows into the site.

Consideration of the cycle links between the sites and Cambridge has indicated that improvements could be made to the existing cycle infrastructure to improve conditions for cyclists on Barton Road. These are principally centred on upgrading the existing shared use facility on the rural section of the route and providing a grade segregated footway and cycleway on the urban section of the route. This would also include providing priority for cyclists at side road crossings. The construction cost of such an upgrade is estimated at £4M, but should be assessed in conjunction with the aims of the Barton Greenways project.
3.6 Network Considerations

To consider the potential impact of a Park and Cycle site at J12, local junction modelling has been undertaken of the two roundabouts connecting to the J12 slip-roads. Modelling of existing conditions indicates that in general the junctions operate within capacity, though some unequal lane usage does result in an element of queuing on the A603 Barton Road approach.

The potential Park and Cycle access junction has been added to the junction model to provide an indication of whether the junctions would operate differently, with vehicles diverting to the Park and Cycle sites. General background growth has also been added to the network to provide an indication of its potential operation in 2031.

The modelling indicates that by 2031 it is expected that capacity constraints on the A603 Barton Road, M11 Northbound Off-Slip (both of which are on the western roundabout) and on Grantchester Road (eastern roundabout) will be exacerbated by the increase in general traffic.

The assessment indicated that the addition of a Park and Cycle facility has limited impact on the operation of Junction 12. With Site 1 in place, the analysis suggests that the existing queueing on the A603 in a north-easterly direction towards the M11 J12 will extend through the proposed site access junction, though overall queue length is reduced slightly towards Cambridge. The modelling also indicates that with a simple priority access junction there could be delays to vehicles on egress from the site in the PM peak, due to the heavy flow of traffic on the A603 Barton Road. If site 1 was considered suitable, further analysis could be undertaken to review the site access location.

As Site 5 is located between the M11 J12 and Cambridge, it is expected that the local traffic patterns will remain the same as existing. As such, there is minimal change in the expected queueing at the junction from the 2031 scenario without a Park and Cycle site. However, it should be noted that any capacity benefits resulting from this option would be expected on the approach to Cambridge, as fewer vehicles will be travelling towards the city centre; any benefits from the removal of vehicles from Barton Road into Cambridge will not have been accounted for within this modelling as it is outside of the modelled network.

The modelling undertaken to assess the impact of a Park and Cycle site indicates that the benefits to the local traffic network would be minimal, and would not result in a step change in road network conditions.

3.7 Environmental Mitigation

Consideration has been given as to how sensitive design could mitigate the potential landscape impacts associated with a Park and Ride site at J12, with an indicative layout provided below. It includes appropriate perimeter planting which could be a mix of native hedgerows in character with the wider rural landscape, to provide complete visual screening of the parking areas and built structures for any potential receptors in the area. The layout also includes amenity planting adjacent to access paths to improve environmental quality of linkages between parking areas and facilities, as well as provide water retention and sustainable drainage. A green roof could be provided on the facilities canopy to contribute further to the biodiversity of the site.
3.8 Planning Assessment

To fully justify a new Park and Cycle location at junction 12, a full sequential test of suitable sites not within the Green Belt would need to be undertaken. The preferred location(s) for this facility will require detailed planning and transport analysis, to include Green Belt, landscape, and visual work, to inform the most appropriate location.

3.9 J12 Park and Cycle Summary

The assessment of a potential Park and Cycle site suggests that a site at J12 could be provided, however the transport impact is unlikely to have a major benefit to the operation of the Junction 12 of the M11, particularly if the site east of the junction is taken forward. It is considered that there would be some benefits along Barton Road, as well as health benefits to the users of the Park and Cycle site. It may be beneficial to consider the site at J12 as part of a suite of Park and Cycle sites located at other key locations around Cambridge.
4. Park and Ride

4.1 Potential Demand

To consider the potential Park and Ride demand along the corridor, a spreadsheet-based model has been developed, informed by survey information and strategic model outputs. The model informed a report published by the GCP in September 2017\(^3\), which considered the change in Park and Ride usage resulting from general growth in trips around Cambridge (Scenario 1), along with the potential impact of parking restrictions at Cambridge Biomedical Campus (CBC) (Scenario 2).

The analysis indicated that for Scenario 2 an additional 600 to 700 spaces, on top of the existing 1,340, could be required at Trumpington Park and Ride to accommodate the additional demand by 2031. This did not account for larger strategic transport schemes such as the GCP City Access scheme, which could further influence the forecast demand for parking spaces at Trumpington Park and Ride. This report also considers Scenario 3, which reviews the potential impact on Park and Ride demand from a key GCP project, known as the City Access project which is a package of measures to tackle congestion within Cambridge.

The high-level approach has considered development growth in the area, potential change in parking behaviours at CBC and the potential impact of city centre demand management measures. The analysis indicates that by 2031 an additional 1,700 spaces could be required along the corridor to accommodate the additional demand. A summary of the demand considerations is provided in Table 1-3.

The profile of this demand increase has been used to inform modelling of the road network, to gain an understanding of how the network may operate with an expanded Park and Ride site.

