1 Introduction

Mott MacDonald has been commissioned by Cambridgeshire County Council (CCC) on behalf of the Greater Cambridge Partnership (GCP) to provide consultancy support for the Cambridge South East Transport (CSET) scheme. This Technical Note considers the feasibility and cost implications of an alternative route for the CSET Phase 2 public transport route following the alignment of the former Haverhill – Cambridge railway through and approaching Shelford.

This option was considered during previous stages of the project and rejected due to constraints, including available space alongside the existing railway at Great Shelford. These matters have been reviewed and reassessed as part of this work.

This note provides a summary of the review to date. Although attempts to engage directly with Network Rail to discuss the implications of the section of the alternative route running within the existing railway corridor have to date been unsuccessful, expected requirements for clearances from the existing railway infrastructure have been identified by Mott MacDonald rail specialists and the impact of these considered. We will continue to pursue engagement with Network Rail and any further information obtained from this will be included within a revised note.

2 Route Description

All of the current shortlisted route options for a new offline public transport route between the A11 and the Cambridge Biomedical Campus follow the approximate alignment of the former Haverhill – Cambridge railway from a point west of High Street to a point north of Sawston, from which the shortlisted routes turn northwards to cross the River Granta and pass to the north of Stapleford and Great Shelford.

The alternative route (Figure 1) diverges from the alignment of the shortlisted route options to continue following the old railway line, crossing under the A1301 south of Stapleford and running to the south of the River Granta before crossing the river immediately to the south of Welch Crescent and reaching the former junction of the Haverhill branch line with the existing main line railway between Cambridge and London Liverpool Street. It follows the existing railway corridor through Great Shelford, passing to the east of Shelford Station and crossing Granham’s Road to the east of the existing level crossing.
3 Previous Assessment

In initial design work undertaken by WSP in 2018, a general ‘zone for implementation’ was identified for an offline route option, then referred to as Strategy 1. This considered following the dismantled railway to the south of Stapleford and through Shelford; however, it was concluded that “this is not viable for a road based public transport system given the lack of available space alongside the existing Cambridge-Liverpool St main line railway, particularly at Shelford Station that is located centrally within the village and surrounded by residential and commercial development that precludes taking a new route that by-passes the station and platforms that abut the railway”\(^1\).

Mott MacDonald has subsequently reviewed alignment options for each segment of the route between Cambridge Biomedical Campus and the A11, including variations of offline (Strategy 1) and online options alongside the A1307. Given that using the former railway alignment through Shelford had previously been considered unfeasible, this was not considered further at this stage.

\(^{1}\) WSP (2018) REF: 70012014-TN-010 Stratgey 1 Route Assessment Technical Note
3.1 Old Railway Corridor South of Stapleford

Figure 2 shows the existing road bridge over the old railway line where the A1301 crosses the old railway south of Stapleford. The width of the bridge arch appears to be approximately 8m. In principle this would be sufficient to accommodate a two-lane public transport route, but not a parallel shared use path.

The headroom at the sides of the arch may restrict the layout of any two-lane route. It may be possible to lower the carriageway to increase headroom, but the foundations of the abutments and drainage from a lowered carriageway would need to be considered. If these constraints cannot be overcome, the alternative would be a single lane through the centre of the arch.

The existing shared use path linking Stapleford and Sawston runs on an off-road alignment to the west of the A1301 at this point, crossing the old railway at-grade as illustrated in Figure 3. The retention of this route would avoid the need for a shared use path running under the bridge.
Figure 4 shows the embankment of the old railway line immediately to the west of the A1301 bridge. There are many mature trees on this section of the route, which would need to be removed or significantly cut to accommodate a public transport route. This part of the route is also within the floodplain of the River Granta and the river itself is a County Wildlife Site. The old railway route continues on the south side of the River Granta before turning northwards to cross the river directly to the south of Welch Crescent and reaching the existing railway corridor. A new bridge over the River Granta would be required for a public transport route on this alignment.

3.2 Existing Railway Corridor South of Shelford Station

Figure 5 shows the existing main line railway where it passes under the A1301 London Road in Great Shelford. The road bridge over the railway (Network Rail Structure no. 1543) has a footbridge on its north side. A public transport route would have to pass beneath this structure.

