M5 Junction 10 Improvements Scheme

West Cheltenham Link Road Route Corridor Assessment (February 2021)

TR010063 - APP 9.52

Rule 8 (1) (b)

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Infrastructure Planning (Examination Procedure) Rules 2010

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M5 Junction 10 Improvement Scheme

Development Consent Order 202[x]

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The traffic modelling presented in this document is based on that available at the time it was produced (February 2021) and reflects the status of the Scheme development at that point. Therefore, the traffic data presented will not necessarily be consistent with the latest traffic modelling reported in the Transport Assessment and associated documents submitted in support of the DCO application.

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M5 Junction 10 Improvement

West Cheltenham Link Road

Route Assessment Report

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This document has 74 pages including the cover.

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1. Introduction

1.1. Scheme Background

1.1.1. New housing and employment sites are proposed for development to the west of Cheltenham. To unlock these housing and job opportunities, Gloucestershire County Council (GCC) needs to ensure that there is sufficient highway capacity to accommodate the increased motorised traffic and non-motorised users it will generate.

1.1.2. An all movements junction has been identified as a key infrastructure requirement to enable the housing and economic development proposed by the Gloucestershire Local Enterprise Partnership's (GFirst LEP) Strategic Economic Plan and is central to the transport network sought by the council in the adopted Gloucestershire Local Transport Plan. The planned housing and economic growth have been included by Cheltenham Borough, Tewkesbury Borough and Gloucester City Councils in the adopted Joint Core Strategy (JCS).

1.1.3. Highways England also identified that improvements to M5 Junction 10 are a critical requirement to maintain the safe and efficient operation of the M5 corridor in their Birmingham to Exeter Route Strategy, whilst enabling the planned development and economic growth around Cheltenham, Gloucester and Tewkesbury.

1.1.4. A bid was submitted in March 2019 to Homes England to the Housing Infrastructure Fund (HIF), wherein an investment case was made for the following infrastructure improvements, which together make up the M5 Junction 10 Improvements Scheme:

- Scheme element 1: Improvements to Junction 10 on the M5 and a new road east of Junction 10 linking the A4019 to west Cheltenham;
- Scheme element 2: A38/A4019 Junction Improvements at Coombe Hill; and
- Scheme element 3: A4019 widening, east of Junction 10.

1.1.5. Figure 1-1 displays the location of each of the scheme elements, as well as the locations of relevant planned development sites under the JCS.

Figure 1-1 – Location of the M5 Junction 10 Improvements scheme elements and safeguarded land at West and North West Cheltenham

1.1.6. Funding was successfully awarded by Homes England in March 2020.

1.1.7. An upgrade to Arle Court Park and Ride (now known as Arle Court Transport Hub) was also included as part of the package of improvements funded by Homes England. Gloucestershire County Council has decided to take this forward separately in order to accelerate the programme for this element of the scheme.

1.2. Purpose of the report

1.2.1. This West Cheltenham Link Road Route Assessment Report describes the operations and environment assessment carried out to identify the most appropriate route for the West Cheltenham Link Road and standard of road required. The West Cheltenham Link Road forms part of scheme element 1.

2. Traffic Forecast

2.1. Introduction

2.1.1. M5J10 HIF bid included a potential but not the final option for the West Cheltenham development site access arrangement, with assumption that the site could be accessed from the north as well as south without any through link for local traffic. Earlier work carried by GCC and the developers also looked at other potential options of either loading all the traffic on the north access or providing a through link via the development for the local traffic.

2.1.2. Thus, to futureproof the scheme, it was essential to understand the impact of other potential options, which were assessed and reported in the document 'West Cheltenham Sensitivity – Stage 3[1]. Key findings from this technical note are presented below to establish the case for the new West Cheltenham Link Road and choosing the most appropriate level of traffic to inform the design and route selection.

2.2. Model Scenarios

2.2.1. This section explains the various potential scenarios modelled to connect the Golden Valley Development to the local areas and its impact on the new West Cheltenham Link Road.

Core Scenario R

2.2.2. This option refers to the preferred M5J10 layout option 2 from Stage 3 traffic forecasts. In this option trips from the West Cheltenham development zones (90101, 94002, 91102 and 95002) were connected to the wider network from the north as well as the south but with no through link, as shown in Figure 2.1. This is the core options that's been carried forward to future stages.

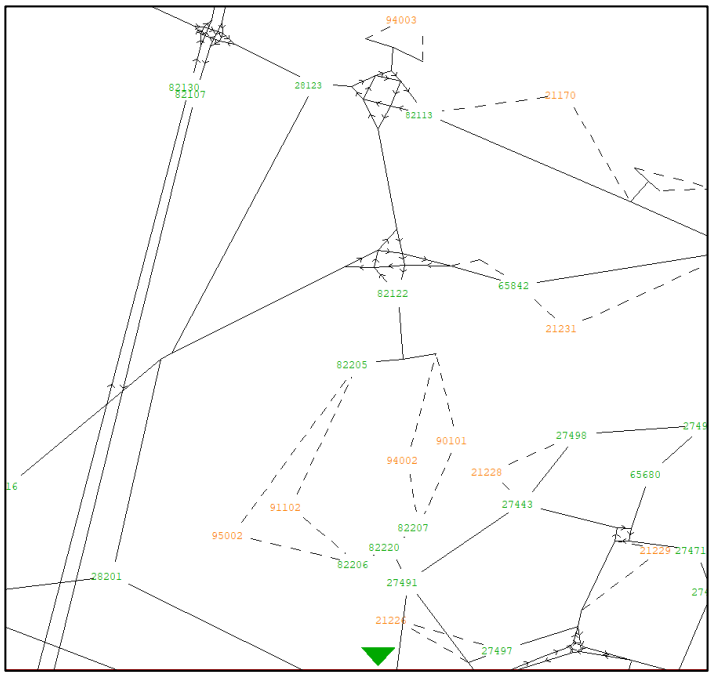

Figure 2.1 – West Cheltenham development zones connection in Option 2

[1] doc ref. GCCM5J10-ATK-HTA-ZZ-TN-TR-000004

Sensitivity Test 1:

2.2.3. In this test, West Cheltenham development zones were connected only to the north i.e. to B4634 Old Gloucester Road via a new roundabout as shown in Figure 2.2.

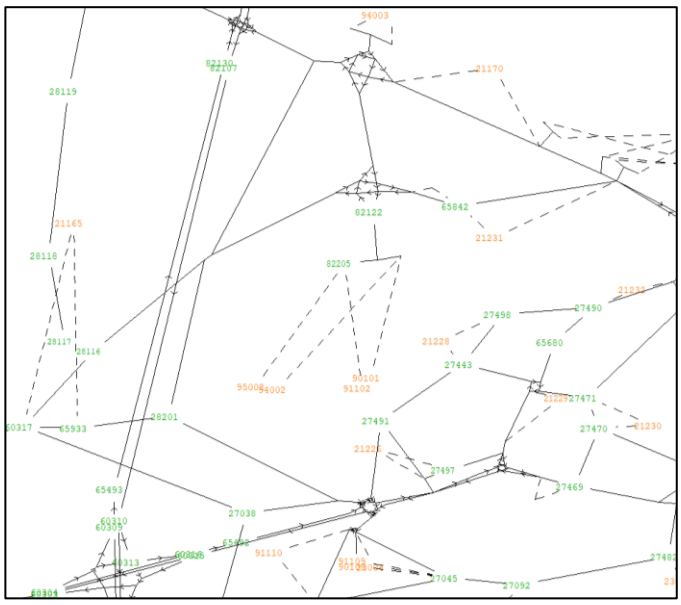

Figure 2.2 – West Cheltenham development zones connection in Sensitivity Test 1

Sensitivity Test 2:

2.2.4. In this test traffic from West Cheltenham development zones was loaded to the wider network via a new through link road within West Cheltenham site, joining a new roundabout at B4634 Old Gloucester Rd in the north and Fiddler's Green Ln/Telstar Way Junction in the south as show in Figure 2.3. The new through link was coded having two lanes in each direction with a free flow speed of 30 mph (48 kph) and with one lane mid-link capacity.

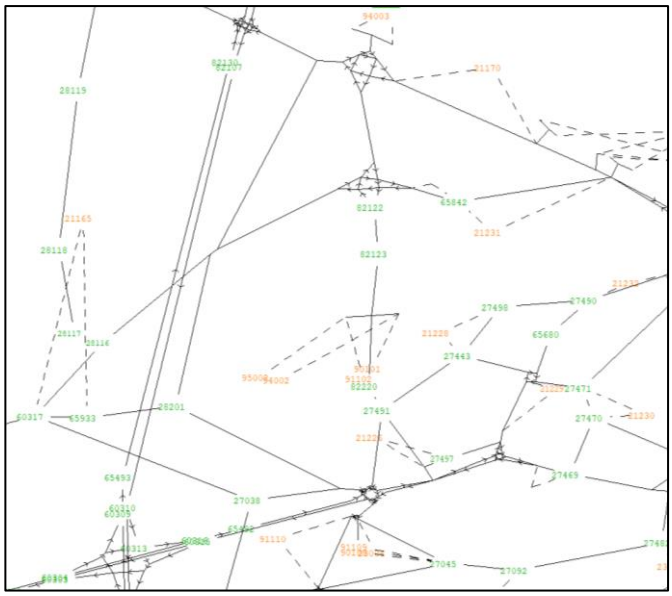

Figure 2.3 – West Cheltenham development zones connection in Sensitivity Test 2

2.3. Sensitivity Test Results

2.3.1. Traffic flows on the West Cheltenham Link Road for three potential scenarios are presented in Table 2.1. Sensitivity Test 1 which provides only a single access to the West Cheltenham site from the north, presents the worst case in terms of traffic flows. Detailed results for each of these tests are presented below along with comparison with the Core scenario.

Table 2.1 – A4019/B4634 Link Rd Flows in PCU's (Worst Peak Hours)

Direction	Core Model Flows (in PCUs)		Sensitivity Test 1 Model Flows (in PCUs)		Sensitivity Test 2 Model Flows (in PCUs)	
	AM	PM	AM	PM	AM	PM
NB	254	347	384	568	396	551
SB	271	194	669	359	491	391

Sensitivity Test 1

2.3.2. This section summarises the traffic impact of loading the WC development sites only through north and comparing it with the stage 3 Core scenario R. The assessment has been carried out with respect to actual flow difference and delay differences in the local area.

2.3.3. Broadly it can be seen that there are three alternate routes between WC development sites and Gloucester, i.e. using A4019, A40 and B4634 Old Gloucester Road. Routings between them affect the network performance within the local area, including J11 to some extent.

2.3.4. Worst peak hour flows in and around WC development sites for AM are shown below in Figure 2.4.

2.3.5. From the flow difference plots between sensitivity test 1 and Core, as presented in Figure 2.5 for AM, it is observed that:

- As expected, when WC development connects via north connection, there is more traffic on Hayden Lane both directions which is a parallel route to M5. In the northbound (NB) direction flow increases by 220 PCUs and in the southbound (SB) direction, it increases by 210 PCUs compared to that of Core flows.
- More traffic is pushed on the M5 motorway between J10 and J11. In the northbound (NB) direction flow increases by 140 PCUs and in the southbound (SB) direction, it increases by 70 PCUs.
- Most of the rerouted traffic uses B4634 Old Gloucester Road to reach the development zones instead of using A40 and southern approach as was the case in Core. An increase of about 450 PCUs can be seen at B4634 Old Gloucester Road eastbound, whereas on southern approach or the Fiddler's Green Lane, a similar reduction can be noted.
- There is an increase in the flow by about 270 PCUs on the westbound B4634 Old Gloucester Road. Trips initially using southern access in core are now using the Hayden Lane to reach A40 from the WC Development sites