<table>
<thead>
<tr>
<th></th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 (base)</td>
<td>1150</td>
<td>1150</td>
<td>1150</td>
</tr>
<tr>
<td>2022</td>
<td>1400</td>
<td>1600</td>
<td>2350</td>
</tr>
<tr>
<td>2027</td>
<td>1500</td>
<td>1850</td>
<td>2690</td>
</tr>
<tr>
<td>2031</td>
<td>1550</td>
<td>2000</td>
<td>3100</td>
</tr>
</tbody>
</table>

Table 1-3 Potential P&R Demand

It may be appropriate to allow an operational contingency with the intention of maintaining the current level of parking space occupancy (85%). Therefore, a further 15% increase on the number of spaces would lead to the additional space requirement for up to 2,000 spaces, depending on the scenario.

This methodology provides an indication of the potential impact of a city centre demand management measures on Park and Ride demand. It should be noted here that this demand forecast could be impacted by the development of other schemes such as the Cambourne to Cambridge Better Bus Journeys Scheme and the Babraham Park and Ride scheme. There is potential for abstraction of users from Trumpington to these sites; this should be considered as part of further work as these schemes become more developed. As part of developing the demand forecasts further, additional consideration should also be given to the high number of departures currently being recorded at the Trumpington Park and Ride site.

For modelling purposes, Scenario 3 2031 has been taken forward for assessment in the future year of 2031.

4.2 Expansion Options

A number of expansion options have been considered, which allows all demand to be accommodated within a single site. Consideration has also been given to the provision of a new site, on the basis that the full expansion of a single site is challenging from a deliverability point of view. A site located immediately north-west of J11 has been identified as a potential location, on the basis that it is situated close to the Strategic Road Network and approximately 3 miles from the city centre\(^4\).

\(^3\) https://www.greatercambridge.org.uk/transport/transport-projects/western-orbital/

\(^4\) Identified as the average distance for a Park and Ride site from the city centre in the Chartered Institute of Highways and Transportation Park and Ride Guidance Note.
4.2.1 Underground Expansion

This option would provide a significant increase in parking spaces but at a substantial cost. 1,600 additional spaces could be provided per level of underground. Therefore, due to the requirement of 2,000 additional spaces, two levels would be required. The proposal would require diversion of an existing local high pressure (LHP) gas main running East-West through the site as well as a high voltage (HV) power cable which runs North-South. Diversion of LHP gas main and HV power cables could be costly and could have significant programme implications.

Figure 1-3 Indicative Underground Layout

The existing car park surface would need to be excavated down to formation level before the ground level could be restored, resulting in a reduced parking capacity whilst construction is carried out. Depending on the phasing and whether the construction could easily be split into sections, some parking spaces could remain in use (but below the current demand), or the entire site would need to be temporarily closed. Temporary Park and Ride facilities at another location would therefore be required whilst the underground car park is constructed.

Risks to the design and construction process include unfavourable ground conditions, a high water table, confined site issues, construction noise/vibration, statutory undertaker’s plant and disruption to the operation of the park and ride during the construction process.

The underground option is the most expensive at £97M for a full basement option. This averages at £48,500 per parking space depending on the option selected.

4.2.2 Above Ground

The second proposal is for a bespoke structure over most of the existing Park and Ride site. A structure is not shown over the bus stops and building due to the increased headroom required for buses and the height of the current building. An indicative layout has been produced showing that around 1,800 additional spaces could be provided per above ground level. Due to the requirement for an additional 2,000 spaces, this would require two additional levels.
Figure 1-4 Indicative Above Ground Parking Layout

The upper levels would be accessed via ramps, with staircases provided for pedestrian access and egress. Lifts are not shown on the indicative design as there is adequate specialist parking available at ground level for any users not able to negotiate stairs. There is no increase required to the existing drainage capacity as water will be intercepted by the deck over the same area as the current ground level parking, therefore drainage could be provided within the structure and linked to the attenuation system proposed as part of the ground level parking currently under development.

In order to construct the above ground parking, sections of the site would need to be closed to allow for the installation of foundations. As with the underground option, depending on the phasing and whether the structure could easily be split into sections, some parking spaces could remain in use (but below the current demand), or the entire site would need to be temporarily closed. Temporary Park and Ride facilities would therefore be required whilst the multi storey car park is constructed.

Risks in the design and construction process include confined site issues during construction, unfavourable ground conditions, the potential loss of spaces for supports and foundations, statutory undertaker’s plant in the vicinity, disruption to the operation of the park and ride during the construction process and the visual impact of the site from adjacent properties and surrounding land.

This option is estimated to cost £50M assuming that diversion of the LHP gas main would not be required. For comparison this averages at £25,000 per parking space.

4.2.3 New Site

The exact layout of any new site would be determined during the design stage based on the site requirements and preferred access arrangements, taking in account the movement of people and vehicles through the site. A number of indicative layouts have produced to give an estimate of the potential footprint of a site for the required 2,000 spaces, which could be in the range of 8.8ha to 11.3ha in size, including areas for environmental mitigation and drainage attenuation.

If designing with possible future expansion in mind, it would be prudent to consider the operability of a large site above the 2,000 spaces currently specified. If additional rows of parking were to be added, walking distances to the bus stop, and hence total journey times, would increase. The walking distance may also be unachievable for some users. Therefore, a site with multiple stops may need to be considered to cut walking distances, as is the case for some airport parking sites. This may increase initial construction costs, but would limit the amount of reconfiguration if future expansion was required.

Risks to the design and construction process include unfavourable ground conditions, a high water table and approval for a new drainage outfall.

This option is estimated to cost £8M based on similar examples. For comparison this averages at £3,650 per parking space.
4.2.4 Bus Operations

Initial consideration has been given the principles of how the two sites could operate in conjunction with each other with regards to bus services for each of the demand scenarios.

