

# Technical note

<b>Project:</b>	A428	<b>To:</b>	CCC
<b>Subject:</b>	A428 Alignment Assessment For Modelling	<b>From:</b>	Atkins
<b>Date:</b>	14 April 2016	<b>cc:</b>	

This note summarises the policy references to a bus link between Cambourne and Cambridge, in particular references to the route alignment, as part of the A428 Cambourne to Cambridge Bus Scheme. The note also summarises the work carried out to determine the preferred routes of the options being currently assessed.

## 1. Policy Review

### 1.1. The Transport Strategy for Cambridge and South Cambridgeshire

The TSCSC consists of a number of policy documents which contain an outline programme to 2031 and details the major schemes proposed to deliver the strategy in line with the Local Plans.

#### Action Plan and Scheme Details

Appendix H outlined the improvements to be made to the St Neots/Cambourne to Cambridge Corridor which includes high quality public transport links throughout the corridor, which consists of the following (Figure H.1):

- Bus Priority between the M11 and A428 (City Deal Scheme CD1c);
- Bus Priority around the A428/A1198 roundabout;
- Segregated bus links from the A428 at Caxton Gibbet through the West Cambourne Site (City Deal Scheme CD1b);
- Segregated bus link from Cambourne to Bourn Airfield (City Deal Scheme CD1a);
- Bus links between Highfields and the junction of the A428/A1303 (City Deal Scheme CD1a); and
- High quality segregated bus priority measures between the junction of the A428/A1303 and the M11 (City Deal Scheme CD1c).

The TSCSC outlines each component of the HQPT corridor in more detail. No further information is provided on the potential route between Cambourne and Bourn Airfield.

#### TSCSC Transport Strategy and High Level Programme

Policy 'TSCSC 21: Planning obligations for Bourn Airfield and West Cambourne' suggests that developers will be expected to make provision for mitigation of the site specific and network impacts of their proposal, and the following interventions are expected to be required to help mitigate and support the development at Bourn Airfield and West Cambourne:

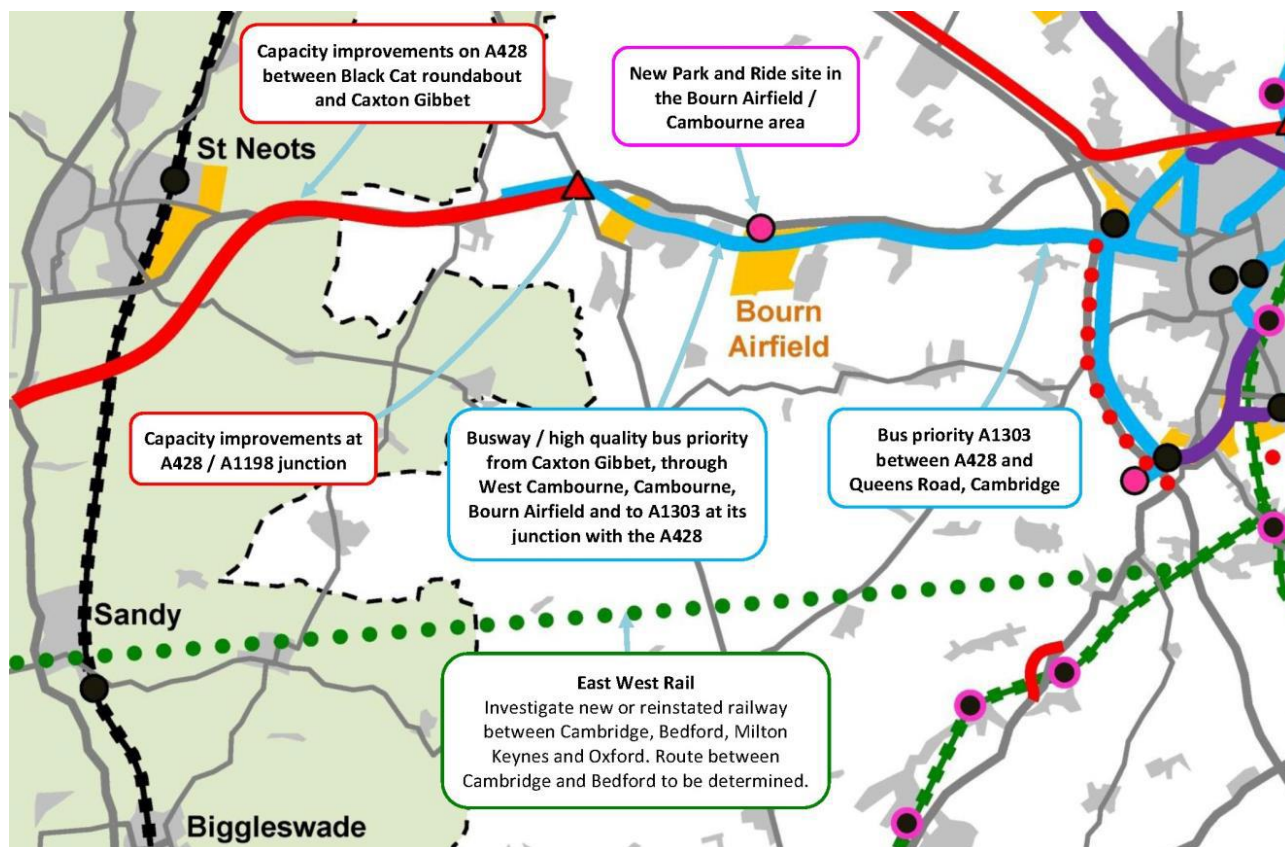
- Busway between West Cambourne site and the junction of the A1303 / A428