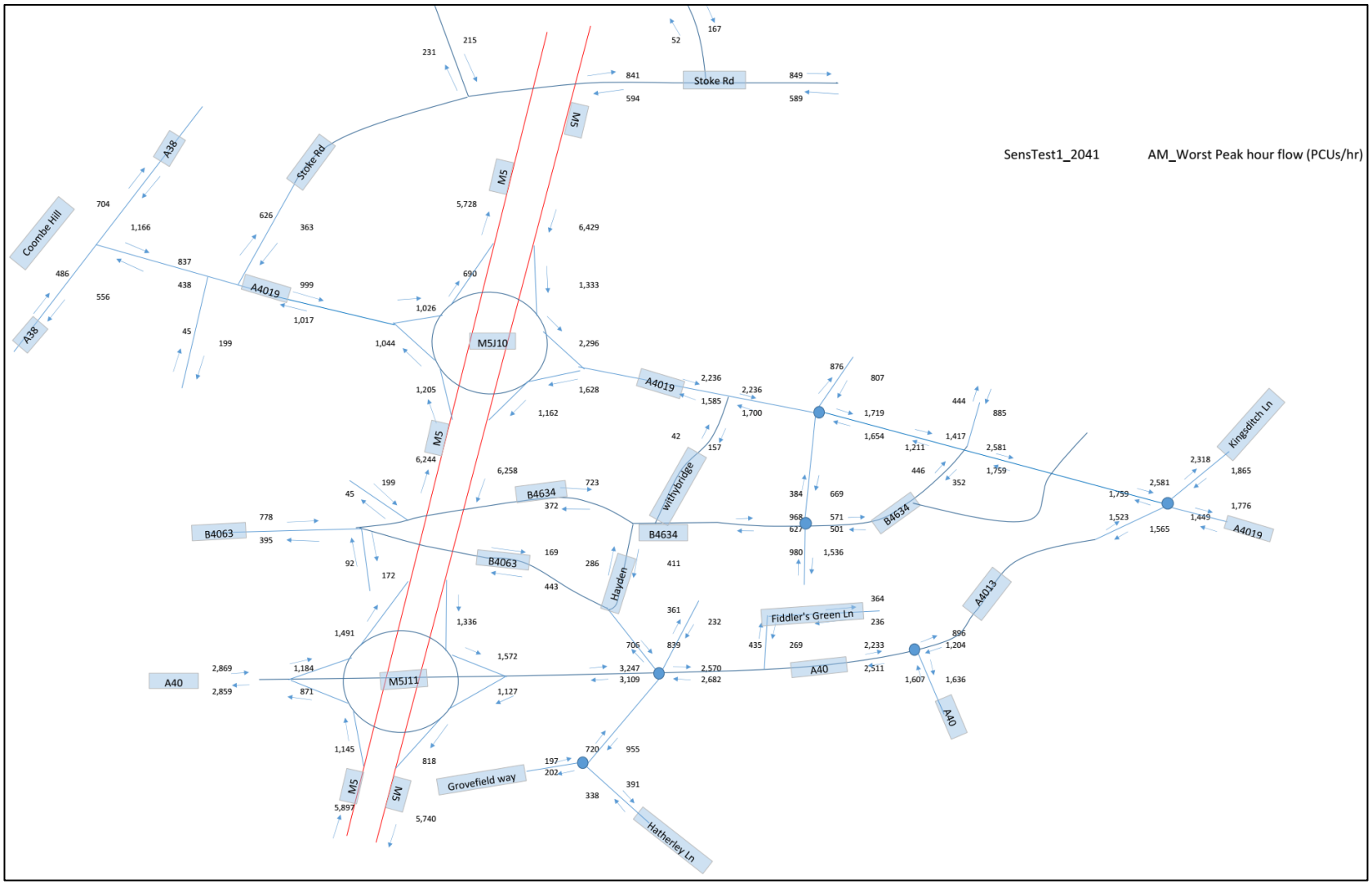

Figure 2.4 – Sensitivity Test 1, Worst Peak Flows plot, AM 2041

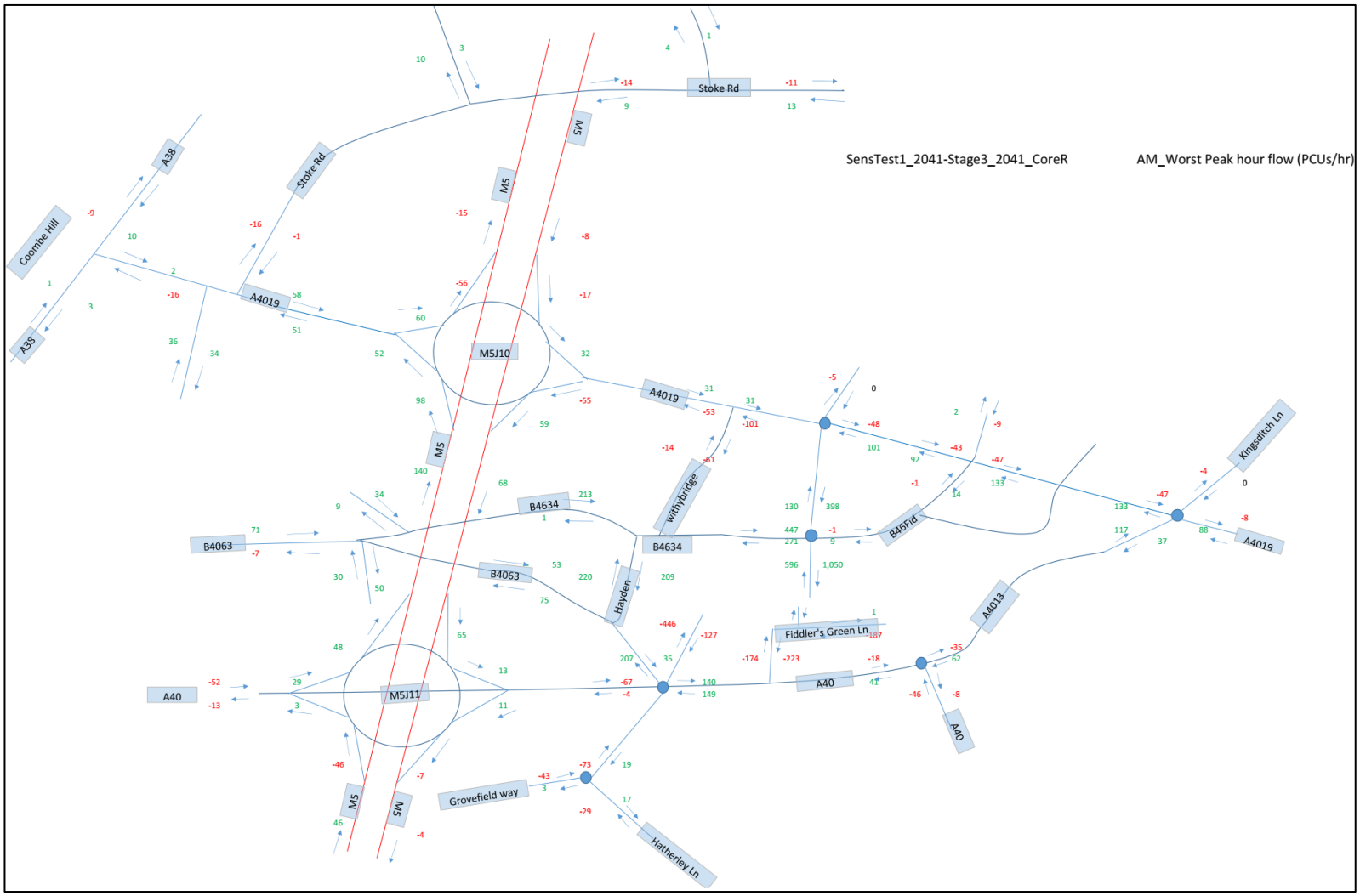

Figure 2.5 – Sensitivity Test 1 minus Core, Worst Peak flow difference plot, AM 2041

2.3.6. Worst peak hour flows in and around WC development sites for PM are shown below in Figure 2.6.

2.3.7. From the flow difference plots for the PM as presented in Figure 2.7, it is observed that:

- The rerouted traffic uses M5 accessed via M5J10 to reach Gloucester and M5J12 instead of M5J11. The increase in the flow on M5 between M5 J10 and M5 J11 in NB and SB directions is about 110 PCUs when compared with Core.
- There is a reduction in the flow on A40 westbound by about 100 PCUs in comparison to Core.
- Extra flows on B4634 to the west of the new roundabout relates to the additional development traffic loading to north in this test.
- An increase of around 130 and 290 PCUs can be seen on Hayden lane on North and southbound respectively in PM.

2.3.8. Appendix A provides all development origins and destinations flow difference plots between Sensitivity Test 1 and Core for average peak hours. From the plots, it is seen that in the AM and the PM, rerouted development traffic mainly uses B4634 Old Gloucester Road to reach Gloucester and the development zones. In the AM, flow increases in the WB direction by about 320 PCUs and in the EB by about 500 PCUs. In the PM, WB flow increases by 500 PCUs and in EB by about 280 PCUs:

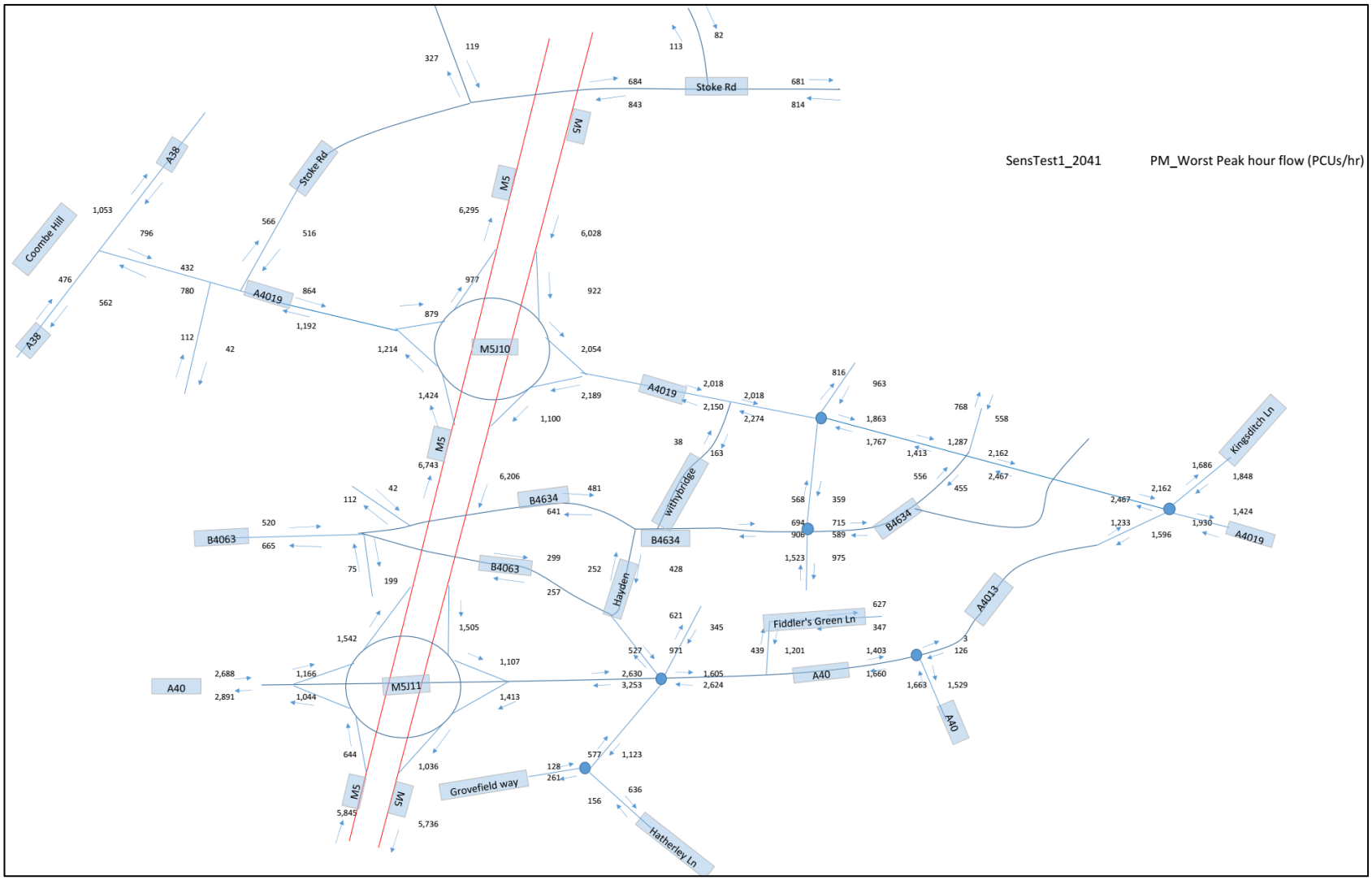

Figure 2.6 – Sensitivity Test 1, Worst Peak Flows plot, PM 2041

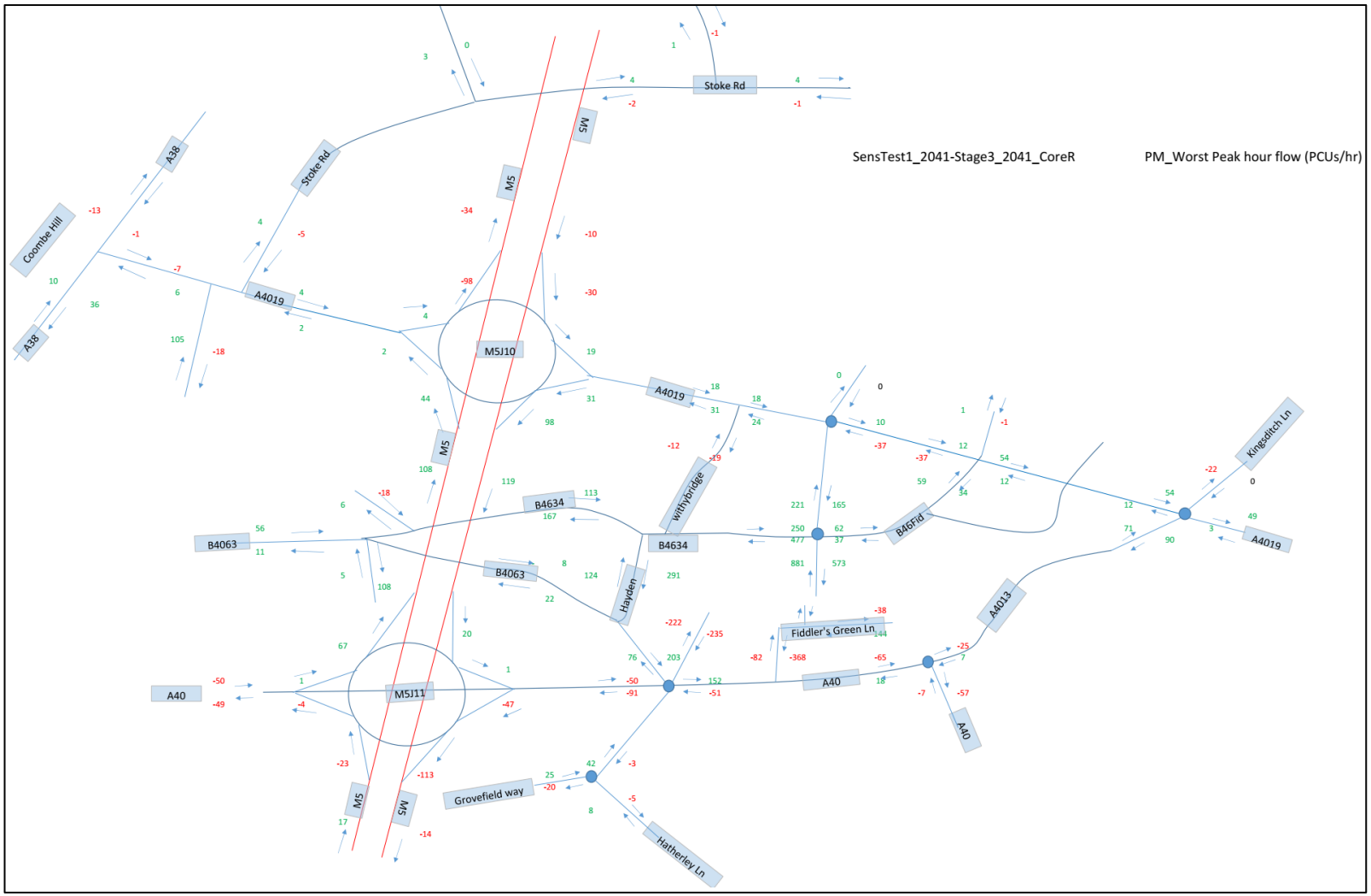

Figure 2.7 – Sensitivity Test 1 minus Core, Worst Peak hour flow difference plot, PM 2041

Sensitivity Test 2

2.3.9. This section summarises the traffic impact of providing a new through link connecting a new junction on B4634 Old Gloucester Rd in the North and Fiddler's Green Ln/Telstar Way Junction in the South. This new link allows for the through movement parallel to M5 J10/J11 and connects the WC development sites. The assessment has been carried out with respect to actual flow and delay differences in the local area.

2.3.10. Broadly it can be seen that there are three alternate routes between WC developments and Gloucester, i.e. using A4019, A40 and B4634 Old Gloucester Road. Routings between them affect the network performance within the local area, including J11 to some extent. Also, the new through link serves as an alternative route for local trips between J10/J11.

2.3.11. Worst peak hour flows for sensitivity test 2 in and around WC development sites for AM are shown below in Figure 2.8.

2.3.12. From the flow difference plots between Sensitivity Test 2 and Core, as presented in Figure 2.9 for AM, it is observed that:

- As expected, with a new through link in place, some of the traffic from the parallel local roads to the east of the new link and from the motorway between J10 and J11 switches to the new West Cheltenham Link Road. There is a shift in the flows from Cheltenham to access M5J10 via the new through link rather than using A40 and M5J11. Also, it is seen, the change/shift in the flows is localised pertaining to M5, A40, A4019, Old Gloucester Road (eastern end), Princess Elizabeth way, Hayden Lane and the new through link.
- On Old Gloucester Road west of the new roundabout, there is a flow reduction of 100 PCUs in EB direction and WB direction when compared to Core as there is a direct SB link to reach south Cheltenham.
- The reduction in flow on M5 between J10 and J11 in NB direction is about 70 PCUs and in SB direction is about 50 PCUs.