The initial assessment is sensitive to the assumptions on direction of travel and further consideration of the split of users at the two sites and the number of users at the sites using bus travel for their onward journey, will be important in developing a strategy that ensures both sites are utilised efficiently.

Dependant upon the demand scenario it could be possible to allocate the sites according to destinations (e.g. one site for CBC and one site for the city centre), or split the destination demand across the two sites.

Initial analysis on the use of the two sites indicates that in Scenario 1 the smaller level of demand would likely be towards CBC. On the basis of slightly higher operating costs for bus services between Trumpington and Hauxton, it would be necessary to concentrate CBC demand at Trumpington and split city centre demand across the two sites.

The city could potentially be served by a higher frequency service to both sites (e.g. every 7 minutes); whilst this maximises frequency, the operation of two sites may cause confusion to passengers and lead to scenarios whereby a bus fills up at Hauxton and passengers are unable to board at Trumpington.

Alternatively, two slightly lower frequency services (e.g. every 10 minutes) could serve each site (whereby a bus from Hauxton does not stop at Trumpington). It would be important to match the frequency if using a single bus service to each site to avoid unbalanced usage whereby passengers favour the site with the higher frequency.

In terms of the split of users in Scenario 2, the analysis indicates that the uplift in users is derived from CBC demand, therefore the considerations for operation of city centre buses would be consistent with Scenario 1. However, the increase in CBC demand means that it could be possible to spread the CBC demand across the two sites, whereby a separate service could serve each site (e.g. every 12 minutes, on the basis that service frequencies are balanced). However, a review of CBC Travel Survey information indicates that the volume of CBC demand fluctuates between the peak hours and the rest of the day. It may therefore be appropriate to adjust the service through the day, for example:

- Peak: CBC > Trumpington and CBC > Hauxton - each every 10 – 12 minutes; or
- Peak: CBC > Trumpington > Hauxton – every 6 minutes; and
- Off-peak: CBC > Trumpington > Hauxton - every 12 – 15 minutes.

In separating the sites in Scenario 2, it will be important to keep in mind the considerations of customer confusion described for Scenario 1.

On the basis of the demand in Scenario 3, the potential demand increases to an extent whereby concentrating CBC demand on one would lead to minimal capacity for city centre demand and a constraint to providing a balanced bus service. It would therefore be necessary to split the city centre demand and the CBC demand across the two sites to allow for a balanced city centre service. In terms of operation, it would be possible to serve the sites in the same way as Scenario 2, however due to the increase in demand a slightly higher frequency of service for CBC and city centre could potentially be supported.

As the development of the scheme progresses it will be important to review the extent to which the level of forecast demand accounts for Kiss and Ride movements (and not just Park and Ride). Further assessment of bus operating strategies should be undertaken to better understand the level of Kiss and Ride trips at the site, the onward travel destinations of potential future users and the forecast level of Park and Ride/ Park and Cycle users.

As part of developing a detailed strategy, the challenges of splitting demand across two sites should be assessed in detail.
Whilst the two sites could positively:

- Provide maximum flexibility for the user;
- Provide the potential to economise by closing one site on quieter days (e.g. Sundays); and
- Provide maximum flexibility for the bus operator.

The challenges of operating the two sites could:

- Result in potential confusion for passengers over which site is which;
- Result in imbalance of demand caused by users favouring one site over another; and
- Result in a need to inform users clearly when a site is full, directing them to the alternative.

4.3 Access Arrangements

A number of access options are also considered, which could facilitate access to and from the Park and Ride site to the Strategic Road Network. As part of considering a new site, access options have been reviewed that would provide buses with priority across the M11 to avoid general traffic, as well as access for Park and Ride users to get into the new and existing Park and Ride site.
## Summary of P&R access arrangements from M11(N) and A10 to new site