The bridge has a pier on the east side of the railway which appears to leave insufficient space to accommodate a two-lane public transport route between this pier and the eastern bridge abutment. Although it was not possible to get a clear view of the space available under the bridge from above, it is likely that this bridge would require significant reconstruction in order to accommodate a two-lane route running within the railway corridor. Figure 6 shows the view looking north from the A1301, with the area available for the new public transport route shown on the right-hand side. Figure 7 shows the existing pedestrian bridge over the A1301 which runs parallel with the road bridge.

Figure 6: View from A1301 towards Shelford Station

Figure 7: A1301 pedestrian bridge over existing railway

The tree corridor on the east side of the railway corridor would need to be removed or significantly cut to accommodate a public transport route.

Meeting requirements for clearances from the existing railway infrastructure is a key issue influencing the feasibility of accommodating a public transport route within this section of the railway corridor. Based on the precedent of the existing section of guided busway running adjacent to the railway corridor immediately to the south of Cambridge Station, it is expected that installation of a pre-cast concrete containment barrier between the railway and public transport route would be required by Network Rail to prevent vehicles encroaching on to the railway. A clearance of 4.5m would typically be required between the railway lines and any new structure.
There is also a requirement for electrical clearance from the Overhead Line Equipment (OLE). A clearance of 3.5m is required between the OLE and any position where people could stand. This would be measured from the return conductor, which is the wire that spans from mast to mast visible in Figure 6.

A topographical survey of the railway corridor including the positions of the OLE masts would be required to conclusively determine whether a two-lane public transport route designed to comply with all clearance and containment requirements could be practically constructed within this section of the railway corridor. However, measurement of the overall width of the railway corridor from Ordnance Survey mapping indicates that achieving a design that would be acceptable to Network Rail is likely to be extremely challenging.

3.3 Shelford Station

The alternative route would cross Station Road adjacent to the level crossing immediately to the south of Shelford Station. The existing crossing barrier and signals arrangement would need to be revised and the layout of the highway changed to address the risk of public transport vehicles crossing Station Road blocking traffic over the level crossing. The level crossing and junction traffic signals would need to be synchronised and it is likely that this would result in additional delays to traffic at this location.

Figure 8 illustrates a pinch point at Shelford Station. The space available between the part of the station building occupied by the Zara Indian Cuisine restaurant and the boundary wall of a residential property at 5 Hinton Way is estimated to be between 6m and 7m. This is insufficient to accommodate a two-lane public transport route. Such a route passing through this point would have a significant impact on both adjacent properties.

In order to avoid the eastern platform of Shelford Station, the alternative route would have to pass through the car park of the Mill Court business park. Figure 9 shows the space available between the station platform and the Mill Court office buildings. Any form of at grade public transport route through this area would result in the loss of the existing parking spaces adjacent to the station platform and may also restrict vehicle access to the parking area at the northern end of the site. A design solution that would involve public transport and other vehicles sharing the space between the Mill Court office buildings and the station platform would significantly limit the speed at which vehicles could operate through this area and raise a range of other safety issues.
3.4 Chaston Road

Figure 10: View from Mill Court to Chaston Road

Figure 11: View from Chaston Road to Mill Court

Source: Mott MacDonald

Figure 12: View looking north on Chaston Road

Figure 13: View looking south on Chaston Road

Source: Mott MacDonald

After passing through Mill Court, the alternative route would have to run through the Chaston Road residential area. It is not feasible to provide a segregated public transport route through this area and the use of existing roads would limit vehicle speed to 30 mph.

Chaston Road is a residential road approximately 5.5m in width, with a footway on the east side only. There is planting on the west side of the road, acting as a noise barrier between the houses on the east side of the road and the railway. As shown in Figure 12, there are pinch points at two locations on Chaston Road where the footway is bordered by the walled back gardens of 3 Grain Close and 72 Chaston Road. Vehicles parked on-street on this section of Chaston Road were observed during a site visit.
Chaston Road does not meet design guidelines for essential engineering requirements for roads acting as bus routes. The document Bus Services & New Residential Developments: General Highways and Urban Design advice to applicants and Highways Authorities (Stagecoach UK Bus, 2017) states:

“A clear carriageway width of at least 6.2m must be consistently available, with any on-street parking provided off carriageway in parallel dedicated bays.”

“Ideally bus routes should be designed with a standard minimum clear width of 6.5m.”

“Localised widening should be assumed on bends, in line with results of a realistic tracking exercise.”