'In the vicinity of the new developments, the public transport corridor will split to allow a strategic link to continue as far as the Caxton Gibbet roundabout, with a loop diverting through the new developments and Cambourne itself, in a similar way to the proposals at Northstowe. Within the new developments, it is expected that buses will be segregated in some way to ensure that they have complete priority.'

'As the design of the developments progress, consideration should be given to the proximity of new homes to the bus route, with an aim of the majority being within 400m of a bus route.'

Figure 5.15 of this policy document shows the components of the HQPT corridor along the A428, which highlights an area to the north of Bourn Airfield for a potential P&R site. This suggests that any segregated bus lane between Cambourne and Bourn Airfield should be routed to fit in with any future P&R in the area.

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## 1.2. South Cambridgeshire Local Plan

‘Policy SS/6: New Village at Bourn Airfield’ of the South Cambridgeshire Local Plan highlights a segregated bus link from Cambourne to Bourn Airfield as part of improvements to Public Transport:

- “Significant improvements in Public Transport, including:
  - A segregated bus link from Cambourne to Bourn Airfield new village across Broadway, and on through the development to the junction of the St Neots road with Highfields road.”

‘Policy SS/8 Cambourne West’ of the South Cambridgeshire Local Plan describes a bus link to Cambourne from the Caxton Gibbet Roundabout:

- “Bus prioritisation measures, including a bus link from one of the roundabouts on the Caxton Bypass through the Cambourne West Site, linking through to Great Cambourne by the Cambourne Business Park.”

## 1.3. Other Planning Documents

Cambridge City Plan makes reference to a high quality bus route from Cambourne into the City. No routes are identified.

### SCDC Reserved Matters Application for the temporary access, appearance, landscaping, layout and scale of the greenway between Cells 2A and 2B, Upper Cambourne

Information has been provided by SCDC regarding the potential for a link from Sterling Way in Upper Cambourne to Broadway. A temporary cycle route and greenway was approved by SCSC in 2015 in association with Cambourne 950. The proposals make reference to ‘proposals to build a guided bus route through the greenway in the future’. The design on the footway and cycleway provision aims to ensure that the impact of clearance works for the busway are kept to a minimum.

Correspondence from SCDC, including a link to the planning application are included within Appendix A of this technical note. The alignment of this potential bus link has been taken into consideration when identifying a preferred route for the Cambourne to Cambridge link.

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## 2. Route Alignment

This section of the note identifies the proposed alignments of the HQPT routes in the A428 corridor, and documents the thought processes involved in reaching a preferred route for the purposes of informing the modelling. Further assessment and consultation regarding the exact alignment of the preferred option will be undertaken in early 2017.