<table>
<thead>
<tr>
<th>Proposal</th>
<th>Description</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Construction Cost Estimate</th>
</tr>
</thead>
</table>
| **1A** | Dedicated M11(N) access via tunnel under A10 | • Segregated Park and Ride access road separated from general traffic.  
• Improved journey times/reliability into the site due to segregated crossing under the A10.  
• Impact of potential increase in traffic at J11 heading to the Park and Ride site is reduced by diverting Park and Ride traffic away from the interchange. | • Higher cost than some other options due to need to construct a structure under the A10.  
• Greater area of land required than some other options to provide approach road aligned with the proposed underpass.  
• Impacts on existing underground services along the A10 corridor  
• Reduced parking provision by providing a separate entrance into the site for M11 northbound traffic.  
• Potential risk of high ground water level on the proposed road indicated by water filled ditches and lagoons in the local area | £3.6M |
| **1B** | Proposed dedicated left turn lane from the M11 northbound exit slip road to the A10 Cambridge Road. | • Dedicated left turn lane with deflection island to bypass the J11 traffic signals.  
• Minimal land take required with majority of the proposed arrangement being constructed within the existing highway verge.  
• Lower cost option than some other arrangements. | • Does not provide a direct priority access for Park and Ride traffic as traffic will be required to merge with A10 traffic to enter the site via an at-grade junction on the A10 to the west.  
• The proposed lane provides a dedicated left turn lane which could be used by all road users and not just Park and Ride traffic.  
• Potential for the lane to be affected by congestion at the J11 interchange.  
• Lower capacity than other options and may not be suitable for increased traffic resulting from future extensions to the proposed Park and Ride site. | £1.8M |
| **1C** | Proposed dedicated left turn lane from the M11 northbound exit slip road and dedicated priority lane adjacent to the A10 | • Dedicated Park and Ride access lane on the J11 northbound exit slip road leading to a dedicated Park and Ride access road alongside the A10.  
• Lower land take requirements than some arrangements, being constructed generally within the existing highway verge.  
• Constructed at-grade reducing the cost and risk associated with providing a structure. | • Does not provide a direct priority access for Park and Ride traffic as traffic will have to cross the A10 via an at-grade junction.  
• Potential for Park and Ride traffic to be delayed crossing at the A10 junction.  
• Lower capacity than direct access option, adding a fourth arm to the proposed A10 junction may lead to increased traffic delays. | £2.2M |
| **2A** | Proposed three-way signal controlled junction on the A10 Cambridge Road to access the proposed Park and Ride site | • Three-way signalised junction arrangement providing dedicated left and right turn lanes from the A10 into the proposed Park and Ride site.  
• Lower land take requirements than some other arrangements.  
• Extends the length of A10 eastbound dual carriageway approach to J11. | • Provides access for the A10 only with no provision for a direct link from the M11 northbound carriageway.  
• Close proximity to the existing partially signalised J11 interchange could lead to delays from traffic queues backing up from the J11 junction.  
• Single lane entry into the Park and Ride site with a merge between traffic from the A10 eastbound and westbound carriageways could lead to delays accessing the site during peak periods. | £200K |
| **2B** | Proposed four-way signal controlled junction on the A10 Cambridge Road to access the proposed Park and Ride site | • Four-way signalised junction arrangement providing dedicated left and two right turn lanes from the A10 into the proposed Park and Ride site.  
• Provides a junction arm connected to a dedicated access lane for traffic from the M11 northbound carriageway.  
• Extends the length of A10 eastbound dual carriageway approach to J11. | • Close proximity to the existing partially signalised J11 interchange could lead to delays form traffic queues backing up from the J11 junction.  
• Multiple carriageway lanes proposed on the A10 through the junction will require widening of the A10 corridor to accommodate the carriageway lanes  
• Four-way junction leading to longer signal phasing and potentially increased traffic delays | £200K |
| **2C** | Proposed four arm roundabout on the A10 Cambridge Road to access the proposed Park and Ride site | • Four-arm roundabout arrangement providing dedicated left and right turn lanes from the A10 into the proposed Park and Ride site.  
• Provides an arm connected to a dedicated access lane for traffic from the M11 northbound carriageway.  
• Does not provide a further signalised junction on the A10. | • Requires greater land area to construct than other A10 junction options.  
• Priority roundabout could lead to Park and Ride traffic blocking the A10 through traffic during peak periods.  
• Traffic flows through the junction will be slowed due to the roundabout arrangement. | £350K |

Table 1-4 Summary of P&R access arrangements from M11(N) and A10 to new site
<table>
<thead>
<tr>
<th>Proposal</th>
<th>Description</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Construction Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Priority bus lanes via a widened J11 Interchange carriageway and widened bridge structures</td>
<td>• Minimal land required, the majority of widening of the carriageway can be achieved within the existing highway land. • Provides the addition of a left turn lane on the A1309 approach to J11. • Bus priority signals provided on the J11 gyratory.</td>
<td>• Shared left turn lane and straight ahead bus lane on the A1309 with a give way arrangement onto the J11 gyratory may lead to delays to buses. • Widening works required over the M11 bridge structures requiring alterations over the bridge deck. • Bus priority signals on the J11 gyratory may cause delays to other road users. • Additional footway/cycleway bridge required adjacent to the northern J11 bridge to replace the existing footway/cycleway lost by the bus lane widening.</td>
<td>£4.7M</td>
</tr>
<tr>
<td>2A</td>
<td>Two-way segregated bus only road using the existing accommodation bridge over the M11 with the bus lane aligned adjacent to the M11 southbound carriageway.</td>
<td>• Segregated two-way bus lanes with no impact on the operation of the J11 interchange. • Utilises the existing accommodation bridge structure to cross the M11.</td>
<td>• Opposing nearside bus flow on the A1309 and M11 southbound could lead to dazzle from vehicle headlights and require anti-dazzle fencing. • Significant impact on Country Park and permissive rights of way that run through it. • Provision of a new bridge structure required over the M11 to maintain the bridleway route which currently utilises the accommodation bridge over the M11. • Signal control required over the accommodation bridge due to the narrow width of the structure to accommodate two-way bus flow.</td>
<td>£13M</td>
</tr>
<tr>
<td>2B</td>
<td>Two-way segregated bus only road using a new bridge over the M11 with the bus lane aligned adjacent to the M11 southbound carriageway.</td>
<td>• Segregated two-way bus lanes with no impact on the operation of the J11 interchange. • Utilises a proposed bridge structure over the M11 which will accommodate two-way bus flow, leaving the existing accommodation bridge unaffected by the bus lanes.</td>
<td>• The proposed structure for the bus lane crossing of the M11 will be more costly than Proposal 2A. • Opposing nearside bus flow on the A1309 and M11 southbound could lead to dazzle from vehicle headlights and require anti-dazzle fencing.</td>
<td>£19M</td>
</tr>
<tr>
<td>2C</td>
<td>Two-way segregated bus only road using the existing accommodation bridge over the M11 with the bus lane aligned across open land to the A1309 at the Addenbrooke’s Road junction.</td>
<td>• Segregated two-way bus lanes with no impact on the operation of the J11 interchange. • Utilises the existing accommodation bridge structure to cross the M11.</td>
<td>• Significant impact on Country Park and permissive rights of way that run through it. • Provision of a new bridge structure required over the M11 to maintain the bridleway route which currently utilises the accommodation bridge over the M11. • Signal control required over the accommodation bridge due to the narrow width of the structure to accommodate two-way bus flow. • Significant impact on Country Park aligning through the southern extent of the park.</td>
<td>£9.8M</td>
</tr>
<tr>
<td>3A</td>
<td>Provision of a segregated two-way bus lane located west of the A1309 Hauxton Road crossing through the J11 interchange with a proposed bridge crossing over the M11.</td>
<td>• Segregated two-way bus lane along the A1309 and through M11 J11. • Priority signalised crossings through the centre of J11 to link to the northbound entry slip road. • Utilises a new crossing of the M11 therefore does not affect existing J11 structures.</td>
<td>• Two crossings of the J11 gyratory carriageway in close proximity could have a negative impact on traffic flows around the interchange. • Opposing nearside bus flow on the A1309 could lead to dazzle from vehicle headlights and require anti-dazzle fencing. • Higher costs associated with providing a bespoke structure for the bus lane.</td>
<td>£14.2M</td>
</tr>
<tr>
<td>3B</td>
<td>Provision of a segregated two-way bus lane located west of the A1309 Hauxton Road, crossing through an enlarged J11 interchange utilising the existing southern bridge structure with a new bridge crossing over the M11 provided to the south for the gyratory.</td>
<td>• The existing junction gyratory increased in size to accommodate future capacity with a new southern bridge structure over the M11. • Segregated two-way bus lanes along the A1309 and through M11 J11 utilising the existing redundant J11 southern bridge structure over the M11. • Priority signalised crossings through the centre of J11 to link to the northbound entry slip road.</td>
<td>• Two crossings of the J11 gyratory carriageway in close proximity could have a negative impact on traffic flows around the interchange. • Opposing nearside bus flow on the A1309 could lead to dazzle from vehicle headlights and require anti-dazzle fencing. • Significantly higher costs associated with providing a new structure and enlarging the existing J11 interchange.</td>
<td>£17.8M</td>
</tr>
</tbody>
</table>
### Summary of P&R access arrangements from M11(S) to existing site