Figure 10 shows the northern boundary of the Mill Court car park. Chaston Road is immediately beyond this boundary, passing to the left of the property at 3 Grain Close visible on the right of the picture. It would not be feasible to provide a segregated public transport route running between this section of Chaston Road (Figures 11 and 12) and the railway.

As shown in Figure 13, to the north of 45 Chaston Road there is a wide grass verge on the west side of the road, broken up by two groups of parking bays and a turning area at the end of the cul-de-sac adjacent to 9 Chaston Road. There is a further pinch point between the boundary wall of 9 Chaston Road and the railway.

The “10,000th mile” cycle path linking Cambridge Biomedical Campus with Great Shelford, part of the National Cycle Network, connects to the northern cul-de-sac end of Chaston Road, with the cycle route continuing on-road through Great Shelford via Chaston Road, Hinton Way and Mingle Lane. Figure 14 shows the southern end of the cycle path where it meets Chaston Road. 9 Chaston Road is on the left and the boundary with the railway on the right.

### 3.5 Granham’s Road Crossing

Figure 15 shows the cycle path approaching Granham’s Road from the south. There is a pinch point at this location between the boundary of a residential property on the south side of Granham’s Road, marked by the trees visible in the photo, and the railway.

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2 This guidance is equally applicable to roads acting as routes for other types of public transport vehicle with similar dimensions and tracking characteristics
As at the Station Road level crossing, the existing crossing barrier and signals arrangement would need to be revised to accommodate a public transport route adjacent to the level crossing. The level crossing and junction traffic signals would need to be synchronised and it is likely that this would result in additional delays to traffic at this location.

As shown in Figures 16 and 17, there is a building adjacent to the railway on the north side of Granham’s Road. Signage indicates that this is the property of Anglian Water and subsequent investigation has established the building is a pumping station, with underground infrastructure on and connecting to this site. It is unlikely that Anglian Water would willingly agree to the relocation of the pumping station. The cost implications of any attempted relocation cannot be quantified at this time but are expected to be significant and extensive.

After crossing Granham’s Road, the cycle path deviates to the east to avoid the Anglian Water site. A public transport route avoiding the Anglian Water site would have to run on-road on Granham’s Road and the existing traffic queue on the approach to the level crossing would have to be relocated northwards to avoid delays to services using this route.

3.6 Granham’s Road to Nine Wells

The cycle path continues northwards on the east side of the railway to Nine Wells. At a point approximately 300m north of Granham’s Road there is a footbridge adjacent to a farm access crossing of the railway line. This would need to be incorporated into the design of the public transport route. There are no other significant physical constraints to the provision of a public transport route alongside this section of the cycle path.

4 Environmental Constraints

A desktop assessment of environmental constraints has been undertaken and these are summarised on the plan provided in Appendix A. The alternative route runs within the floodplain of the River Granta for a greater distance than the shortlisted route alignments, potentially requiring greater flood storage compensation. The alternative route would require greater removal of mature vegetation and hedge rows in comparison to the
shortlisted route alignments, which would typically result in the loss of arable farmland. The alternative route is therefore likely to have greater impacts on habitat and biodiversity.

The impact of the route on existing residents and businesses would be greater given the proximity to a number of properties, which is not the case with the shortlisted alignments, and the requirement to run on-road through the Chaston Road residential area. The route would also run adjacent to the Great Shelford conservation area and a number of Grade II listed buildings on Granham’s Road. It therefore has the potential to impact on the setting of these; however, the majority of the route alongside the conservation area would be within the existing rail corridor.

## 5 Interface with Main Line Railway

Any proposal for a public transport route alongside the main line railway would be subject to engagement and agreement with Network Rail. It is expected that Network Rail requirements would include alterations to structures and OLE, as well as requirements for a containment structure to prevent vehicles using the new public transport route from encroaching on to the railway. There is a precedent for this containment treatment where the existing guided busway runs alongside the main line railway to the south of Cambridge Station.

In addition to the direct construction costs, it is expected that construction work within the main line railway corridor will require possessions of the railway infrastructure. Possession working will involve management costs and may require isolation of the OLE. Where possessions require rail services to be cancelled or redirected, this will generate compensation payments to the affected train operators.