Route options 1A, and 2A have not been considered as part of this assessment as their routes are constrained by the corridor, therefore alternatives are not feasible.

Plans showing the alignments of the routes discussed in this section are presented in Appendix B.

### 2.1. Route Option 1B

Route option 1B concerns the link between Madingley Mulch P&R, between the roundabout and Madingley Wood, and Madingley Road to the east of Cambridge Road. Initial route discussions highlighted Madingley Wood, a SSSI (Site of Special Scientific Interest), as a sensitive site that any route from the P&R site would be required to avoid. Also within the vicinity of the link is the American Cemetery. Therefore all route options from the P&R are required to run to the north of the wood and the American Cemetery, to the north of Cambridge Road. Three initial options were put forward, as outlined below, and shown on the plan in Appendix B.

#### Red

The red option runs north from the proposed P&R site, in line with the A428, and crosses Cambridge Road between the A428 bridge and Trinity Cottages. The route then turns to the east and runs parallel to Cambridge Road, north of Moor Barn Farm, to join Madingley Road. This option was designed to provide maximum distance between the route and Madingley Wood and the American Cemetery. It also maintains the link between Moor Barn Farm and Madingley Road but severs the fields to the north of Cambridge Road. This route is likely to incur high cost due to the engineering challenges of passing between the A428 bridge and Trinity Cottages. The small distance between the bridge and the cottages means modifications to the bridge abutments may be required if the buses were to follow this route. This is the longest route option of approximately 2770m.

#### Blue

The blue option runs north from the proposed P&R site along the footpath to Cambridge Road. The route crosses Cambridge Road and turns to the east, running parallel to Cambridge Road, to the south of Moor Barn Farm, to Madingley Road. This option was designed to provide a shorter alternative to the red route and to avoid disruption to Trinity Cottages and structural work closer to the A428. Changes in land levels and the proximity to the American Cemetery prevent the route running adjacent to Cambridge Road. This is the shortest route option of approximately 2450m.

#### Green

The green route option runs north from the proposed P&R site and crosses Cambridge Road to the west of the blue route, before turning east and joining the alignment of the red route, to the north of Moor Barn Farm, to Madingley Road. This option was designed to provide a greater distance between the route and Madingley Wood, as well as avoiding disruption to Trinity Cottages and structural work closer to the A428. It allows for the pedestrian footpath to the north to be accommodated via a small diversion rather than a separate crossing point. It also avoids the severance of Moor Barn Farm and Madingley Road but leads to more severance of the fields north of Cambridge Road. As land falls away from Cambridge Road, this route has the potential to be screened better to minimise landscape impact. This route is approximately 2540m.

#### Summary

Given the strengths and weaknesses of the route options outlined above, the **Green** route option is to be taken forward to the modelling. It is considered that this option provides minimal disruption to Trinity Cottages, Madingley Wood and the American Cemetery, without compromising on route length. It also maintains the connection between Moor Barn Farm and Madingley Road.

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## 2.2. Route Option 1C

Route option 1C concerns the link between Madingley Mulch P&R, between the roundabout and Madingley Wood, and Grange Road, via West Cambridge. Due to the length of this link, for the purpose of this assessment, it has been broken down into three sections.

### 2.2.1. From Madingley Mulch P&R to Cambridge Road (north of Coton)

#### Blue

This option begins in Madingley Mulch P&R and crosses Madingley Road to the south before bending to the east and running between the reservoirs and Coton Court to Cambridge Road, north of Coton. This option would run through the middle of five fields, potentially causing severance.

#### Green A

This option begins in Madingley Mulch P&R and crosses Madingley Road to the south before bending to the east and running north of the reservoirs to Cambridge Road, north of Coton. This route also runs through five fields, however is aligned further south, to run along the northern boundary of the reservoirs in order to avoid severance where possible. It has not been determined how close the route can run to the reservoirs at this stage, as no information on the structures and their foundations is readily available, however this route intends to run as close as possible.

#### Green B

This option begins at Madingley Mulch P&R and runs along Madingley Road for approximately 500m before diverting offline to the south of Madingley Road, towards the reservoirs, before bending to the east and joining the alignment of Green A to Cambridge Road. This route involves the bus services running on Madingley Road and therefore has the potential to be held up in congestion, especially during the peak hours. It is also required to make a right turn across Madingley Road, therefore holding up outbound traffic. This route would run through four fields.