<table>
<thead>
<tr>
<th>Proposal</th>
<th>Description</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Construction Cost Estimate</th>
</tr>
</thead>
</table>
| 1A       | Proposed dedicated Park and Ride only slip road and segregated access road adjacent to the M11 southbound carriageway | • Segregated access road away from the existing M11 carriageway and junction.  
• Minimised land required by maintaining the road close to the existing M11 carriageway alignment.  
• Park and Ride lane priority provided at the J11 interchange.  
• Minimised impact on utilities and drainage within the verge of the M11 by providing an area of separation between the M11 and the access road in which to position signs etc. | • Dedicated Park and Ride exit slip road may cause confusion for road users and result in accidental use.  
• Access road is required to be located closer to the M11 southbound carriageway at the accommodation bridge to align under the bridge, impacting on signing.  
• Reconstruction of the accommodation bridge southbound verge abutment to enable vehicles to pass under the structure.  
• Access road merge with the Park and Ride site carriageway lane on the A1309 could result in conflict between road users.  
• Misuse by through traffic. | £5.1M |
| 1B       | Proposed dedicated Park and Ride only slip road and segregated access road adjacent to the M11 southbound carriageway avoiding the accommodation bridge | • Segregated Park and Ride access road away from the existing M11 carriageway.  
• Retains existing accommodation bridge by aligning away from the structure.  
• Park and Ride lane priority provided at the J11 interchange.  
• Minimised impact on utilities and drainage within the verge of the M11 by providing an area of separation between the M11 and the access road in which to position signs etc | • Dedicated Park and Ride exit slip road may cause confusion for road users and result in accidental use.  
• The access road will cut through environmental earthworks bund between the M11 and the Trumpington Meadows Country Park.  
• Significant impact on Country Park and permissive rights of way that run through it.  
• Access road merge with the Park and Ride site carriageway lane on the A1309 could result in conflict between road users.  
• Potential Misuse by through traffic. | £5.2M |
| 1C       | Proposed dedicated Park and Ride only slip road and segregated access road across open land to the A1309 at the Addenbrooke’s Road junction | • Segregated Park and Ride access road away from the existing M11 carriageway.  
• Access road aligns directly west to link with the A1309 at the existing Park and Ride site, avoiding the J11 and the accommodation bridge  
• Minimised impact on utilities and drainage within the verge of the M11. | • Park and Ride only exit slip road may cause confusion for road users and result in accidental use.  
• Access road cuts through environmental earthworks bund between the M11 and the Trumpington Meadows Country Park.  
• Greater impact of the Trumpington Meadows residential development with the access road along the southern edge of the site. | £4.5M |
| 1D       | Dedicated Park and Ride only slip road on the M11 J11 southbound exit slip road and segregated left turn lane | • Dedicated left turn Park and Ride access lane at J11 to provide priority through the junction to the Park and Ride site.  
• Reduced length of access lane provision therefore lower cost of provision.  
• Minimised impact on the local area and reduced land requirements compared with other options. | • Dedicated Park and Ride access lane on the J11 southbound slip could lead to confusion and potential misuse by other road users.  
• Short lane length could result in users having to queue on the slip road prior to the lane commencing during busy periods — significantly reducing the benefit of providing the dedicated lane.  
• Construction of the new dedicated lane will impact on existing carriageway drainage and signing along the exit slip road. | £1.1M |
| 1E       | Dedicated Park and Ride access lane the full length of the M11 J11 southbound exit slip road and segregated left turn lane | • Dedicated left turn Park and Ride access lane at J11 to provide priority through the junction to the Park and Ride site.  
• Lower cost of proposal with works only along exit slip road  
• Minimised impact on the local area and reduced land requirements compared with some other options.  
• Longer length of dedicated lane than provided with Proposal 1D reduces potential for delays due to queuing traffic on the slip road. | • Dedicated Park and Ride access lane on the J11 southbound slip could lead to confusion and potential misuse by other road users.  
• Position of the dedicated lane in the nearside verge of the slip road will impact on existing carriageway drainage and signing along the exit slip road. | £3.4M |
### Summary of P&R access arrangements from M11(N) and A10 to existing site