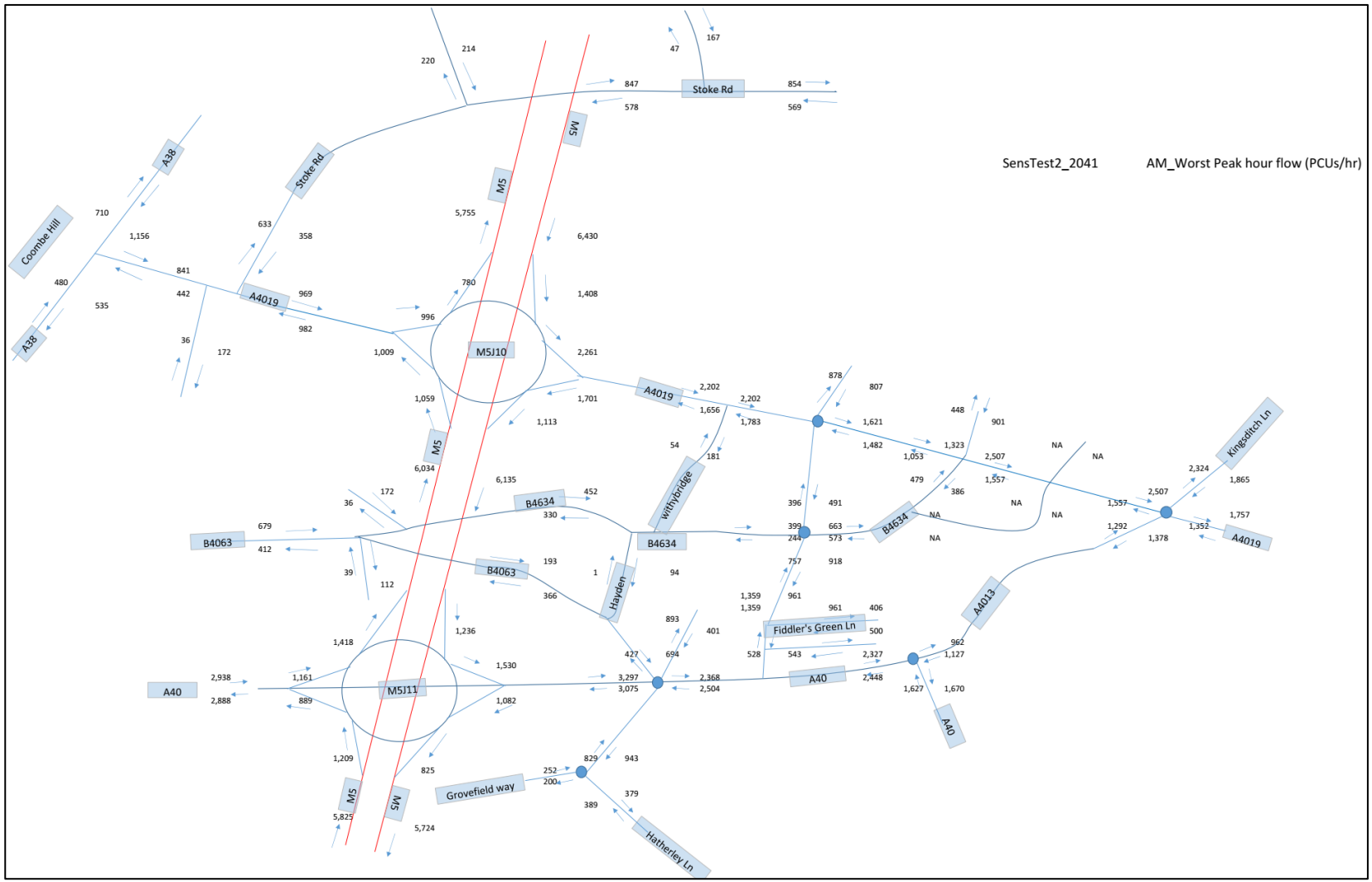

Figure 2.8 – Sensitivity Test 2, Worst Peak Flows plot, AM 2041

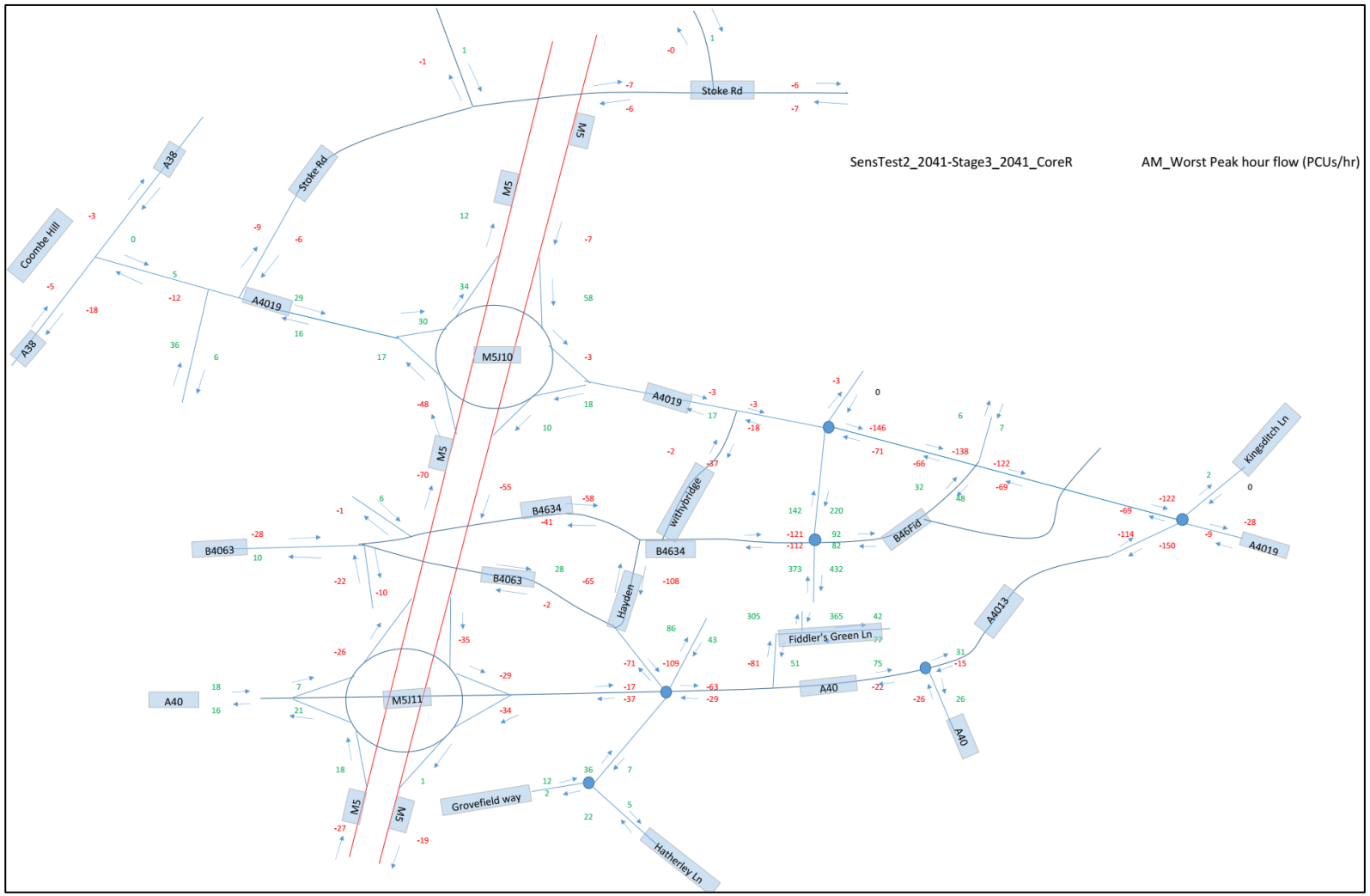

Figure 2.9 – Sensitivity Test 2 minus Core, worst peak flow difference plot, AM 2041

2.3.13. Worst peak hour flows for test 2 in and around WC development sites for PM are shown below in Figure 2.10.

2.3.14. From the flow difference plots provided for the PM in Figure 2.11 it is observed that:

- As expected, with a new through link in place, some of the traffic from the parallel local roads to the east of new link and from the motorway between J10 and J11 switches to this road. There is a shift in the flows from Cheltenham to access M5J10 through the new through link rather than using A40 and M5J11. Also, it can be seen the change/shift in the flows is localised pertaining M5, A40, A4019, Old Gloucester Road (eastern end) and Princess Elizabeth way, Hayden Lane and the new through link.
- Reduction of over 250 PCUs is seen on Old Gloucester Road, A4019 and Princess Elizabeth Way when compared to Core.
- The reduction in flow on M5 between M5 J10 and M5 J11 in NB and SB direction is about 90 PCUs.
- Increase of traffic on the link road connecting Old Gloucester Road and Fiddlers Green Lane is around 420 PCUs northbound and 350 PCUs southbound.

2.3.15. Appendix A provides WC development origins and destination flow difference plots between Sensitivity Test 2 and Core. From the plots, it can be seen that:

- The routings for WC development sites produced through Select Link Analysis (SLA) remains almost similar in Sensitivity Test 2 and Core. Though, correlating this with overall flow difference plots shows a marginal reduction of flow on the motorway and increase in traffic via the new through link road.

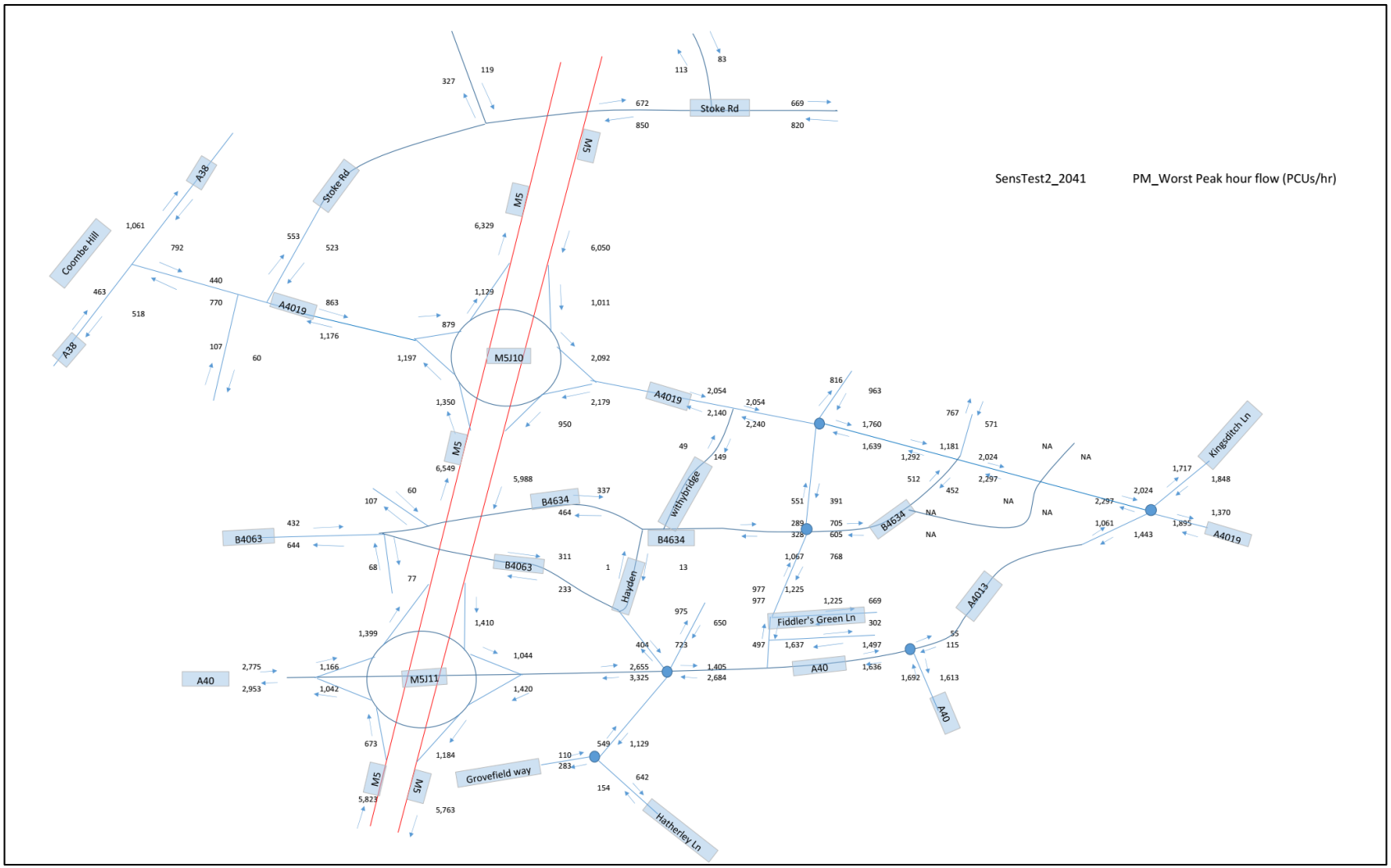

Figure 2.10 – Sensitivity Test 2, Worst Peak Flows plot, PM 2041

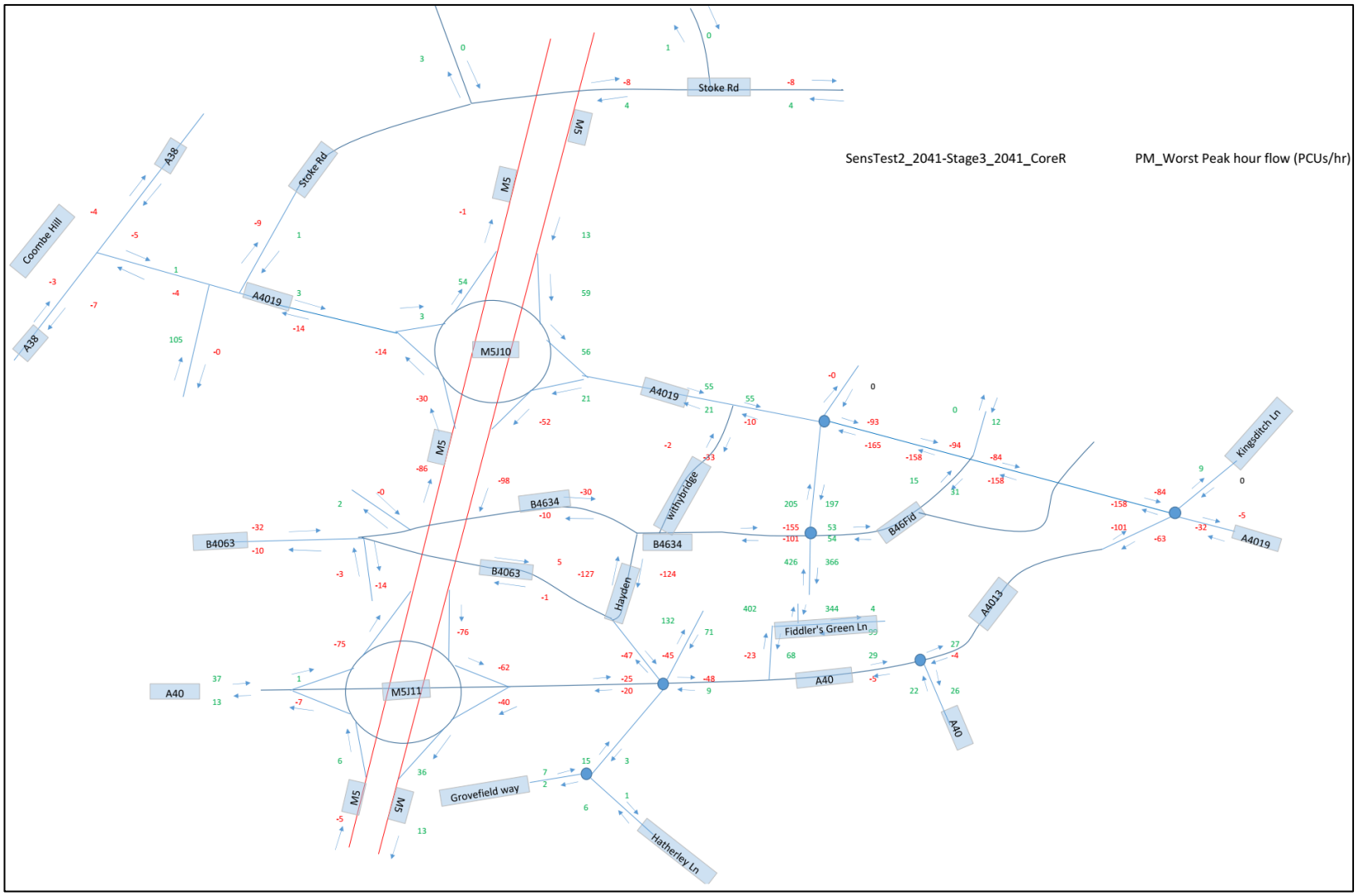

Figure 2.11 – Sensitivity Test 2 minus Core, Worst Peak flow difference plot, PM 2041

2.4. Need for intervention

2.4.1. Various options for potential access arrangements for West Cheltenham development were tested within the traffic model and the overall two-way demand on the West Cheltenham Link Road varies between 525 to 1053 PCUs in AM peak and 541 to 942 PCUs in PM peak. Majority of the traffic using this link road is from the development and rest is from local area trying to avoid the already congested B4634 and Princess Elizabeth Way.