#### Summary

Given the strengths and weaknesses of the route options outlined above, the **Green A** route option is to be taken forward for the purposes of modelling. It is considered this route option will meet the aims of the Cambourne to Cambridge Bus route by providing fast and reliable travel in its nature as an offline busway. Its alignment close to the reservoirs serves to minimise the severance of the fields south of Madingley Road.

### 2.2.2. From Cambridge Road, across the M11, into West Cambridge

#### Blue

This option from Cambridge Road runs in a straight alignment through Coton Orchard, across the M11 into West Cambridge to join Charles Babbage Road through the development. This option follows a cutting in the vicinity of the M11 and would therefore minimise the visibility and acoustic impact of the busway in this area. This route also has the potential of having the least expensive earthworks for the new structure. There is a level difference between the motorway and the embankments at the crossing point, and subject to ground investigation, this may minimise the extent to which abutments may need to be built up. The motorway at this location is slightly wider than further south, and therefore the bridge deck may need to span further, with a subsequent increase in cost.

The route would be limited to 20mph along the road from the M11 through West Cambridge. As the route is on-road through the development it would be subject to conflict from other modes, potentially slowing the services further..

#### Green

This option runs to the south of the blue option, through Coton Orchard to the north of the wood west of the M11. East of the M11 the option runs along an internal development road before heading south and joining the alignment of Coton footpath. The route would be limited to 20mph along the road from the M11 through West Cambridge. As the route is on-road through the development it would be subject to conflict from other modes, potentially slowing the services further. This route would run adjacent to a lake and watercourse within the development and is therefore considered unfeasible.

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## Red

This option runs through Coton Orchard to the south of options blue and green, closer to the residential properties in Coton. It crosses the M11 at Coton footpath and runs to the south of the West Cambridge Development. This option would be offline and therefore would be permitted to run at full speed along this link. Since the bus stop for this route, at West Cambridge, is located further south than for the Green route, walking distances to some of the employment areas may be longer. However, since the existing P&R at Madingley Road will remain open, these destinations could still be served by services from that hub. A catchment assessment, of areas accessible within 400m of the busway has indicated that 45,000sqm of the Cambridge West Development will be within the catchment of the busway.

## Summary

Given the strengths and weaknesses of the route options outlined above, the **Red** route option is to be taken forward for the purposes of modelling. It is considered that this option adheres to the aims of the Cambourne to Cambridge Bus link as it offers an offline busway that will not be constrained by the limits of the development and come into conflict with other road users, whilst maintaining access for users of the development. The route also provides the least severance to Coton Orchard and avoids the water course within West Cambridge.

## 2.2.3. From West Cambridge to Grange Road

### Blue

This option links from Charles Babbage Road, to the north of the University Sports Ground and pond onto Adams Road.

The junction of Wilberforce Road and Adams Road has reduced visibility where the proposed busway would join Adams Road. The radius at the junction of Adams Road and Grange Road at the corner of Trinity College old Field Sports Ground is approximately 2m and would need to be increased to 8m to allow buses to navigate this corner.

This route is considered to have the greatest catchment however the proximity to the pond and the constraints on Adams Road, in terms of parked cars, have the potential to make the route unfeasible. It is unlikely that the parking is by local residents as most properties have generous off road parking available therefore objections to necessary TROs would be unlikely.

### Green

This option runs to the south of the University sports fields, therefore avoiding the pond, and connects with Grange Road via Herschel Road. Parked vehicles on Herschel Road could have the potential to slow services along this route. It is unlikely that the parking is by local residents as most properties have generous off road parking available therefore objections to necessary TROs would be unlikely.

### Red

This route runs from the south of West Cambridge and the University playing field, and links with Grange Road to the north of the University Rugby Ground. This route would be offline, allowing for uncongested travel to Grange Road. Some level of disruption to the University sports ground could be expected due to the narrow nature of the existing access track.

## Summary

Table 1 below shows the approximate lengths of each route.