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>New diverge lane from M11(N), dedicated connector road with loop over new bridge</td>
<td>• Direct dedicated access to the park and ride site from the M11; • Realigned merge lane prevents the need for weaving section.</td>
<td>• This option only provides priority for M11(N) traffic, those travelling along the A10 would have to access the site via congested existing junction; • Significant earthworks and multiple new structures required; • Severance of land parcels, particularly to the NE of the existing junction; • Significant amount of additional land required; • High cost of construction and maintenance; • Park and ride only slip may be confusing and result in misuse from other road users.</td>
<td>£23.4M</td>
</tr>
<tr>
<td>2</td>
<td>New diverge lane from M11(N), dedicated connector road with hook over existing bridge</td>
<td>• Direct dedicated access to the park and ride site from the M11; • Realigned merge lane prevents the need for weaving section.</td>
<td>• This option only provides priority for M11(N) traffic, those travelling along the A10 would have to access the site via congested existing junction; • Significant earthworks required; • Severance of land parcels, particularly to the NW of the existing junction; • Significant amount of additional land required; • Park and ride only slip may be confusing and result in misuse from other road users.</td>
<td>£13M</td>
</tr>
<tr>
<td>3</td>
<td>Lane widening on M11(N) off-slip and gyratory east of M11</td>
<td>• Provides a dedicated park and ride lane from M11(N); • Increased stacking capacity for park and ride vehicles on the M11(N) off-slip; • Minimal acquisition of surrounding arable land; • Physical segregation of the P&amp;R lane on the A1309, preventing misuse; • Improvement of existing facilities, therefore low cost.</td>
<td>• P&amp;R traffic will have to negotiate existing traffic signal control; As there are only 2 inbound lanes on the gyratory west of the M11, a bottleneck is created between the 3 lanes on the off-slip and A1309; • No improvement to capacity on the A10 arm of the junction; • Disruption to general traffic on the local and strategic road network during construction.</td>
<td>£8M</td>
</tr>
<tr>
<td>4 &amp; 5</td>
<td>Dedicated arm on existing gyratory for park and ride access via new connector road over new bridge. Potential for segregated M11(N) link via tunnel under A10</td>
<td>• Direct dedicated access to the park and ride site from the M11(N); • Additional dedicated arm on the gyratory for the park and ride side; • New segregated route can be utilised by both M11(N) and A10 traffic.</td>
<td>• High cost due to new structures and large sections of new carriageway; • Significant amount of land acquisition required; • Additional crossing of NMU route on the new arm. • Severance of land parcels, particularly to the NE of the existing junction; • Significant earthworks and multiple new structures required; • Disruption during construction of the underpass.</td>
<td>£17.3M</td>
</tr>
<tr>
<td>6</td>
<td>Priority park and ride lane from the A10/M11(N). Widened structure to provide 3 inbound lanes on the gyratory</td>
<td>• Priority lane for P&amp;R on A10 and M11(N) approaches; • Widening of north overbridge provides a continuous lane from the A10 and M11(N) around the gyratory and into the park and ride site; • Widening of existing infrastructure only, therefore costs kept relatively low; • Minimal landtake required.</td>
<td>• Vehicles will have to negotiate the existing signal control at the junction; • Construction is likely to result in disruption to the local and strategic road network; • Widening of existing structure required.</td>
<td>£4M</td>
</tr>
<tr>
<td>7</td>
<td>Partial through-about of enlarged gyratory with realignment of the A10</td>
<td>• Park and ride traffic from M11(N) on a different traffic signal phase to CBC and City Centre, therefore signal times can be tailored to ensure good park and ride flow; • Dedicated P&amp;R lane provides some priority; • Enlarged gyratory provide additional stacking capacity for park and ride traffic; • No amendments required to existing structures.</td>
<td>• Construction phase likely to result in significant disruption; • P&amp;R traffic from M11 northbound will have to negotiate traffic signal control at M11 J11 placing additional demand on the existing junction; • Short distances between signals could result in lane blocking; • Realignment of the A10 will affect statutory undertakers; • Giving more green time to the park and ride lanes has an adverse effect on journey times for other destinations.</td>
<td>£5.1M</td>
</tr>
<tr>
<td>8</td>
<td>An enlarged and widened gyratory with dedicated P&amp;R lanes and a new north overbridge</td>
<td>• New route can be utilised by both M11 (N) and A10 traffic; • Increased capacity on the gyratory for park and ride traffic; • Priority park and ride lanes for direct access.</td>
<td>• Increased maintenance liability of existing structure is retained; • Additional crossing of NMU route would be required; • Significant disruption during construction; • High costs due to extensive realignment works and new structure; • Acquisition of surrounding land required; • P&amp;R traffic will have to negotiate traffic signal control; • Realignment of the A10 will affect statutory undertakers.</td>
<td>£16.2M</td>
</tr>
<tr>
<td>9</td>
<td>An enlarged and widened gyratory with dedicated P&amp;R lanes and new overbridges</td>
<td>• New route can be utilised by both M11 (N) and A10 traffic; • Increased capacity on the gyratory for park and ride traffic; • Priority park and ride lanes for direct access; • Provides increase outbound capacity at the junction.</td>
<td>• Increased maintenance liability of existing structure is retained; • Additional crossing of NMU route would be required; • Significant disruption during construction; • High costs due to extensive realignment works and 2 new structures; • Acquisition of surrounding land required; • P&amp;R traffic will have to negotiate traffic signal control; • Realignment of the A10 will affect statutory undertakers.</td>
<td>£25.9M</td>
</tr>
</tbody>
</table>
4.4 Network Considerations