2.4.2. Thus, without the West Cheltenham Link Road, all this traffic will use the existing network causing much more pressure on the network. Thus, expected link road flows clearly establishes the requirement for the West Cheltenham Link Road.

3. Environmental Constraints

3.1. Baseline Environment

3.1.1. The environment within the study area relevant to this report (between the M5, B4634, A4019 and Route Corridor 4) is characterised by open fields with hedgerows, within the floodplain of the River Chelt. The key environmental features within the area (other than flooding which is addressed separately below), which have been considered in the assessment of the route options, are as follows. These have been identified by desk study and field survey work undertaken to date:

- The River Chelt watercourse and its associated banks.
- The hedgerows along the field margins, and the trees within them. The trees and the River Chelt form the key natural landscape and ecological features within the study area.
- Land designated as Green Belt.
- Clusters of buildings, for example at Butler's Court, Withybridge Lane and along the B4634, as well as larger groups of buildings at Uckington and Withybridge Gardens. Buildings at Butler's Court and Withybridge Lane for example have also been identified as confirmed roosting locations for bats.
- The Scheduled Monument and listed buildings at Moat House.
- Two listed (Grade II) buildings at Millhouse Farm, one on each side of Withybridge Lane (Withybridge Mill and the adjoinging barn, and Butler's Court Cottages).
- Grade II listed building at Butler's Court (Butler's Court Farmhouse).
- A potential for buried archaeology across the previously undisturbed parts of the study area.

3.1.2. The landscape and ecological features (fields and hedgerows) are of a similar environmental value across the study area and provide a less of a differentiating factor in the selection of the route alignment, assuming that landtake can be tweaked so as to retain the hedgerows and trees where possible. The Green Belt designation applies to all of the study area relevant to this report, and will therefore not be a differentiating factor in the route alignment selected. The existing buildings, and their importance for people, ecology (bats) and heritage (the listed buildings and Scheduled Monument), are a more differentiating factor in the selection of a route alignment. Direct impacts to these, including potential impacts to the setting(s) of the listed buildings and Scheduled Monument, should be avoided.

3.2. Flooding

3.2.1. The baseline investigations show that extensive flooding occurs on the River Chelt floodplain. Floodwater overtops the River Chelt channel near Uckington and passes over the farmland, across Withybridge Lane, and into the fields east of the motorway. Flood depths from the 1% annual exceedance probability event (1 in 100-year return period) with allowance for future climate change, at Withybridge Lane (mid-way between the A4019 and Withybridge), are over 600 mm. Upstream of Uckington, the River Chelt remains mostly in channel, although there are smaller areas of inundation near Moat House.

3.2.2. Significant flooding is held east of the motorway, particularly upstream of the Piffs Elm, River Chelt and Staverton culverts under the M5 motorway, where flood depths in the 1% annual exceedance probability event (1 in 100-year return period) event, with allowance for future climate change, are over 1 m. In fact, during such an event the A4019 itself will be overtopped, with water passing from the River Chelt into the Leigh Brook.

3.2.3. The fields bordering the River Chelt's southern riverbank, north of Pilgrove Farm, are inundated during the larger events. Similarly, flooding is predicted where the Staverton

stream turns under the M5 motorway, creating a large flooded area on the east of the embankment, south of Butler's Court.

3.2.4. This significant flooding presents a constraint on the West Cheltenham Link Road. Firstly the road will need to be raised to remain operable during flood, and secondly the impact of that raising would have the consequence of displacing floodwater and would need to be mitigated for. Given the pattern of flooding, the further east the West Cheltenham Link Road is located, the less it will be impacted by flooding.

4. Route Corridor Identification and Initial Assessment

4.1. Introduction

4.1.1. A link between the A4019 and the B4634 is proposed to be included within the M5 J10 Improvements scheme to connect the improved M5J10 junction to the West Cheltenham Development proposals. There are no reasonable alternative development sites or points to connect to the M5.

4.1.2. The key objective of the West Cheltenham Link Road is to be as direct as practical while avoiding key environmental, social and economic impacts, which include flooding, loss of property, noise and environmental constraints.

4.1.3. This section of the report provides details of a high-level assessment of alternative route corridors undertaken for the proposed West Cheltenham Link Road. The assessment will support the flood risk sequential testing and includes the following main assessment categories;

- Impact on floodplain;
- Directness of route;
- Impact on properties; and
- Impact on Environment.

4.1.4. Four route corridors have been identified linking the A4019 to the B4634 and these are shown in Figure 4.1 below. For full details please refer to drawing GCCM5J10-ATK-HGN-L2-SK-CH-001004 included in Appendix B.

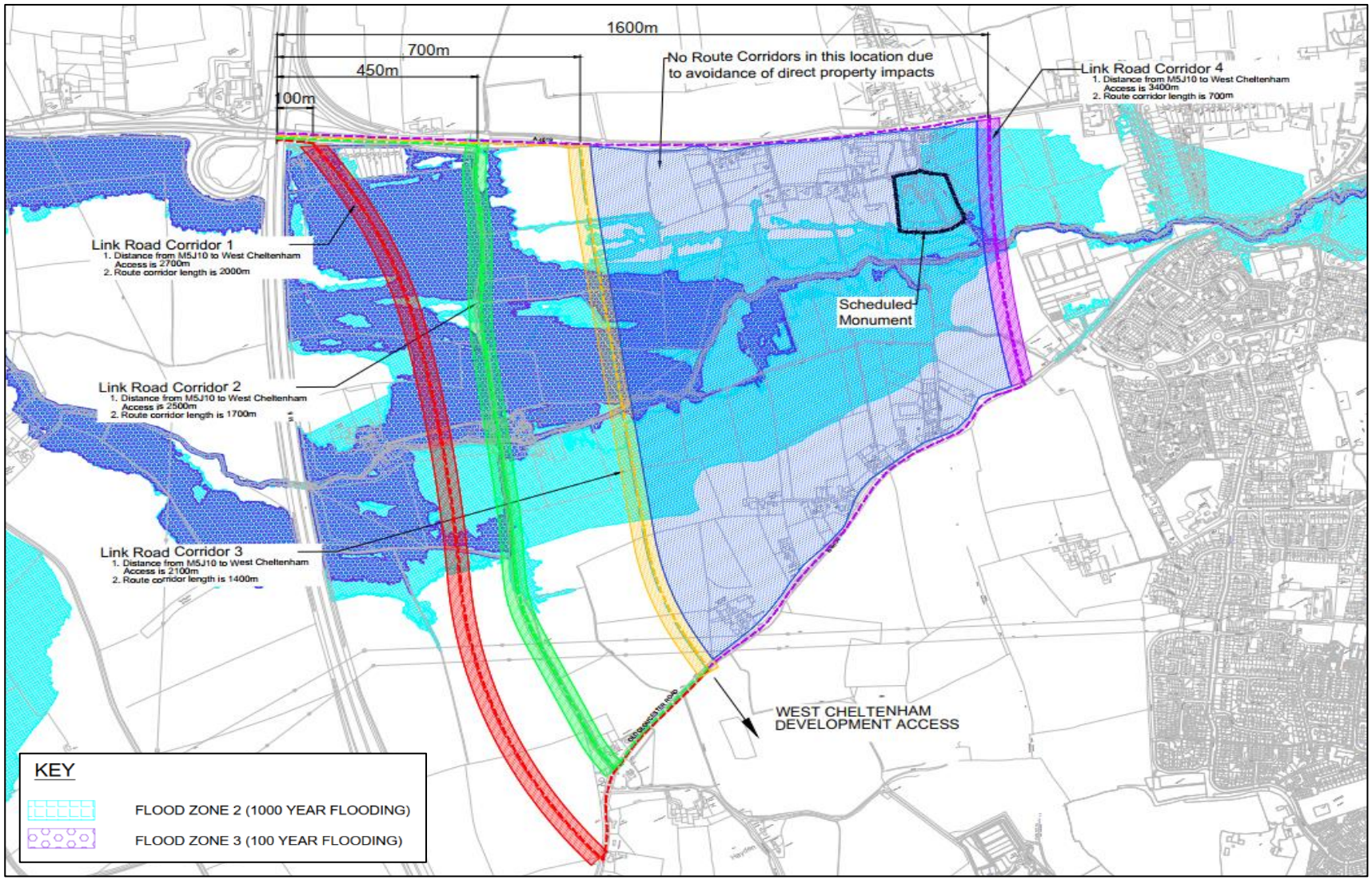

Figure 4.1 – West Cheltenham Link Road Route Corridors

4.2. Route Corridor Assessment Table

4.2.1. Table 4.1 records the outcomes of the assessment of the four route corridors against each of the four assessment categories. For the length of route category, this was considered relative to the M5 Junction 10 as the purpose of the West Cheltenham Link Road is to unlock the West Cheltenham Development site by providing access to M5 Junction 10 and thereby mitigating potential traffic congestion at the M5 Junction 11.

4.2.2. It was also assumed for the purposes of the assessment that the location of the access to the West Cheltenham development site is broadly fixed to the general area proposed for the B4634 roundabout within the M5 Junction 10 Technical Appraisal Report (TAR). This access point location has been discussed and agreed with the developer of the West Cheltenham site.

Table 4.1 – West Cheltenham Link Road route corridor assessment

Route Corridor	Assessment Category			
	Impact on floodplain	Directness of route	Impact on properties	Impact on environment
Corridor 1	Route corridor 1 crosses the floodplain of the River Chelt, which in this location extends over 1.2 km from the A4019 to south of the river. The floodplain in this area is dominated by the constraint of the M5 motorway and is indicated by the Environment Agency to principally include Flood Zone 3 (1% annual exceedance probability event (1 in 100-year return period)). Deep floodwater >1 m is predicted in this area. The scheme would require a large amount of compensatory floodplain and multiple culverts to maintain hydraulic connectivity.	Corridor 1 would likely provide direct connection to the M5 Junction 10 roundabout. However, this would be difficult to configure with separation between slip roads and A4019 arms and the arrangement would need detailed consideration. This corridor is the longest of the four options at 2000m and would also require road users to travel eastwards along the B4634 to link to the West Cheltenham development site access road. The total distance between M5J10 to the West Cheltenham development site using this corridor would be 2700m.	This corridor would involve the demolition of several properties at Withybridge Gardens. However, these would already need to be demolished by M5J10 Option 2 (if this is the option taken forward). The corridor then passes approximately mid-way between a small cluster of properties at the Grade II listed Butler's Court, The Hayloft and the Grade II listed Butler's Court Cottages. The corridor remains approximately 70m from the nearest of these properties. The corridors connection to the B4634 would be directly opposite the property Holmdale.	This corridor will have an impact on the open fields and associated hedgerows and trees along the length of the corridor. Assuming that the River Chelt would be crossed by a clear span bridge then direct impacts to the River Chelt will be limited to shading of the watercourse directly under the bridge. There could also be an impact to the setting of the Grade II listed buildings at Butler's Court (Butler's Court Farmhouse), and Millhouse Farm (Grade II listed Butler's Court Cottages and Withybridge Mill and the adjoining barn) as a consequence of the proximity of the road to these properties. There is also the potential for buried archaeology across the previously undisturbed parts of this route corridor. Construction of the road would have a direct impact on this buried archaeology.
Corridor 2	Route corridor 2 crosses Flood Zone 2 and 3 of the River Chelt, which in this location extends over 1 km from the A4019 to south of the river. The route corridor follows the existing Withybridge Lane. The floodplain in this area is controlled by the constraint of the M5 motorway and is indicated by the Environment Agency to mostly comprise Flood Zone 3 (1% annual exceedance probability event (1 in 100-year return period)), although with the area south of the River Chelt being Flood Zone 2 (0.1% annual exceedance probability event (1 in 1000-year return period)).	This corridor is relatively direct to the M5 Junction 10 being approximately 450m east of the junction and extends due south westwards to the B4634. This corridor would require road users to travel a short length eastward along the B4634 to link to the West Cheltenham development site access road. This route corridor represents the second shortest overall route between the M5 Junction 10 and the West Cheltenham development site out of the four corridors at 2500m.	This corridor generally follows the existing Withybridge Lane route. The creation of a road that meets current design standards is likely to result in direct impacts to the properties on both sides of the road at Millhouse Farm. The corridor also has the potential to impact the House in the Tree (Public House), Withybridge End and Orchard House at the connection to the B4634.	This corridor will have an impact on the hedgerows and associated trees along both sides of Withybridge Lane. As the existing Withybridge Lane has hedgerows along both sides of much of its length then this corridor would result in the greatest loss of hedgerow compared to the other three. Assuming that the River Chelt would be crossed by a clear span bridge then direct impacts to the River Chelt will be limited to shading of the watercourse directly under the bridge. Direct impacts to buildings at Millhouse Farm is expected to include the Grade II listed Butler's Court Cottages and Withybridge Mill and the adjoining barn. These buildings have also been identified as confirmed roosting locations for bats. The potential for buried archaeology within this route corridor is lower than the other three corridors as a consequence of the previous construction of Withybridge Lane. Construction of the road in this corridor would be expected to have lower impact on buried archaeology therefore.

Route Corridor	Assessment Category			
	Impact on floodplain	Directness of route	Impact on properties	Impact on environment
	The scheme would require a reasonable amount of compensatory floodplain (although likely less than Route 1) and multiple culverts to maintain hydraulic connectivity Existing flood depths here are up to 0.6 m.			
Corridor 3	Route corridor 3 crosses the floodplain of the River Chelt, which in this location extends some 0.6 km from the farmland west of Old Hall to south of the river. The floodplain in this area is only marginally influenced by the constraint of the M5 motorway and is indicated by the Environment Agency to be Flood Zone 3 (1% annual exceedance probability event (1 in 100-year return period)) to the north of the River Chelt and Flood Zone 2 (0.1% annual exceedance probability event (1 in 1000-year return period)) south of the River Chelt. The scheme would require compensatory floodplain and multiple culverts to both maintain hydraulic connectivity and ensure conveyance of floodwater across the floodplain, although flood depths here are <300 mm	This corridor is slightly further away from the M5 Junction 10 at approximately 700m from the junction. However, it has a shorter route corridor than Corridors 1 and 2 at 1400m and connects to the B4634 opposite the West Cheltenham development site access road. This route corridor represents the shortest overall route between the M5 Junction 10 and the West Cheltenham development site out of the four corridors at 2100m.	This corridor is generally the most remote from properties of the four route corridors. The nearest property to this corridor is Hayden Hill.	This corridor will have an impact on the open fields and associated hedgerows and trees along the length of the corridor. Assuming that the River Chelt would be crossed by a clear span bridge then direct impacts to the River Chelt will be limited to shading of the watercourse directly under the bridge. There is also the potential for buried archaeology across the previously undisturbed parts of this route corridor, and the construction of the road would have a direct impact on this buried archaeology. Impacts to the Grade II listed buildings at Millhouse Farm (including setting issues) will be much less than for corridors 1 and 2 as a consequence of the greater distance of corridor 3 to these buildings.
Corridor 4	Route corridor 4 crosses the floodplain of the River Chelt, which in this location extends some 0.3 km from the A4019 to the river. The area is indicated by the Environment Agency to comprise Flood Zone 2 (0.1% annual exceedance probability	This corridor is the furthest away from the M5 Junction 10 at approximately 1600m from the junction. However, it has the shortest route corridor of the four options at 700m. It would require road users to travel back westwards along	This corridor joins the A4019 opposite the properties Cherry Orchard and Pox Box Cottage and next to No 3 The Row. The corridor would also pass in very close proximity to the Grade II listed Moat Cottage and Moat House along with Moated Site which is a Scheduled	This corridor will have an impact on the open fields and associated hedgerows and trees along the length of the corridor. These impacts may be less than for corridors 1 and 3 as a result of the shorter length of this corridor. This assumes that there would be no impact on the hedgerows along the B4634.