**Table 1. Option 1C Route Lengths**

Link	Length
Red	4767m
Green (A)	4656m
Green (B)	3535m
Blue	4630m

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Given the strengths and weaknesses of the route options outlined above, it has been agreed that the alignment of the **Red** route is to be continued from West Cambridge and is to be redirected to the north of the University playing field to join the green alignment along Hershel Road. This will allow for an offline busway to the south of West Cambridge whilst linking with a viable route to Grange Road with minimal disruption of University sports facilities.

## 2.3. Route Option 2B

Route option 2B concerns the link between Cambourne West and Bourn, via Cambourne. Due to the length of this link, for the purpose of this assessment, it has been broken down into two sections.

### 2.3.1. From Cambourne West into Cambourne

#### One – Via Sheepfold Way

This route option would link Cambourne West and Cambourne via Sheepfold Lane. Sheepfold Lane is the primary vehicle access to Cambourne Village College and adjacent Primary School. This would prove to be the longest route option with minimal potential to intercept trips along its route. The one way nature of Cambourne Road would lead to a convoluted bus route with a length of approximately 1420m eastbound and 1020m westbound to the junction of Broad Street / School Lane.

#### Two – Via Cambourne Business Park

This route option would link to Cambourne West via Cambourne Business Park. The width of the road is considered appropriate as it is able to accommodate HGVs requiring access to the business park currently. This option would link with the main Cambourne roundabout which links Greater and Upper Cambourne. Therefore services would have the option to be diverted to take account of the catchment in both villages. The length of this route from Cambourne West to the Broad Street / School Lane junction would be approximately 1100m.

A further housing development is proposed for the area south of the business park. No details on housing numbers are available at this time, but this route would offer the possibility of placing a bus stop which would serve the business park and the new development along this road.

#### Three – via Woodfield Lane

This route option is routed from Cambourne West via Woodfield Road, a residential route in Lower Cambourne. This route would limit the speed of the buses through the residential area, but would allow for greater patronage extent with 30,000 sqm of residential properties within 400m of the route. Further assessments of this route option have rendered it unfeasible due to the narrow nature of the cut through to Cambourne West between the residential properties on Codling Way and Woodfield Lane. The length of this route would be approximately 1120m to the junction between School Lane and Broad Street.

#### Other considerations

Further discussions looked at the feasibility of accessing Cambourne West via the parcel of land between Lower Cambourne and Cambourne Business Park. At present this space is occupied by Cambourne Nature Reserve which consists of Oaks Wood, Boundary Woods, a series of ponds and a network of footpaths, cycleways and bridleways. Information from the Wildlife Trust has suggests the presence of Great Crested Newts in the reserve.

#### Summary

Given the strengths and weaknesses of the route options outlined above, it has been decided that route **Two** should be taken forward for the purposes of modelling. This route provides a balance of patronage and the ability to provide a high quality public transport link from Cambourne West. It also provides the option for flexible bus services to encompass links to both Upper and Greater Cambourne depending on the preferred route from Option 2C.

### 2.3.2. From Cambourne to Highfields Caldecote

All routes on this link run from Broadway to the north of Highfields Caldecote via the same alignment.

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## One – from Jeavons Lane

This option consists of a busway from the junction of Jeavons Lane and Monkfield Lane, east, to meet Broadway north of the east west runway at Bourn Airfield. The existing route is a green corridor and footpath with housing fronting onto the footpath for parts of the route. It is believed that access to residential properties for residents would be able to be maintained in all cases however further clarification would need to determine this as the design progresses. The route is considered of ample width to accommodate a busway and footway. The length of this route would be approximately 3940m from the junction between School Lane and Broad Street to Highfields Caldecote. 20,000sqm of residential properties are accessible within 400m of the busway.

## Two – from School Lane

This is the longest route option for the link between Cambourne and Broadway as it circles Great Cambourne rather than running through it. The distance from the Broad Street / School Lane junction would be approximately 4800m. This would allow for faster journey times between Cambourne and Bourn. The route would leave Cambourne from a new junction on School Lane, in between Fenbridge and Crow Dean. The route would run to the east of Lake Ewart around Great Cambourne to the East of Whomping Willow Lake before heading north to join the alignment of route option One at Broadway.