In order to review the potential operation of the road network within the immediate vicinity of the Park and Ride site and the potential impact of the expansion access options, a traffic model has been developed using VISSIM micro-simulation software\(^5\). The base VISSIM model that was developed to test the Trumpington Park and Ride expansion (Scenario 2) has been utilised as a base model to test the potential operation of the network with a fully expanded Trumpington Park and Ride.

The initial stage modelling indicates that options could feasibly be provided that would facilitate the expansion of the Park and Ride capacity at Junction 11. An expansion of the existing Park and Ride site at Trumpington, without any infrastructure changes, would potentially result in an under-utilised Park and Ride site, as Park and Ride users are unable to access the site due to congestion on the network. However, the addition of dedicated Park and Ride access measures could facilitate access to the site in the AM peak.

Whilst access to the Park and Ride in the AM peak would be largely improved by these access measures, the PM peak would not benefit in the same way. It appears likely that in the PM peak, users would be unable to get out of the Trumpington site efficiently due to the level of demand from the single site.

To test the potential operation of two Park and Ride sites, a series of model tests have been undertaken, including:

<table>
<thead>
<tr>
<th>Model Test</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction of Hauxton P&amp;R with dedicated bus link through J11 to Trumpington P&amp;R.</td>
</tr>
<tr>
<td>2</td>
<td>As Model Test 1, with the introduction of a dedicated left lane along the M11 northbound off slip and joins with the A10.</td>
</tr>
<tr>
<td>3</td>
<td>As Model Test 2, with the dedicated lane running directly to the Hauxton P&amp;R junction, forming a new 4 arm junction.</td>
</tr>
<tr>
<td>4</td>
<td>As Model Test 3, but with a dedicated left lane along M11 southbound off slip for Trumpington P&amp;R.</td>
</tr>
</tbody>
</table>

Table 1-8 Modelling scenarios

The provision of two Park and Ride sites leads to the reassignment of traffic that results in fewer vehicles being able to pass through the network, and some additional delay on the A10. This however, should be considered within the context of a high number of users currently leaving the Park and Ride in the AM peak, an element of which have been transferred to the Hauxton site. These departures are shown to be egressing from Hauxton and joining the back of the queue into Cambridge across J11 M11. Further development of forecast traffic movements could show that this situation is unlikely to occur in reality, and the performance of the junction on the A10 could potentially be optimised further with J11.

The addition of the Park and Ride access measures, most notably the dedicated slip for M11 southbound Park and Ride users (model test 4), facilitates the use of the Park and Ride sites in the AM peak, with more vehicles able to pass into the area compared a single site expansion without any further infrastructure changes. The operation of two sites also appears to result in a better performing Park and Ride offering in the PM peak, as users leaving the Park and Ride sites are shared between the two sites.

The above observations should be considered in the context of the robust test which includes the bus link across the J11 of the M11. The bus access options also include solutions whereby a bus connection

\(^5\) A modelling software that analyses individual vehicle movements and interactions, alongside different methods of traffic control (Version 8.00-13)
would be provided without any interaction with the junction. This could result in minor changes to the operation of the junction, however due to the general network congestion the change is unlikely to be notable.

The modelling indicates that access to the two Park and Ride sites could be achieved with minimal impact on the network as a whole, as compared against a single site scenario with no infrastructure changes. Overall more vehicles are able to pass through the area with model test 4 compared to a single Park and Ride site without any further infrastructure changes. The initial stage modelling indicates that in order to facilitate access to the two Park and Ride sites, the bus infrastructure across the M11 facilitating bus priority, and the M11 southbound off-slip would provide the most benefit, though further analysis is required to optimise the new access with the A10.

It is recommended that the development of an option to provide a second site is explored further on the basis of the potential AM and PM operation, with further analysis on the potential demand and reassignment undertaken. It would be appropriate to consider additional data sources such as:

- ANPR data;
- Potential dedicated Kiss and Ride/ rat-run survey; and
- Potential strategic model run that includes GCP strategic projects, and a two site Park and Ride provision at J11.