Route Corridor	Assessment Category			
	Impact on floodplain	Directness of route	Impact on properties	Impact on environment
	event (1 in 1000-year return period)). The scheme would require some compensatory floodplain (although far less that all other options) and multiple culverts to both maintain hydraulic connectivity of floodwater across the floodplain.	the B4634 to link to the West Cheltenham development site access road. Due to the length of travel along the A4019 and B4634, this corridor represents the longest overall route between the M5 Junction 10 and the West Cheltenham development site out of the four corridors at 3400m.	Monument. Directly to the east of Moat Cottage the corridor passes very close to the location of outbuildings/stables. The corridor connects at the B4634 just to the east of the property Haydon.	Assuming that the River Chelt would be crossed by a clear span bridge then direct impacts to the River Chelt will be limited to shading of the watercourse directly under the bridge. The proximity of this corridor to the Scheduled Monument and listed buildings at Moat House, means there is potential for impacts to the setting of these buildings. The location of this corridor to the east of Uckington and Hayden Hill means that traffic using this corridor, travelling between Junction 10 and the West Cheltenham development, will pass through both of these villages. This will result in traffic associated noise and air quality effects that will not be realised for the other three corridors.

4.3. Outcome of Route Corridor Assessment

4.3.1. The corridor that has the least impact on floodplain is Corridor 4 and these impacts increase for each of the corridors as you move westwards and closer towards the M5, with Corridor 1 impacting on the greatest length of the floodplain.

4.3.2. For directness of route, Corridor 3 performs best, with Corridor 2 the second best. Corridor 4 is the least direct of the four corridors and has an overall route distance from M5 Junction 10 to the access to the West Cheltenham development site of approximately 1.3km more than Corridor 3. However, the area of safeguarded land for the West Cheltenham development site extends for approximately 1.1km to the east of the access point assumed for the purpose of this assessment and follows the existing boundary of the B4634. Therefore the overall route distance for Corridor 4 would be reduced if access to the West Cheltenham development site was moved to the east. Even if the access to the site was moved directly opposite Corridor 4 the overall route distance from the M5J10 to the access would be approximately 2.3km. This would still represent a greater distance than Corridor 3 provides within this assessment, whilst also involving a longer journey along the A4019 and its signalised junction at Moat Lane causing an additional barrier to directness of the route.

4.3.3. Corridor 3 has also been assessed as having the least impact on properties out of the four corridors. The other three corridors have similar impacts, passing close to Grade II listed properties and additionally, a Scheduled Monument for Corridor 4.

4.3.4. All Corridors would have slighly differing impacts on the environment. Corridor 4 is likely to have the least impact on hedgerows and trees and Corridor 2 the greatest impact. Corridor 2 is likely to have the least impact on buried archeology. Corridor 4 is likely to have the greatest noise and air quality impacts. All corridors have impacts on listed buildings but Corridor 4 also has the potential to have impact on the setting of a Scheduled Monument.

4.3.5. Overall, it is recommended that Corridor 3 is taken forward for consideration of route options as it is the most direct, has least impact on properties, second least impact on floodplain and generally the scale of environmental impacts is less than the other corridors.

4.3.6. Since Corridor 1 has the greatest impact on floodplain and Corridor 4 is the least direct it is recommended that these corridors are discounted from further consideration. Corridor 2 is the second-best performing corridor and contains existing highway infrastructure in the form of Withybridge Lane. It is recommended that the merits of routes within this corridor are also considered further.

4.3.7. Therefore the outcome of the route corridor assessment has concluded that both Corridors 2 and 3 should be carried forward for further assessment.

5. Route Corridor 2 Assessment – Upgrade of Withybridge Lane

5.1. Introduction

5.1.1. Corridor 2 was identified as the second-best performing corridor as part of the initial route corridor assessment. This corridor contains existing highway infrastructure in the form of Withybridge Lane. The suitability of the existing Withybridge Lane route as an alternative to constructing a new West Cheltenham Link Road was investigated and is discussed below.

5.1.2. In addition, options were investigated for upgrading the existing Withybridge Lane to provide enhanced highway standards including segregated facilities for pedestrians and cyclists and improved resilience to flooding. These options are also detailed below.

5.2. Existing Conditions

Highway Standards

5.2.1. A high-level assessment of the existing highway standards along Withybridge Lane has been undertaken using OS data as topographical data is not presently available. Table 5.1 includes the results of this assessment.

Table 5.1 – Existing highway standards along Withybridge Lane

Parameter	Comments
Posted Speed Limit	50mph
Road Type	Single carriageway
Carriageway Width	6.0m (3.0m + 3.0m lane widths)
Verge Width	Existing verge widths varies along the road ranging from approximately 0m – 12m
Horizontal Alignment	Sections of tight horizontal geometry with approx. min radii of 300m, which includes three back to back curves. No evidence of transition lengths.
Super Elevation	From inspection of OS data, super elevation is not provided at the curve locations except at one location.
Vertical Gradients	Existing road includes flat vertical gradients in many locations with approx. min gradient of 0.013%. This presents drainage problems and increases the likelihood of standing water.
Visibility	Visibility is obstructed by existing shrubs / dense vegetation / trees along the road at tight horizontal curve locations. The existing verge width is insufficient to accommodate the visibility splay and this results in forward visibility being restricted to approx. 50-60m in places.
Accesses	There are a number of existing direct field and property accesses along the route and these generally have low visibility standards.

5.2.2. The existing route is fairly typical of an unclassified rural single carriageway road with narrow verges, high hedgerows and associated restrictions in forward visibility. It is

anticipated that the route is currently predominately used by local traffic for access to fields and properties. The highway standard supports the current usage of the route and would appear to be appropriate for this current usage.

5.2.3. However, post scheme the existing road would need to cater for increased traffic demand from the adjacent housing and employment development sites as well as the associated increase in demand for walking, cycling and horse-riding facilities. It is considered that this existing route could not safely cater for such future strategic demand without significant improvement.

Traffic Forecast

5.2.4. Figure 5.1 below shows the forecast 2041 AADT flows in vehicles/day for the core scenario R.

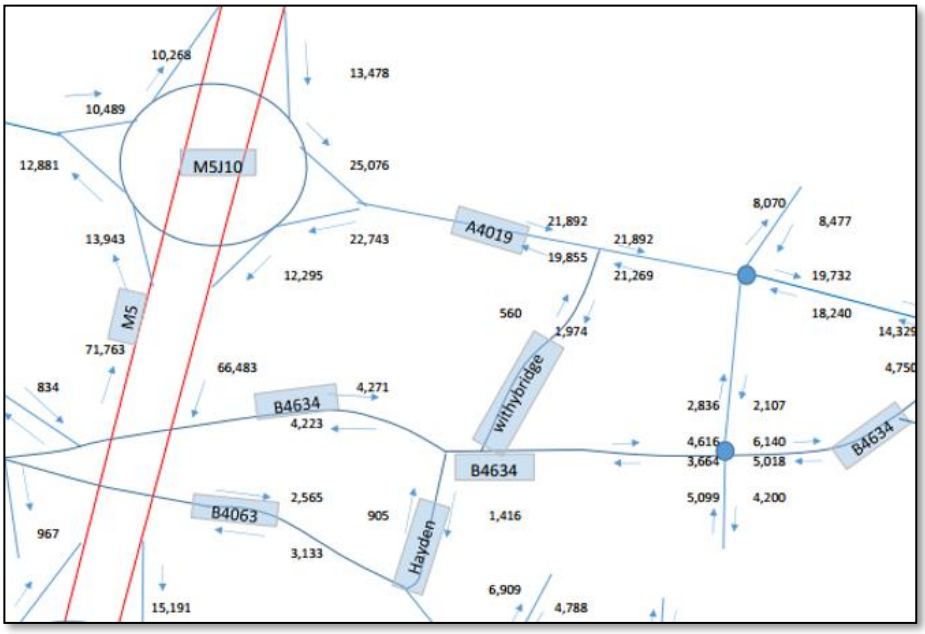

Figure 5.1 – Forecast 2041 AADT flows (veh/day)

5.2.5. If the West Cheltenham Link Road was not constructed it is assumed under a worst-case scenario that the traffic from this route would divert to Withybridge Lane. This would give a two-way AADT of 7,477.

Flooding

5.2.6. The existing Withybridge Lane is predicted to suffer shallow flooding during the present day 1% annual exceedance probability event (1 in 100-year return period). The extent of such flooding stretches from the A4019 highway in the north to the River Chelt in the south. Some 750m of Withybridge Lane is predicted to flood by the latest hydraulic modelling, with the most recent flood modelling predicting depths of water on the road between 100 mm and 300 mm, passing floodwater into the fields to the west. The adjacent fields are also inundated and typically to greater depths. The extent and depth of flooding along Withybridge Lane, north of the River Chelt, is similar to that in the fields to the east: a wide expanse of flooding although with shallow depths and slow flow velocities.

5.2.7. South of the River Chelt, the published Flood Map indicates an area of Flood Zone 3 along some 300 m of Withybridge Lane, with Flood Zone 2 in the fields around it. The Environment Agency predicts a notable area of flooding, arising from overland at Hayden, heading north westerly towards the Staverton culvert underneath the M5 motorway. This is predicted to cover some 350m of Old Gloucester Road. Whilst the junction with Withybridge Lane lies outside this floodplain, the land to the east is predicted to inundate.

5.2.8. Peak flow velocities of this 1% annual exceedance probability event (1 in 100-year return period) shallow flooding are predicted to be around 0.5 m/s. This, along with the shallow depths of flooding imply a Hazard Rating[2] of 0.2, being classified as '*very low hazard – caution*'. This would appear to be tolerable to the average road user and satisfies the basic National Planning Policy Framework planning requirement of a development being safe over its lifetime (assuming that the hazard remains low).

5.2.9. However, as a primary access route into new development sites (with more than light traffic), this amount of flooding would not be appropriate. Measures would likely be required by the Environment Agency to protect the road, reduce the risk for users, and better afford safe access and egress to the land served by the road.

5.2.10. It should be noted that alleviation of this low hazard flooding, for example by elevating the route in sections, is in itself likely to cause much more permanent impact on local flood risk than the temporary impacts of the predicted infrequent flooding. Alternative solutions could be investigated to rely on cut-off ditches along the scheme, intercepting this shallow floodwater and conveying it safely passed the Scheme.

5.2.11. With the impacts of climate change, the 1% annual exceedance probability event (1 in 100-year return period) increases its extent and depth although the effects appear to be slight here, although depths over Withybridge Lane increase to 600 mm. However, at the northern end of Withybridge Lane, the A4019 itself is predicted to be inundated (overtopped) during this future event, passing floodwater into the Leigh Brook. The Environment Agency's position would require Withybridge Lane to remain safe regardless of the A4019, which is likely to be raised and made flood free as part of the Junction 10 improvement works.

5.3. Design Options

Option 1

5.3.1. The engineering assessment of the existing route has concluded that this would not be suitable for the future strategic demands without significant upgrade to the geometry of the route.

5.3.2. Option 1 is shown in Figure 5.2 and Figure 5.3 below. For full details please refer to Drawing Nos. GCCM5J10-ATK-HGN-L2-SK-CH-001002 and 001003 in Appendix C.

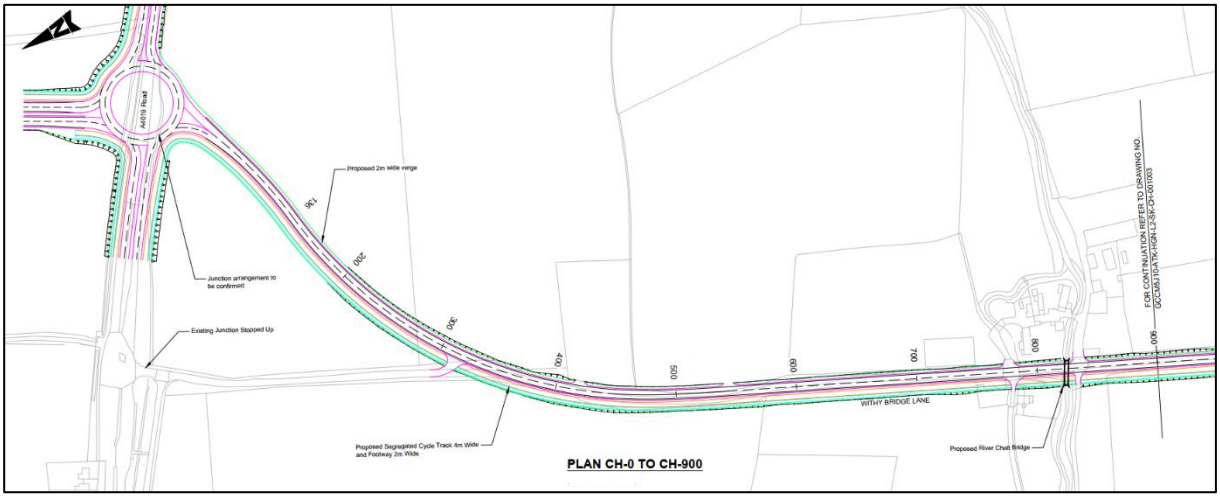

Figure 5.2 – Withybridge Lane Option 1 (CH-0 to CH-900)

[2] Defra (2008) SUPPLEMENTARY NOTE ON FLOOD HAZARD RATINGS AND THRESHOLDS FOR DEVELOPMENT PLANNING AND CONTROL PURPOSE – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1. Based on a Depth 0.2m. Velocity 0.5m/s. Debris factor 0.

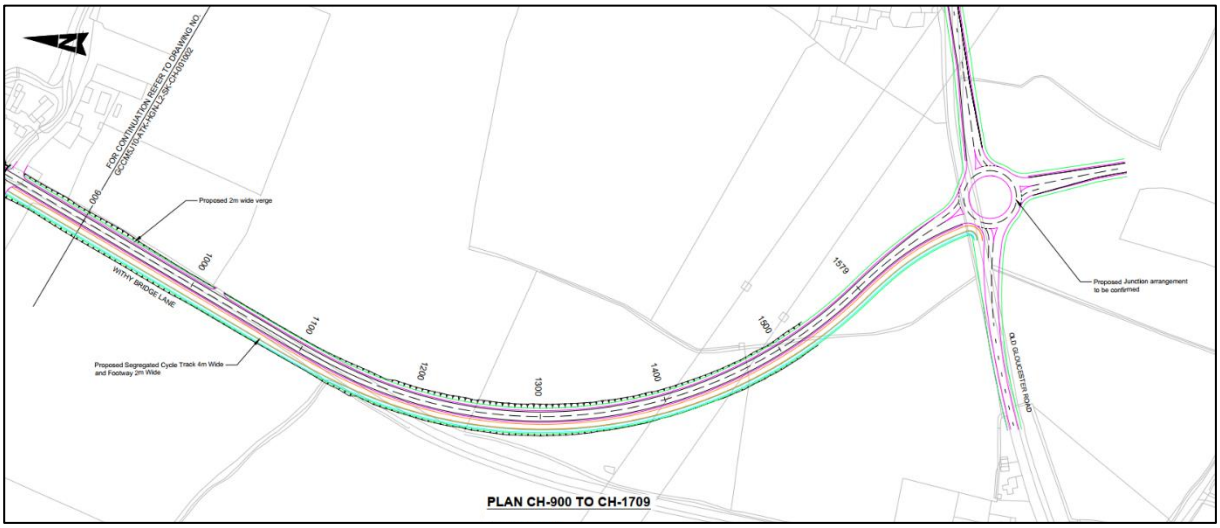

Figure 5.3 – Withybridge Lane Option 1 (CH-900 to CH-1709)

5.3.3. This option involves upgrading the existing Withybridge Lane to a 7.3m single carriageway road with 2.5m wide verge to the east and an 8m verge to the west. Within the 8m wide verge there would be a segregated 2m wide footway and a 4m wide two way cycle path.