The alignment of this route would sever links between Great Cambourne and Lower Cambourne whilst impacting on the landscape of Cambourne Nature Reserve. Information from the Wildlife Trust has suggests the presence of Great Crested Newts in the reserve.

The land levels along this route also change considerably throughout the nature reserve. A busway along this alignment would be visible from locations around Cambourne and therefore would have the potential to impact aesthetically and acoustically on the landscape.

The alignment of this route, although allowing for quicker and more reliable bus services extends further south than is necessary for a Cambourne to Cambridge link. Behavioural patterns and perceptions may discourage use of this route due to its diversion from the main Cambourne to Cambridge link. Alignment from the centre of Cambourne provides access to 12,500sqm of properties within 400m.

Other accesses to Cambourne, between Great Cambourne and Lower Cambourne were investigated in the emergence of this route option. Routes via Fenbridge and Langate Green were not feasible due to the narrow and convoluted nature of the roads.

## Three – south on Jeavons Lane

This route option consists of an on-road route along Monkfield Lane and Jeavons Lane, exiting Cambourne at its southern tip near Whomping Willow Lake. The route would run to the south of the lake and connect with the alignment for option Two outlined above. The alignment of this route, although maintaining the link between Great Cambourne and Lower Cambourne would still impact on Cambourne Nature Reserve and landscape around Whomping Willow Lake. Information from the Wildlife Trust has suggested the presence of Great Crested Newts in the reserve. The length of this route would be approximately 4780m and would have the potential to intercept a catchment of 30,000sqm within 400m of the route.

## Four - Sterling Way Bus Link

As outlined in Section 1.3 of this note, there is the potential for the installation of a bus link from Sterling Way in Upper Cambourne to Broadway. Therefore route option 4 incorporates this link as part of a route from Great Cambourne and Sterling Way. The route would be required to run along the road around the Sterling Way loop as residential properties front onto the green corridor through Upper Cambourne. A bus link would be provided from Sterling Way, north of Lysander Close, through to Broadway, just north of Little Common Farm. This would allow for a link across Bourn Airfield further north than the alignments proposed in options One, Two and Three.

This bus link option provides an option to run a service via Back Lane and via High Street, therefore allowing for a greater patronage extent with the potential to intercept 38,750sqm of properties within 400m of the route.

Correspondence with SCDC has highlighted the potential for the bus link to be secured through the proposals for Cambourne West as there is presently a contribution and requirement to deliver the bus link in the draft Heads of Terms for Cambourne West.

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## Summary

Given the strengths and weaknesses of the route options outlined above, it has been decided that route option **One** will be taken forward for the purposes of modelling. This is the fastest route, and its nature as a direct segregated route will lead to more reliable journey times. The route does not cause extensive severance between residential areas and also avoids impacts on the Cambourne Nature Reserve. Further work to determine the nature of the residential accesses along the bus link through the development will need to be carried out as the design progresses and to determine which side of the bus link the footway should be located.

Option **Four** should be considered as a real alternative to option One. Although the route identified above is convoluted and slow, it is the shortest of the routes identified for this link and takes account of existing planning applications.

## 2.4. Route Option 2C

Route option 2C concerns the link between Cambourne West and Bourn, via Cambourne. Due to the length of this link, for the purpose of this assessment, it has been broken down into two sections.

### 2.4.1. From Broadway to Highfields Caldecote

All options from Broadway are proposed to begin on the alignment where Option 2B ends, just north of the East – West runway. Three options have been developed for bypassing Highfields Caldecote.

#### One – North of Highfields Caldecote

This route option runs across the airfield to the north of the existing airfield buildings and across Highfields Road to the north of the village. As well as linking well with routes One, Two and Three for Option 2B this route would also link well with option Four, the bus link through Upper Cambourne. This link would be approximately 4460m and have the potential to intercept trips from approximately 149,500sqm, within 400m of the route.

#### Two – Through Highfields Caldecote

This route option runs across the airfield and crosses West Drive as it enters the village. The bus would be required to route down Bossert's Way before crossing Highfields Road onto Hall Drive. This route would prove to be the shortest (4040m) and has the greatest patronage potential but the speed would also be constrained through the village. The catchment of the route is approximately 107,000sqm within 400m of the route.