4.5 Environmental Considerations

A high-level review of environmental constraints has been undertaken to identify potential constraints to the expansion of the existing Park and Ride site at Trumpington, and to the development of a new Park and Ride site at Hauxton, in relation to key environmental topics.

Whilst the review did identify some minor differences in constraints between the two sites, there have not been any identified that would preclude the expansion of the existing site, or the provision of a new site. As regards the requirement for Environmental Impact Assessment (EIA), the extension of the Trumpington Park and Ride site by up to 1000 spaces or the construction of an entirely new Park and Ride site would be considered a Schedule 2 development under the Town and Country Planning (Environmental Impact Assessment) Regulations 2017. As such, the proposed development will need to be screened by the relevant local planning authority (Cambridge City Council, South Cambridgeshire District Council) to determine whether significant effects on the environment are likely and whether an EIA is required.

As with the potential Park and Cycle site at J12, consideration has been given as to how sensitive design could mitigate the potential landscape impacts associated with a Park and Ride site at J11; an indicative layout provided below. The layout includes appropriate perimeter planting for screening, envisaged to be a mix of native hedgerows in character with Trumpington Meadows. There could also be an opportunity to improve green links with permitted rights of way in the area through the site. The layout also includes amenity planting adjacent to access paths to improve environmental quality of linkages between parking areas and facilities, as well as provide water retention and sustainable drainage. A green roof could be provided on the central building to contribute further to the biodiversity of the site.
4.6 Planning Assessment

In terms of the Park and Ride options, sequential preference should be given to increasing the capacity of Trumpington Park and Ride in the first instance, which is partly within and partly outside of the Green Belt. Even the area that is within the Green Belt, is defined as previously developed land and would sequentially be preferred to other Green Belt sites that are not on previously developed land. A separate Planning Appraisal has been prepared, which assesses the transport merits of expanding Trumpington Park and Ride at ground level. It is understood that a planning application for this expansion will be submitted in due course.

In the longer term, as part of the Western Orbital scheme, options being considered propose to increase the capacity of Trumpington Park and Ride by either delivering additional capacity underground or by decking. In Green Belt terms, either option would be preferable above provision for any new site within the Green Belt. However, a number of detailed planning matters would also need to be considered. In relation to the decking option, the visual impact and the impact upon neighbouring residential amenity would be key considerations in planning terms. Also ensuring that either option provides convenient parking, within close walking distance to the buses would also be a key consideration, along with matters related to drainage.

In the event that the increase in capacity of Trumpington Park and Ride is not large enough to accommodate the required number of parking and cycle spaces or is not feasible/deliverable in planning terms, it is considered that, based on the transport information provided to date, a strong planning case could be made for a new Park and Ride and Park and Cycle site within the Green Belt.

To fully justify a new Park and Ride at junction 11, a full sequential test of suitable sites not within the Green Belt would need to be undertaken. However, on the basis that approximately two thirds of demand for the Park and Ride is associated with traffic leaving the M11, it is unlikely that any suitable sites in close proximity to the M11 will be available that are not in the Green Belt (other than Trumpington Park...
and Ride). The preferred location(s) for this facility will require detailed planning and transport analysis, to include Green Belt, landscape, and visual work, to inform the most appropriate location.

4.7 Park and Ride Summary

The assessment of Park and Ride use at J11 indicates that there could be a need for additional capacity along the corridor. The assessment indicates that the provision of an expanded site at Trumpington could result in high costs due to the complexities of providing either decking or underground spaces, therefore it is recommended that the development of an option to provide a second site is explored further. In terms of network considerations, the analysis indicates that access options would be required to facilitate the provision of a new site at Hauxton, due to the extent of network congestion in 2031.

<table>
<thead>
<tr>
<th>Expansion</th>
<th>Existing Site</th>
<th>New Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>£50-97M.</td>
<td>£8M.</td>
</tr>
<tr>
<td>Access</td>
<td>Utilising existing Park and Ride access.</td>
<td>Access to new site provided directly off A10.</td>
</tr>
<tr>
<td>Operation</td>
<td>Expansion of an existing site would largely operate as existing. Consideration should be given to providing bus priority along Trumpington Road to facilitate more reliable bus services to the city centre.</td>
<td>Dedicated bus infrastructure would be required to connect the new site to connections east of the M11. A bus strategy would be developed to ensure balanced usage of the site. Consideration should be given to providing bus priority along Trumpington Road to facilitate more reliable bus services to the city centre.</td>
</tr>
<tr>
<td>Network</td>
<td>The network is likely to be severely congested in 2031; dedicated Park and Ride access options would facilitate usage of the Park and Ride site in the AM peak. Egress from the site in the PM peak is a potential constraint.</td>
<td>The network is likely to be severely congested in 2031; dedicated Park and Ride access to existing site required for users of Trumpington Park and Ride; access options required to optimise network operation.</td>
</tr>
<tr>
<td>Planning</td>
<td>Partially within greenbelt.</td>
<td>Wholly within greenbelt.</td>
</tr>
<tr>
<td>Environmental</td>
<td>Screening for full Environmental Assessment required.</td>
<td>Screening for full Environmental Assessment required.</td>
</tr>
</tbody>
</table>

Table 1-9 Park & Ride Summary

Further analysis of network conditions, including the operation of the Park and Ride site in relation to a high number of departures in the AM peak is required, which could utilise further data sources as part of the next phase of works. In addition, further development of the access options in terms of optimising the operation of the network is required, in conjunction with Highways England, to determine the most appropriate intervention.