It should also be noted that potential options for the proposed East-West rail route include a connection to the existing rail network south of Cambridge. This and proposals for Cambridge South Station would also result in four-tracking of the railway between Cambridge Station and Shepreth junction. Initial work undertaken by Mott MacDonald has suggested that four-tracking of the main line could be accommodated alongside the proposed public transport route. This work is most likely to affect the area to the north of Granham’s Road and, as such, it is not considered that there would be an additional impact on the feasibility of the new public transport route running via the former Haverhill railway.

## 6 Cost Comparison

Engineering solutions to the pinch point at Great Shelford such as tunnelling under or decking over of the railway would have substantial costs in relation to the overall scheme and would significantly outweigh the benefits. Therefore, these options are not deemed to be feasible on cost grounds, even if the technical complexities could be overcome.

Were a parallel route to be possible alongside the railway, it is still expected that there would be significant costs not incurred by other route options. These are likely to include:

- Acquisition of railway land;
- Direct and indirect costs for possessions of the railway infrastructure;
- Acquisition of commercial property, including part of Mill Court business park; \(^3\)
- Alterations to railway infrastructure, including overhead electrification;

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\(^3\) The Mill Court business park was sold for £9.85 million in December 2017 (source: Buccleuch Property)
• Additional bridge works which will either require significant alterations to existing structures or potentially their replacement;
• Construction of a containment structure alongside the main line railway;
• Relocation of the Anglian Water pumping station at Granham’s Road; and
• Additional environmental mitigation costs.

In total, additional costs for the alternative route are expected to be in excess of £15 million.

7 Benefits Comparison

Table 1 summarises the advantages and disadvantages of an alternative route along the former railway line and existing railway corridor through the centre of Great Shelford, compared to the shortlisted options, all of which route to the east of the village. Route length is expected to be similar for both alignments. However, journey times for the alternative route are expected to be longer as a result of operation at lower speed on the section of route adjacent to Shelford station and the on-road route through the Chaston Road residential area, plus the potential for the synchronisation of level crossing and junction traffic signals to generate delays to public transport vehicles at the Station Road and Granham’s Road junctions.

Table 1: Advantages and disadvantages of former railway alignment compared to shortlisted options

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>• Improved public transport frequency and accessibility for the centre of Great Shelford</td>
<td>• Provides less of a public transport alternative to the existing rail service and serves the same catchment</td>
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<tr>
<td>• A stop in the centre of Great Shelford would serve a greater potential catchment</td>
<td>• Longer journey time due to lower operating speed through Great Shelford and greater potential for delay at junctions adjacent to level crossings</td>
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<tr>
<td>• Reduced impact on the greenbelt</td>
<td>• Greater impact on business, including loss of parking at Mill Court</td>
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<td></td>
<td>• Impact on existing rail infrastructure, including need for mitigation such as vehicle containment barriers</td>
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<tr>
<td></td>
<td>• Impact on operation of traffic control at level crossings</td>
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<tr>
<td></td>
<td>• Greater impact on the floodplain of the River Granta</td>
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<tr>
<td></td>
<td>• Greater impact on mature trees</td>
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<tr>
<td></td>
<td>• Greater impact on residential properties, including proximity to dwellings on Chaston Road</td>
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<tr>
<td></td>
<td>• Not feasible to provide a segregated public transport route at Chaston Road</td>
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<td></td>
<td>• Chaston Road does not meet design guidelines for a public transport route</td>
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<tr>
<td></td>
<td>• Provision of a Non-Motorised User route is likely to be of lower quality at route pinch points and conflict with Greenway proposals in the vicinity of Shelford Station</td>
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<td></td>
<td>• Impact on Anglian Water pumping station at Granham’s Road</td>
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<td></td>
<td>• Potential impact on the setting of Grade II listed buildings at Granham’s Road</td>
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8 Conclusions

This note has reviewed the feasibility of an alignment via the former railway line from the point north of Sawston where the shortlisted route options and former railway diverge. An alignment via the former railway would take the proposed public transport route into the centre of Great Shelford.
In principle, this alternative alignment would have some advantages including improved public transport frequency and accessibility for residents of the village as well as a greater potential catchment area for the service. It would also reduce the impact on the greenbelt to the east of the village. However, when the route is investigated further it can be seen that there are several barriers to its implementation including constraints within the main line railway corridor, the proximity to residential and business premises and expected significant additional costs.

For these reasons, the conclusion of this assessment is that a route alignment via the former railway would not provide a feasible alternative to the shortlisted options, supporting previous work undertaken.
Appendices

A. Environmental Constraints Map