Further investigation into the feasibility of this route option has highlighted the narrow nature of Hall Road. Disruption to the adjacent residential properties would be required to route a bus via central Highfields Caldecote.

#### Three - South of Highfields Caldecote

This route runs from Broadway, south across Bourn Airfield to the southern tip of Highfields Caldecote. Initial study into this route highlighted the location of Hardwick Wood and Caldecote Meadows as SSSI sites; both of which are located to the south of the village. Therefore the route has the potential to run to the north of the Caldecote Meadows, along the residential boundary, to meet Hardwick Road. To the east of Hardwick Road the route runs to the north of Hardwick Wood. In order to avoid the SSSI sites to the south of the village the alignment of this route option runs through the eastern edge of a wildlife site.

The alignment of this route to the south of the village is considered to extend the route further south than is necessary given the route options to the north. The length of this route be approximately 4200m and has the potential to reach a catchment of 96,250sqm within 400m of the route.

#### Other Considerations

Two further options for encompassing Hardwick Caldecote in the route were discussed during initial route development.

- Entering the village from the south near Caldecote Meadows, running along Highfields Street to join the northern option to take the route east towards Cambridge; and
- Running the route through the 'less dense' housing area towards the south of the village.



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Despite the increased catchment area for potential trips, both of these options were discounted due to being too costly and obtrusive to the village, for very little benefit. Furthermore, both options would lead to reduced journey times due to the convoluted route through the village, which is outside the scope of the Cambourne to Cambridge busway.

## Summary

Given the strengths and weaknesses of the route options outlined above, it has been decided that route option **One** will be taken forward for the purposes of modelling. This route option is considered to be the most direct and fastest given its segregated nature. Aligning the route towards the north of the village will cause no impact on the SSSI and wildlife sites to the south.

## 2.4.2. From Highfields Caldecote to Madingley Mulch P&R

Two route options have been put forward to accommodate a bus link between Highfields Caldecote and Madingley Mulch P&R. Both routes are aligned to the south of Hardwick.

### One - North of Farm

This route option runs from Hardwick to the north of farm and across Madingley Road to the P&R site. Via this alignment, the route is able to cross Bin Brook at a perpendicular angle, therefore reducing the cost of infrastructure. The field to the north of the farm would be severed by the route. The length of this link would be approximately 3190m.

### Two - South of Farm

By aligning the route to the south of the farm, severance of the field is minimised. The route would be required to cross Bin Brook at an angle, which could prove more costly. The length of this link would be approximately 3480m.

## Summary

Given the strengths and weaknesses outlined above, route option **One** is to be taken forward for the purposes of modelling. It is considered that this route provides the most direct route to the P&R site and also minimised infrastructure costs when compared to the route to the south of the farm.

## 3. Summary and Conclusions

This technical note has outlined the policy guidance relating to a potential high quality public transport link from Cambourne to Cambridge. The note has documented the processes behind selecting an alignment to be modelled for each of the options.

In summary, the preferred route for Options 2B and 2C runs from Cambourne West via Cambourne Business Park and exits Cambourne via a link from Jeavons Lane to Broadway. The preferred route to bypass Highfields Caldecote is via the north of the village in order to avoid residential and environmental constraints to the south. For Option 2C, from Highfields Caldecote the preferred route will align to the south of Hardwick, and to the north of Jaggards Farm before accessing the Madingley Mulch P&R from the south. The preferred option for route 1B is to the east of Trinity Cottages and the north of Moor Barn Farm. The preferred option for route 1C involves leaving the P&R site to the south and running along the boundary of the reservoirs to Cambridge Road. The route would cross the M11 to the south of West Cambridge and run along the southern boundary of the development, accessing Grange Road via Hershel Road.

It is considered that the preferred route options are best suited to achieving the aims of the Cambourne to Cambridge Better Bus Journeys Study by having the ability to provide fast and reliable bus services between Cambourne and Cambridge. The routes chosen are considered to provide a balance between fast and direct access to the City and the potential to absorb trips from the settlements and business hubs adjacent to the route without compromising environmental sustainability.