5.3.4. This option would aim to utilise as much of the existing route corridor through the central section of Withybridge Lane as possible. Straightening and widening of the existing route would be required to improve forward visibility and this would generally take place to the west of the existing route in order to minimise impact on the existing features to the east of the route.

5.3.5. The vertical alignment of this section of the route would generally follow the existing road levels in order to minimise land-take and other associated impacts.

5.3.6. At either side of the central section, the route would diverge away from the existing Withybridge Lane towards the east to form junctions with the A4019 to the north, and the B4634 to the south.

5.3.7. At the B4634 junction, it is considered that a new roundabout junction would provide enhanced capacity for the increased traffic accessing the route. It would also be positioned to allow a fourth arm leading to the future West Cheltenham development site.

5.3.8. At the A4019 junction it is also considered that a new roundabout junction would provide enhanced capacity for the increased traffic accessing Withybridge Lane within this option. The roundabout would be positioned to the east of the existing A4019/Withybridge Lane junction as this will provide greater spacing from the M5J10 roundabout and also be located such that a fourth arm could be provided to access the safeguarded land to the north.

5.3.9. Along the central online section, existing field and property accesses would generally be retained in the current locations but just set back to suit the proposed edge of carriageway positions. Visibility from the accesses would be improved to meet the design standard requirements.

5.3.10. At the northern section where the route would diverge away from the existing Withybridge Lane, access to the existing northern section of Withybridge Lane could be retained from the improved road via a junction and this would provide continued access to fields. The existing junction with the A4019 could then be stopped up.

5.3.11. At the southern offline section, existing access to properties would generally be retained from the existing Withybridge Lane via its existing junction with the B4634. Direct access onto the improved road from the retained section of road would not be proposed.

5.3.12. The existing bridge that carries Withybridge Lane over the River Chelt is of insitu reinforced concrete construction. The structure has a clear span of 3.2m and an overall width of 8.8m between parapets. The last assessment of the structure was carried out in 1996 and found the deck to have a restricted live load capacity of 3 tonnes. It would therefore not be feasible to consider widening of the existing structure to provide the upgraded carriageway cross section. Instead it would be preferable to replace the structure with a wider deck bridge with compliant live load capacity of 40 tonnes.

5.3.13. Highway drainage considerations associated with this option are as follows:-

5.3.14. Advantages

- Utilising footprint of Withybridge Lane will reduce new impermeable areas required when compared with a completely new West Cheltenham Link Road. This will result in a reduced attenuation pond size requirement.
- Betterment in terms of treatment in that the existing Withybridge Lane catchments will discharging via an improved treatment train.
- Potential opportunities to reuse existing drainage on Withybridge Lane.

5.3.15. Potential risks

- Intermediate low points along alignment require further consideration to ensure systems can be piped outside of the floodplain to appropriate pond locations.
- Angle of the connection to the A4019 cuts through current location of pond serving section of A4019 up to the M5 junction. Further consideration required to move the pond or determine new location.
- Longitudinal gradients are particularly shallow which could cause a problem achieving appropriate gradients for piped systems.
- The road will flood during lower order (approximately 1 in 20 year) flood events.

5.3.16. In addition to the permanent land acquisition that would be required for this option, temporary land would also be needed during the construction phase. This would include land for parallel haul roads and craning areas for the construction of the bridge.

Option 2

5.3.17. Option 2 is shown in Figure 5.4and Figure 5.5 below. For full details please refer to Drawing Nos. GCCM5J10-ATK-HML-L2-SK-CH-001006 and 001007 in Appendix C.

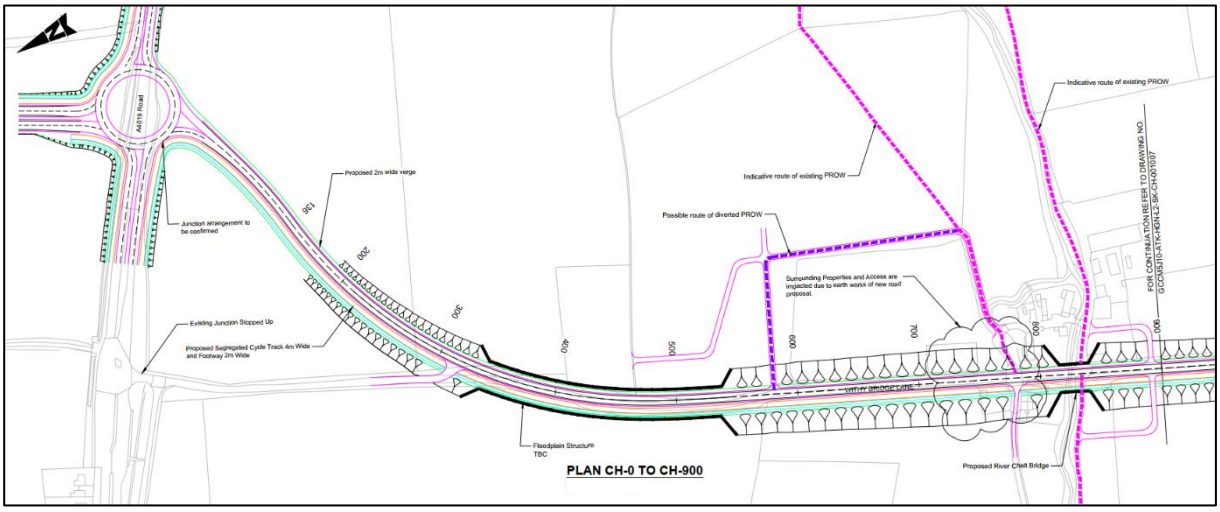

Figure 5.4 – Withybridge Lane Option 2 (CH-0 to CH-900)

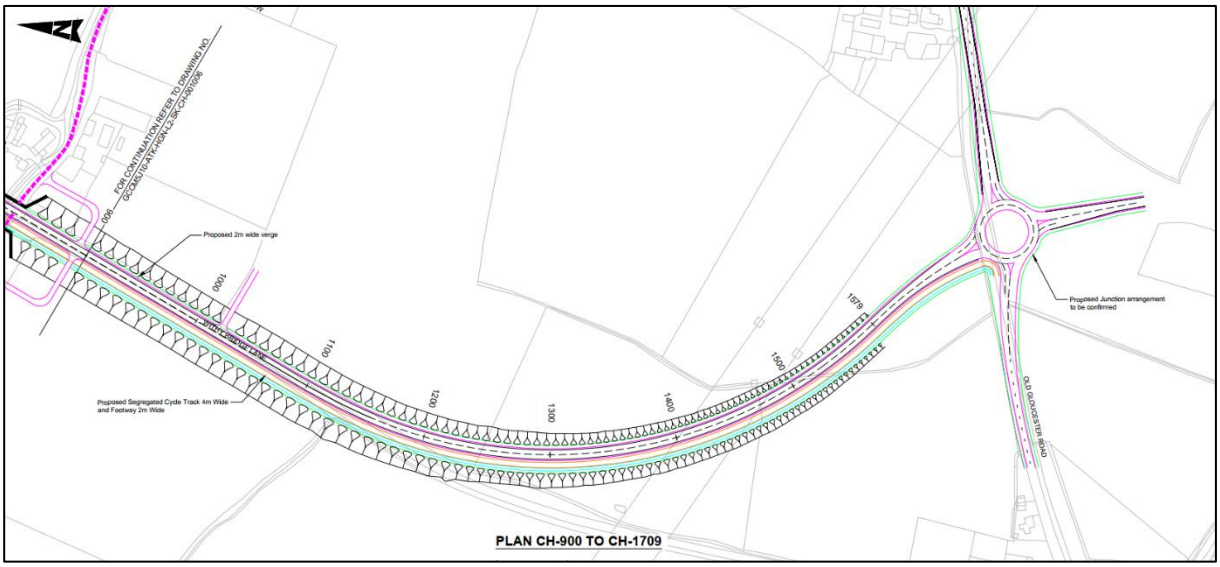

Figure 5.5 – Withybridge Lane Option 2 (CH-900 to CH-1709)

5.3.18. This option provides the same cross section, horizontal alignment and junctions as Option 1. The difference lies in the vertical alignment which has been raised from Option 1 to provide resilience to flooding impacts described in Section 3.

5.3.19. This would generally involve elevating the scheme on to embankment of up to approximately 6.5m in height, particularly along the central section of the route.

5.3.20. At the River Chelt crossing a new bridge would be needed and this is likely to require 4m wide access routes on either side of the river banks beneath the bridge and 3.7m high clearance. This will allow safe maintenance access and use by equestrians, should the existing footpath (Boddington Footpath 24) be diverted under the bridge and upgraded in status. These requirements would mean that the approach embankments to the bridge would be up to approximately 6m in height. These embankments would impact on land and properties to the immediate north and south of the bridge. Land take could be partly mitigated through the use of retaining walls, however, it would still require access to the land and properties to be diverted around the extents of the retaining walls.

5.3.21. Due to the elevation of the route, particularly in the central section, field and property accesses would need to be graded into fields to avoid very steep gradients. These long accesses, which would be shared in part, would likely be undesirable from both a user and landowner perspective.

5.3.22. It is also likely that the existing PROW would be diverted to avoid the embankment slopes and instead join the highway via the graded field and property access route.

5.3.23. A floodplain structure would be required, and this has been indicatively shown to extend for approximately 200m from Ch 340m to 540m. Further flood modelling work and consultation would be required to determine the extent and form of this structure.

5.3.24. Highways drainage considerations associated with this option are as follows:-

5.3.25. Advantages

- The elevated road will remove the risk of flooding from the River Chelt.
- There may be more scope to avoid intermediate low points and shallow longitudal gradients due to the eleveation of sections of the route

5.3.26. Potential risks

- The elevated road will displace floodwater elsewhere and present an informal dam across the floodway. That displaced floodwater will need to be accommodated elsewhere.

- Angle of the connection to the A4019 cuts through current location of pond serving section of A4019 up to the M5 junction. Further consideration required to move the pond or determine new location.

5.3.27. In addition to the permanent land acquisition that would be required for this option, temporary land would also be needed during the construction phase. This would include land for parallel haul roads and craning areas for the construction of the bridge.

5.4. Environment

Baseline Environment

5.4.1. Desktop and field survey work undertaken to date has identified the following environmental receptors along the line of (or close to) the existing Withybridge Lane. Details of these are presented in the webGIS for the project:

- The hedgebanks (hedgerows) along both sides of the road.
- Trees within these hedgebanks, and around Millhouse Farm as potential roosting locations for bats and nesting sites for Barn owls.
- The River Chelt watercourse and its associated banks.
- Buildings at Millhouse Farm providing bat roost locations. Three of these buildings have been identified as confirmed bat roost locations. Impacts to these buildings would require mitigation with the creation of replacement bat roosts.
- Buildings at Butler's Court. Whilst slightly further away from Withybridge Lane compared to Millhouse Farm, there are also confirmed bat roosts in nine buildings at Butler's Court.
- Two listed (Grade II) buildings at Millhouse Farm, one on each side of Withybridge Lane.

Environment Impacts

5.4.2. The proposed Option 1 for the redevelopment of Withybridge Lane would result in the loss of the hedgebanks and associated trees along at least one side of the Lane. It would not be possible to retain or translocate all of the hedgebanks. The loss of hedgebanks would be much greater compared to the construction of the West Cheltenham Link Road in Corridor 3, as the route (in the most part) cuts through existing hedgerows, rather than running along their length as Withybridge Lane Option 1 is proposed to do. Loss of the hedgebanks will also have a landscape and visual impact, particularly given the open nature of the area with the existing hedgerows being key landscape features.

5.4.3. It is expected that there would be an impact to both of the Grade II listed buildings at Millhouse Farm. The impact may be a direct impact, particularly to the 'Cottages by the drive to Butler's Court' which are next to the Lane. The other listed building at Millhouse Farm (Withybridge Mill and adjoining barn) is slightly further away from the Lane. Even if the alignment of Option 1 can be set so that direct impacts to either listed building area avoided, then the Option 1 will still result in indirect impacts to the setting of both listed buildings.

5.4.4. Impacts to the River Chelt will be minimised with a bridge that has no direct impacts to the river channel or to either bank. However, a wider bridge would result in an increased indirect impact as a result of greater shading of the river and banks.

5.4.5. The presence of occupied buildings at Millhouse Farm means that Option 1 will have a noise and air quality impact to people living in those buildings. These impacts may be exacerbated as a result of the Option 1 passing Millhouse Farm at an elevated position over the new bridge over the River Chelt.

5.4.6. It is expected that Option 2 for Withybridge Lane will cause a greater impact to the existing environment as a consequence of the larger footprint required from the embankments to create the elevated road. As a worst case these embankments may result in the removal of the existing hedgebanks and associated trees on both sides of Withybridge Lane.

Assuming there are hedgerows along both sides of Withybridge Lane then Option 2 is calculated to result in the loss of 2.4km of hedgerow. (Option 1 would result in the loss of 1.2km of hedgerow).

5.4.7. Option 2 would also have greater impact to the Grade II listed buildings and these impacts are more likely to be direct impacts due to the height of embankments or retaining walls adjacent to the proposed River Chelt bridge. The Grade II listed 'cottages by the drive to Butler's Court' are within the footprint of the embankments and are therefore likely to be destroyed by the development.

5.4.8. Some sustainability benefits may be incurred if materials in the existing Withybridge Lane can be re-used in the upgraded Option 1 or Option 2. However, it is not known at this stage whether the materials such as sub-base and fill materials will be suitable for re-use.

5.5. Outcome of Route Corridor 2 Assessment

5.5.1. The assessment of the existing Withybridge Lane layout has concluded that this is unlikely to be suitable to cater for future traffic and walking, cycling and horse-riding demand after the scheme and surrounding developments are in place due to the existing alignment and cross sectional restrictions.

5.5.2. Option 1 was developed as a 'do minimum' option to address the highway layout and cross section deficiencies within the current layout. This option was developed following existing road levels as much as possible in order to minimise land, property and environmental impacts. However, the flooding assessment has shown that the road, retained at existing levels, is likely to suffer from flooding during the 1% annual exceedance probability event (1 in 100-year return period). As a primary access route into new development sites this amount of flooding would not be appropriate and measures would be required to protect the road, reduce the risk for users, and better afford safe access and egress to the land served by the road. The environmental assessment of this option also concluded that there would be significant loss of hedgerows on at least one side of the lane and potential direct impacts on the Grade II listed buildings at Millhouse Farm.

5.5.3. Option 2 was then developed to address concerns raised from the flooding assessment and improve the route's resilience to flooding. However, the elevation of the route would introduce greater environmental impacts than Option 1 including greater loss of existing floodplain, hedgerows and trees and the likelihood of more severe direct impacts on the Grade II listed buildings at Millhouse Farm.

6. Alignment Options Assessment for Route Corridor 3

6.1. Introduction

6.1.1. Following the route corridor identification and initial sifting exercise described in the Section 4, Corridor 3 was taken forward for consideration of route options.

6.1.2. This section of the report discusses the alignment options considered for Corridor 3 and the assessment undertaken to identify the most appropriate route.

6.2. Route Corridor 3 – Alignment Options

6.2.1. Five route options were assessed for the proposed West Cheltenham Link Road within Corridor 3, which can be seen in Figure 6.1 below. For full details please refer to drawing GCCM5J10-ATK-HGN-L2-SK-CH-001001 included in Appendix D.

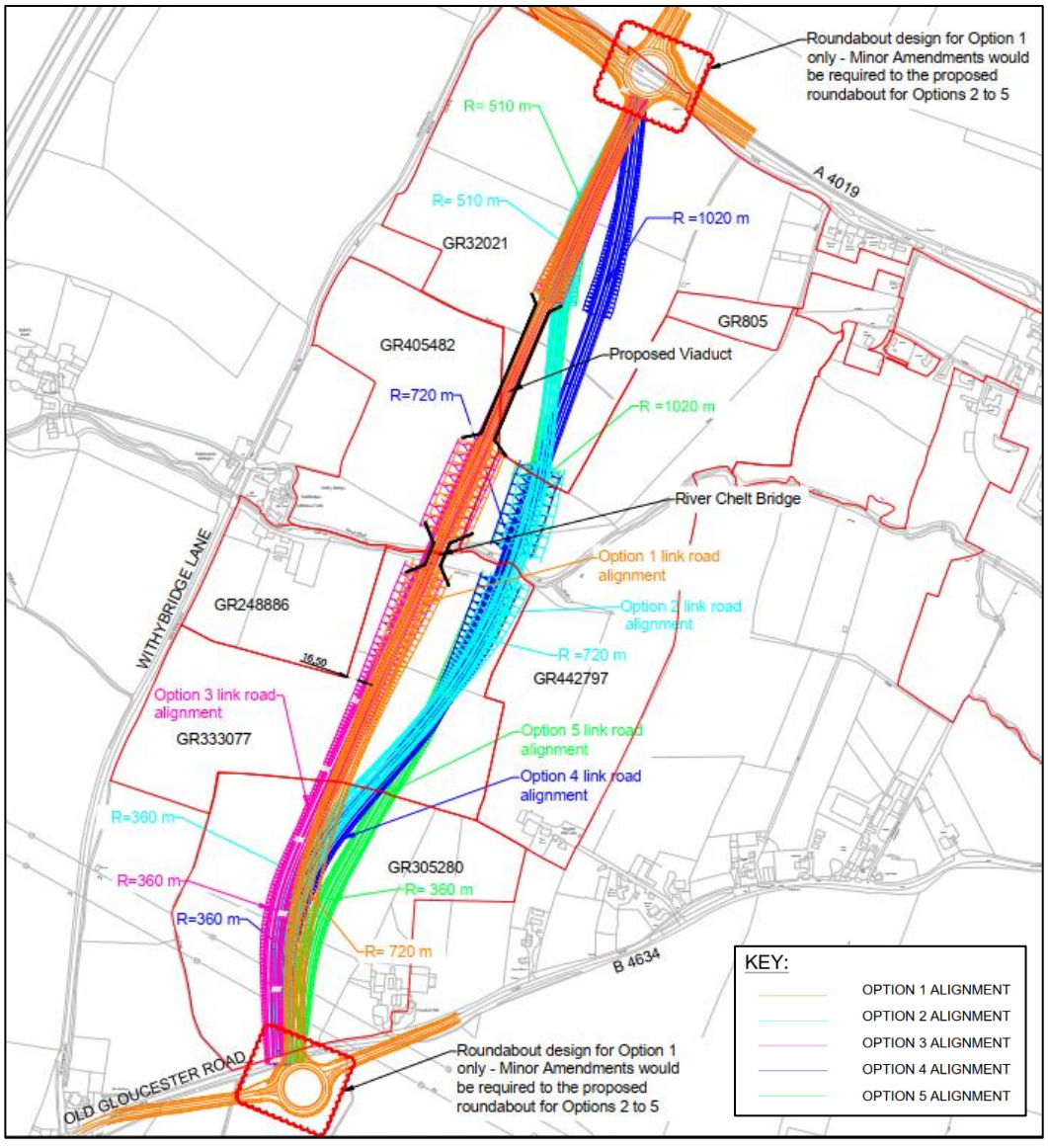

Figure 6.1 – Proposed West Cheltenham Link Road alignment options within Corridor 3

6.2.2. Drawing GCCM5J10-ATK-HGN-L2-SK-CH-001001 and Figure 6.1 were developed based on early assumptions that roundabouts would be provided at either end of the West Cheltenham Link Road. Further design and assessment work is to be carried out during the next phase of the design to confirm junction form and size; this will consider the most approriate form of junction for the forecast traffic flows and also provide greater benefits for walking, cycling and horse-riding inclusion as well as reducing environmental impacts. The drawings also refers to a proposed viaduct but this initial concept has now been replaced by alternative structure options (culverts, arches etc) which are outlined in the tables below.

6.2.3. All options follow a similar corridor in order to connect to proposed junctions on the A4019 and the B4634. These junction positions allow only small degrees of flexibility to their location as they will also provide links to future development sites.

6.2.4. For each alignment option, advantages and disadvantages have been entered alongside the main assessment categories in order to determine the most appropriate route.

6.3. Option 1

6.3.1. Advantages and disadvantages of the Option 1 alignment are included in Table 6.1 below.

Table 6.1 – Option 1 assessment

Assessment Category	Advantages	Disadvantages
Highway Standard	Proposed design speed of the road is 100 Kph and is fully compliant with DMRB standards.	In order to achieve the through visibility, verge widening is required in at least one location.
Land take/severance		Bisects Plot GR32021 and access would be required from West Cheltenham Link Road to the east. This access would also be used for the severed eastern portion of GR405482 via a reasonably long track through Plot GR32021. Track under River Chelt Bridge required for livestock movement to western portion of plot. Bisects Plot GR333077 and access would be required from West Cheltenham Link Road to the east with track under the River Chelt Bridge for livestock movement to western portion of plot. Bisects Plot GR305280 but existing accesses are likely to be maintained to east and west portions.
Flooding	Gentle flow path of the River Chelt into the bridge	Northern embankment at the River Chelt bridge in the floodplain. Possibility (uncertainty and sensitivity) of southern embankment and alignment being at flood risk
Drainage	Option consisting of the shortest length of highway, albeit marginally, reducing the lengths of drainage required and overall impermeable area resulting in reduced runoff and attenuation requirement.	-
Structures	Bridge crosses the River Chelt at moderate skew but at a generally straight section of river channel, keeping the bridge span to a minimum. Minimal impact is anticipated on the river channel anticipated during the bridge construction.	The northern section of the West Cheltenham Link Road crosses a floodplain. Flood modelling is currently ongoing but worst case scenario would require a circa 250m long crossing to span the flood area – this could be a series of pipe or box culverts, or a multi-barrelled flexi-arch solution.
Environment		

Assessment Category	Advantages	Disadvantages
- landscape		Straighter alignment. Relatively high impact on existing field boundaries, particularly to the north of the River Chelt.
- ecology		Relatively high impact on existing field boundaries, particularly to the north of the River Chelt.
- heritage (potential for below ground archaeology)	Option 1 poses the lowest impact (compared to the other options, but will still pose an impact). Potential impacts of options to below ground archaeology: - Option 1+3 (lowest relative impact) - Option 2 - Option 5 - Option 4 (greatest relative impact)	Impacts on the area of potential below ground archaeology at the northern end of the West Cheltenham Link Road.
- sustainability	Shortest option	
PRoW		Crosses Uckington Footpath 11 and Boddington Footpath 24. Both of these may require a minor diversion to pass under the proposed River Chelt bridge adjacent to the north and south abutments respectively.
Statutory Utilities		Crosses 11KV overhead lines, High pressure gas main and 132KV overhead lines. Private water main also identified at River Chelt bridge location. However, details currently unknown.

6.4. Option 2

6.4.1. Advantages and disadvantages of the Option 2 alignment are included in Table 6.2.

Table 6.2 – Option 2 assessment

Assessment Category	Advantages	Disadvantages
Highway Standard	Proposed design speed of the road is 100 Kph and is fully compliant with DMRB standards.	In order to achieve the through visibility, verge widening is required in at least two locations.
Land take/severance	Based on the assumption that it would be more favourable to retain one larger field rather than two smaller fields partially severed by the route, this option reduces the impacts at GR333077.	Bisects Plot GR32021 and access would be required from West Cheltenham Link Road to the east. This access would also be used for the severed eastern portion of GR405482 via a reasonably long track through Plot GR32021. Track under River Chelt Bridge required for livestock movement to western portion of plot. Bisects Plot GR333077 and likely that the relatively smaller area of land severed to the east would be retained for environmental mitigation. Bisects Plot GR305280 but existing accesses are likely to be maintained to east and west portions.
Flooding	Northern embankment at the River Chelt bridge moved out of the floodplain although the northern part of this West	Some additional loss of floodplain off the south bank of the River Chelt.

Assessment Category	Advantages	Disadvantages
	Cheltenham Link Road remains in an area at risk of flooding. Confidence that the southern embankment and alignment is not at risk of flooding.	River Chelt bend at the bridge face – hydraulically awkward. Will need engineered channel.
Drainage	-	Option consisting of the longest length of highway, albeit marginally, increasing the lengths of drainage required and overall impermeable area resulting in increased runoff and attenuation requirement.
Structures	Short, square bridge crossing at River Chelt if an engineered channel is provided to straighten the River Chelt.	If a straightened engineered River Chelt channel is not provided, then the bridge span will significantly increase due to crossing at river meander. The northern section of West Cheltenham Link Road crosses a floodplain. Flood modelling is currently ongoing but worst case scenario would require a circa 200m long crossing to span the flood area - this could be a series of pipe or box culverts, or a multi-barrelled flexi-arch solution.
Environment		
- landscape	Curved alignment. Lower impact on existing field boundaries, particularly to the north of the River Chelt.	
- ecology	Lower impact on existing field boundaries, particularly to the north of the River Chelt.	A straightened river channel will have an impact to the aquatic ecology present as a consequence of the loss of channel variety and the loss of riverine vegetation. Expected that mitigation would be required in the form of the creation of replacement meander or backwater section. The construction of the engineered channel is also expected to pose an adverse effect to ecology downstream during the construction phase.
- heritage (potential for below ground archaeology)		Impacts on the area of potential below ground archaeology at the northern end of the West Cheltenham Link Road. The geophysical survey identified several anomalies on the south side of the River Chelt near where the Option 2 bridge would be located (identified as Area 2 in the geophysical survey report). These anomalies were interpreted as relating to extractive activities of unknown date and may include important archaeological remains, though they are presumed to be of low value, contributing to local research objectives and understanding of the past May require further geophysical investigation because of the shift in alignment eastwards.
- sustainability		Longest option
PRoW		Crosses Uckington Footpath 11 and Boddington Footpath 24. Both of these may require a minor diversion to pass under the proposed River Chelt bridge adjacent to the north and south abutments respectively.
Statutory Utilities		Crosses 11KV overhead lines, High pressure gas main and 132KV overhead lines.

6.5. Option 3

6.5.1. Advantages and disadvantages of the Option 3 alignment are included in Table 6.3.

Table 6.3 – Option 3 assessment

Assessment Category	Advantages	Disadvantages
Highway Standard	Proposed design speed of the road is 100 Kph and is fully compliant with DMRB standards.	In order to achieve the through visibility, verge widening is required in at least one location.
Land take/severance		Bisects Plot GR32021 and access would be required from West Cheltenham Link Road to the east. This access would also be used for the severed eastern portion of GR405482 via a reasonably long track through Plot GR32021. Track under River Chelt Bridge required for livestock movement to western portion of plot. Bisects Plot GR333077 and access would be required from West Cheltenham Link Road to the east with track under the River Chelt Bridge for livestock movement to western portion of plot. Bisects Plot GR305280 but existing accesses are likely to be maintained to east and west portions.
Flooding	Gentle flow path of the River Chelt into the bridge	Northern embankment at the River Chelt bridge in the floodplain. Possibility (uncertainty and sensitivity) of southern embankment and alignment being at flood risk
Drainage	-	At its southern end this option reduces the land available within the parcel identified at Stage 2 for an attenuation pond. If necessary, the pond could be accommodated on the eastern side of the West Cheltenham Link Road within the same parcel of land.
Structures	Bridge crossing the River Chelt at a moderate skew but at a generally straight section of river channel, keeping the bridge span to a minimum. Minimal impact is anticipated on the river channel during bridge construction.	The northern section of West Cheltenham Link Road crosses a floodplain. Flood modelling is currently ongoing but worst case scenario would require a circa 200m long crossing to span the flood area - this could be a series of pipe or box culverts, or a multi-barrelled flexi-arch solution.
Environment	Option 3 is assessed to be very similar to Option 1	
- landscape		Straighter alignment. Relatively high impact on existing field boundaries, particularly to the north of the River Chelt.
- ecology		Relatively high impact on existing field boundaries, particularly to the north of the River Chelt.
- heritage (potential for below ground archaeology)		Impacts on the area of potential below ground archaeology at the northern end of the West Cheltenham Link Road. Option 3 would have nearly identical impacts to the historic environment as Option 1
- sustainability	3rd Shortest option.	
PRoW		Crosses Uckington Footpath 11 and Boddington Footpath 24. Both of these may

Assessment Category	Advantages	Disadvantages
		require a minor diversion to pass under the proposed River Chelt bridge adjacent to the north and south abutments respectively.
Statutory Utilities		Crosses 11KV overhead lines, High pressure gas main and 132KV overhead lines. Private water main also identified at River Chelt bridge location. However, details currently unknown.

6.6. Option 4

6.6.1. Advantages and disadvantages of the Option 4 alignment are included in Table 6.4.

Table 6.4 – Option 4 assessment

Assessment Category	Advantages	Disadvantages
Highway Standard	Proposed design speed of the road is 100 Kph and is fully compliant with DMRB standards.	In order to achieve the through visibility, verge widening is required in at least one location.
Land take/severance	Based on the assumption that it would be more favourable to retain one larger field rather than two smaller fields partially severed by the route, this option reduces the impacts at GR333077 and (marginally at) GR32021	Bisects Plot GR32021 and access would be required from West Cheltenham Link Road to the east. This access would also be used for the severed eastern portion of GR405482 via a reasonably long track through Plot GR32021. Track under River Chelt Bridge required for livestock movement to western portion of plot. Bisects Plot GR333077 and likely that the relatively smaller area of land severed to the east would be retained for environmental mitigation. Bisects Plot GR305280 but existing accesses are likely to be maintained to east and west portions.
Flooding	Northern embankment at the River Chelt bridge moved out of the floodplain. although the northern part of this West Cheltenham Link Road remains in an area at risk of flooding. Confidence that the southern embankment and alignment is not at risk of flooding.	Some additional loss of floodplain off the south bank of the River Chelt. River Chelt bend at the bridge face – hydraulically awkward. Will need engineered channel.
Drainage	-	At its northern end this option clashes with the pond location identified at Stage 2. If necessary, the pond could be moved further east, which appears to be part of the same parcel of land.
Structures	Short, square bridge crossing is required at the River Chelt if an engineered channel is provided to straighten the watercourse.	If a straightened engineered River Chelt channel is not provided, then the bridge span will significantly increase due to crossing at a river meander. The northern section of the West Cheltenham Link Road crosses a floodplain. Flood modelling is currently ongoing but worst case scenario would require a circa 200m long crossing to span the flood area. This could be a series of pipe or box culverts, or a multi-barrelled flexi-arch solution.

Assessment Category	Advantages	Disadvantages
Environment		
- landscape	Curved alignment. Lower impact on existing field boundaries, particularly to the north of the River Chelt.	
- ecology	Lower impact on existing field boundaries, particularly to the north of the River Chelt.	A straightened river channel will have an impact to the aquatic ecology present as a consequence of the loss of channel variety and the loss of riverine vegetation. Expected that mitigation would be required in the form of the creation of replacement meander or backwater section. The construction of the engineered channel is also expected to pose an adverse effect to ecology downstream during the construction phase.
- heritage (potential for below ground archaeology)		Impacts on the area of potential below ground archaeology at the northern end of the West Cheltenham Link Road. Potentially the highest impact to below ground archaeology, of the five options. The alignment would result in the removal of the majority of archaeological anomalies identified by geophysics at GHER 8637. Not only would the quantity of archaeological materials be destroyed by the construction of this option, it is likely that this option would require removal of the most significant part of GHER 8637. While all options will require archaeological evaluation and recording, Option 4 would likely require detailed excavations and extensive analysis to fully understand the archaeological significance of the materials that would be destroyed during its construction. Option 4 would also bring the alignment of the West Cheltenham Link Road closer to the Scheduled Monument and group of three Grade II listed buildings at Moat House, which may have further impacts to the settings of these designated assets. This should be avoided if at all possible. May require further geophysical investigation because of the shift in alignment eastwards.
- sustainability		Longer option.
PRoW		Crosses Uckington Footpath 11 and Boddington Footpath 24. Both of these may require a minor diversion to pass under the proposed River Chelt bridge adjacent to the north and south abutments respectively.
Statutory Utilities		Crosses 11KV overhead lines, High pressure gas main and 132KV overhead lines.

6.7. Option 5

6.7.1. Advantages and disadvantages of the Option 5 alignment are included in Table 6.5.

Table 6.5 – Option 5 assessment

Assessment Category	Advantages	Disadvantages
Highway Standard	Proposed design speed of the road is 100 Kph and is fully compliant with DMRB standards.	In order to achieve the through visibility, verge widening is required in at least two locations.
Land take/severance	Based on the assumption that it would be more favourable to retain one larger field rather than two smaller fields partially severed by the route, this option reduces the impacts at GR333077.	Bisects Plot GR32021 and likely that the relatively smaller area of land severed to the east would be retained for mitigation. Access would be required from the West Cheltenham Link Road for the severed eastern portion of GR405482. Track under River Chelt Bridge required for livestock movement to western portion of plot. Bisects Plot GR333077 and likely that the relatively smaller area of land severed to the east would be retained for environmental mitigation. Bisects Plot GR305280 but existing accesses are likely to be maintained to east and west portions.
Flooding	Northern embankment at the River Chelt bridge moved out of the floodplain although the northern part of this West Cheltenham Link Road remains in an area at risk of flooding. Higher confidence that the southern embankment and alignment is not at risk of flooding.	Some additional loss of floodplain off the south bank of the River Chelt. River Chelt bend at the bridge face – hydraulically awkward. Will need engineered channel.
Drainage	Option consisting of one of the shortest lengths of highway, albeit marginally, reducing the lengths of drainage required and overall impermeable area resulting in reduced runoff and attenuation requirement.	-
Structures	Short, square bridge crossing is required at the River Chelt if an engineered channel is provided to straighten the watercourse.	If a straightened engineered River Chelt channel is not provided, then the bridge span will significantly increase due to crossing at a river meander. The northern section of West Cheltenham Link Road crosses a floodplain. Flood modelling currently ongoing but worst case scenario would require a circa 200m long crossing to span the flood area. This could be a series of pipe or box culverts, or a multi-barrelled flexi-arch solution.
Environment	Option 5 is assessed as to be very similar to Option 2	
- landscape	Curved alignment. Lower impact on existing field boundaries, particularly to the north of the River Chelt.	
- ecology	Lower impact on existing field boundaries, particularly to the north of the River Chelt.	A straightened river channel will have an impact to the aquatic ecology present as a consequence of the loss of channel variety and the loss of riverine vegetation. Expected that mitigation would be required in the form of the creation of replacement meander or backwater section. The construction of the engineered channel is also expected to pose an adverse effect to ecology downstream during the construction phase.
- heritage (potential for		Impacts on the area of potential below ground archaeology at the northern end of the West Cheltenham Link Road.

Assessment Category	Advantages	Disadvantages
below ground archaeology)		Greater potential impact than Options 1, 2, and 3, but less impact than Option 4. May require further geophysical investigation because of the shift in alignment eastwards.
- sustainability	Shorter option	
PRoW		Crosses Uckington Footpath 11 and Boddington Footpath 24. Both of these may require a minor diversion to pass under the proposed River Chelt bridge adjacent to the north and south abutments respectively.
Statutory Utilities		Crosses 11KV overhead lines, High pressure gas main and 132KV overhead lines.

6.8. Comparative Assessment of Options

6.8.1. Table 6.6 below uses the assessments of each option detailed above and indicates which option performs best for each of the assessment categories.

Table 6.6 – Comparative assessment of options

Assessment Category	Best Performing Option
Highway Standard	All options would be fully compliant with DMRB standards for a 100 Kph design speed. However, the more curved options 2, 4 and 5 are likely to require greater lengths of verge widening in order to achieve the required visibility standards.
Land take/severance	All options introduce severance to four main plots. Option 1 and Option 3 tend to bisect these plots into two reasonable size plots which are likely to still be useable to the landowners. Option 2, 4 and 5 pushes the alignment of the route to the east in varying degrees and as such makes the severed eastern portion of some of the plots smaller and therefore likely to be of less future use to the landowner. These smaller severed plots would then become more suitable for mitigation plots but this would increase the total land take required from that landowner. Based on the assumption that it would be more favourable to retain one larger field rather than two smaller fields partially severed by the route, Options 2, 4 and 5 would be slightly more favourable.
Flooding	All five options cross a floodplain north of the River Chelt. There is little difference between the options: all will require a structure of some form to carry the West Cheltenham Link Road across this area, ensure hydraulic connectivity and limit the flood impact. Moving the road east within Route Corridor 3 has little effect on the extent of floodplain to be crossed. However, those options placing the West Cheltenham Link Road crossing of the River Chelt nearer the existing 90-degree bend on the river will require some realignment of the watercourse and protection against scour at the bridge abutments and foundations. Detail hydraulic modelling is currently being undertaken to quantify a solution for the crossing based on the depth, extent and flow velocities in this region. The outcome of this will determine the form, location, capacity and elevation requirements for any opening (culvert / bridge) structure and the size of any related compensatory floodplain.
Drainage	Although there are some minor advantages and disadvantages for each option relating to variations in total length and area of highway and impacts on land where pond locations were identified at Stage 2, all would have very similar impacts on drainage design.
Structures	All five options require a River Chelt bridge crossing and a crossing of currently undetermined length to carry the northern section of the West Cheltenham Link Road over a flood plain area. **River Chelt Bridge** Options 1 and 3 cross the river at a similar location, meaning the bridge will likely be very similar. An approximate span length of 24m has been

Assessment Category	Best Performing Option
	calculated based on 4m structural offset from riverbank on each side to allow for PROW, farm access and EA maintenance requirements. An approximate bridge skew angle of 20 degrees has been calculated. This structure would be relatively simple to design and construct, with in-channel works kept to a minimum. The moderate skew angle increases the bridge span slightly compared to a straight span arrangement Option 2, 4 and 5 cross the river at a similar location. Although this crossing is square to the river channel direction, it is at a natural meander in the river, meaning that a longer span is required to provide the same structural offsets as mentioned for Option 1 and 3 above. This would require an approximate clear span length of 26m, resulting in a slight increase in construction depth and therefore vertical alignment of the West Cheltenham Link Road compared to Option 1 and 3. Alternatively, if an engineered river channel were constructed to straighten the river channel, the bridge span length could be significantly reduced to circa 16m. However, straightening the river channel would require significant in channel works which would need to be agreed and approved by the EA. **Floodplain Structure** All five options are shown to cross a floodplain at the northern section of the West Cheltenham Link Road. There is therefore limited differentiation between the options as all will require a similar structure to carry the West Cheltenham Link Road over this area to limit the flood impact. Detailed flood modelling is currently being undertaken, the outcome of which will determine the requirements for a structure in this area. Any floodplain structure will need to maintain conveyance and minimise displacement of water. This could be a series of pipe or box culverts, or a multi-barrelled flexi-arch solution. A maximum height over the floodplain of 1m will be required to provide the conveyance and an acceptable freeboard.
Environment (add sub categories if required)	**Landscape:** There is limited differentiation between the five options with regards to landscape and visual impact. Each of the options will result in the creation of the same new built infrastructure within a greenfield location. Trees and hedgerows are the key landscape features within the area. The preferred options from a landscape perspective will be those that result in the removal of the least amount of hedgerow and significant trees. The options with a curving horizontal alignment may provide better opportunity for landscape mitigation compared to options with a straight alignment. Assumption is that none of the options have lighting, beyond the immediate confines of the roundabouts. **Agricultural land value:** Whilst an assessment is still to be completed on the value of the soil for agriculture (Agricultural Land Classification), it is expected that the alignments of the options are too close together for differences in agricultural land value to be a differentiating factor between the options. **Ecology:** Ecological assessment of the West Cheltenham Link Road alignment is ongoing. The higher value ecological receptors along the line of the West Cheltenham Link Road are the River Chelt, and the hedgerows (and associated trees). Some of the trees have been identified as potential bat roosts, although following further survey none of these have been identified as confirmed bat roosts (for information a confirmed bat roost has been identified in a tree under the northbound on slip at J10 and in buildings at Sheldon Nurseries). The trees have also been identified as potential barn owl nesting sites. Details of the particular areas of ecological value are shown on the webGIS at 'Surveys/Environmental'. Impacts to the River Chelt are significantly different between the options that require an engineered channel under the River Chelt bridge (Options 2, 4 and 5), compared to the options that have no expected impact on the river channel during construction and operation with no engineered channel required, and no changes to the existing river banks or construction within the river channel (Options 1 and 3). The potential significance of the impacts to the River Chelt means that the construction of the engineered channel is considered to be the differentiating factor between the options from an Ecology perspective. Options 1 and 3 would therefore be preferable to Options 2, 4 or 5. If an engineered channel

Assessment Category	Best Performing Option
	is not required, then the differentiator between the options for ecology will be the extent to which each results in the removal of hedgerows and trees. This assessment is based on the lengths of field boundaries each option may result in being removed. Options 1 and 3 appear to remove more hedgerow than the other options as a consequence of the alignment cutting along the line of the hedgerow immediately north of the River Chelt. **Heritage:** Geophysical investigation has been undertaken along the length of the West Cheltenham Link Road. This has identified areas of potential below ground archaeological value which will need to be investigated further through intrusive survey (trial trenching), if the area is within the construction boundary (for both temporary and permanent works). The area at the northern end of the West Cheltenham Link Road, within the alignment of the Option 1, and to the east, is identified in the geophysical assessment as having the highest potential for below ground archaeology. Option 1 would bisect GHER 8637 (Gloucestershire Historic Environment Record area of probably later prehistoric or Romano-British date) and remove approximately half of the features identified through geophysics in the south-eastern quadrant of this GHER area. However, compared to the other options, Options 1 and 3 pose the lowest potential impacts to below ground archaeology. **Noise and air quality impacts:** Traffic using the West Cheltenham Link Road will cause impacts on noise and air quality (AQ). Impacts will also occur at construction stage from vehicle use. As assessment of the potential impacts posed is still to be undertaken. Proximity to housing is expected to result in greater noise and AQ impacts to people in those houses, and may require mitigation measures (such as noise bunds and fences) to be included in the design. The relative proximity of the alignments to each other, particularly at the southern end of the West Cheltenham Link Road where the road will be closest to housing means that mitigation may be required for all options. The difference in alignments at the River Chelt crossing is likely to make only a negligible difference to noise impacts to residents at Millhouse Farm, given the proximity of the M5 to these houses. Overall, noise and AQ impacts are not a differentiator for the options. **Sustainability:** The similarity of the options (to each other) in their basic design, component parts (such as the bridge and flood defence structures) and length, means that sustainability is not a significant differentiating factor between the options. Whilst the option with the shortest route length will offer the lowest materials requirements, which is preferable from a sustainability perspective; overall there is limited difference in the sustainability of the five options. <u>Overall</u> If an engineered channel is required for Option 2, Option 4 or Option 5, then overall Option 1 and Option 3 are preferable from an Environment perspective.
PRoW	All options would have very similar impacts on existing public rights of way and they are therefore considered to perform equally in this factor.
Statutory Utilities	All options would have very similar impacts on existing statutory utilities and they are therefore considered to perform equally in this factor.

6.9. Outcome of Options Assessment for Route Corridor 3

6.9.1. The assessment of the five route options identified little differentiation between the routes for many of the assessment categories. The largest differentiator appears to be the need for an engineered river channel due to the bend at the River Chelt bridge location within Options 2, 4 and 5. This would likely give rise to the following issues:-

- Environment Agency permits and approvals would be required for the works, including a Flood Risk Activity Permit;
- Hard engineering of the bend to prevent scour would need to be enhanced with softer features to maintain riparian habitats;
- Additional land would be required to provide the realignment work; and
- Expected that mitigation (for the engineered river channel) would be required in the form of the creation of replacement meander or backwater section.

6.9.2. Based on the above issues it is considered that Options 2, 4 and 5 should be sifted out from selection.

6.9.3. From the remaining Options 1 and 3, Option 3 is slightly preferential from a land impact perspective as it is closer to the western boundary of GR333077 and therefore is slightly more efficient in land use.

7. Preferred Route Alignment

7.1. Conclusions and Recommendations

7.1.1. Following the assessment of route corridors then the subsequent assessment of specific routes within the shortlisted route corridors 2 and 3, it is now possible to draw conclusions from this assessment and make a recommendation on the preferred route alignment for the proposed West Cheltenham Link Road.

7.1.2. The assessment of options within route corridor 2 (Withybridge Lane corridor) concluded that the existing Withybridge Lane layout would not be suitable to cater for future traffic and walking, cycling and horse-riding demand after the scheme and surrounding developments are in place due to the existing alignment and cross sectional restrictions.

7.1.3. Significant widening and geometrical improvements would be required for both engineering and flood resilience. The environmental impacts that would be associated with upgrading this route to a standard which safely provides for forecast traffic and walking, cycling and horse-riding demand, as well as providing resilience to flooding, are considered to be significant. These impacts include significant loss of existing floodplain, hedgerows and trees and severe direct impacts on the Grade II listed buildings at Millhouse Farm. Up to 2.4km of existing hedgerow could be lost in the development of route corridor 2, compared to 700m of hedgerow in the development of route corridor 3.

7.1.4. The assessment of options within route corridor 3 concluded that there was little differentiation between the routes for many of the assessment categories, with the largest differentiator being the need for an engineered river channel due to the bend at the River Chelt bridge location within Options 2, 4 and 5. These options were sifted out for that reason and Options 1 and 3 were considered further.

7.1.5. Of Options 1 and 3, Option 3 was considered to have a slightly more efficient use of land and was therefore considered to be the best performing option within route corridor 3.

7.1.6. The environmental impacts associated with the construction of the route within corridor 2, in particular the impacts to listed buildings and existing hedgerows, are considered to be greater to those associated with the construction of a route within corridor 3.

7.1.7. It is therefore recommended that Option 3 from route corridor 3 is taken forward as the preferred option for connectivity.

8. Road Standard

8.1. Introduction

8.1.1. This section will discuss the cross section standard requirements for the proposed West Cheltenham Link Road based on the Stage 3 traffic forecast flows.

8.2. Forecast Traffic

8.2.1. Forecast traffic for the proposed West Cheltenham Link Road was provided by the traffic team for the following scenarios:-

- Opt2: Stage 3 Option 2 model in which West Cheltenham development zones are connected to stubs in both North and South;
- ST1: Sensitivity model 1 in which West Cheltenham development zones are connected to stub only in North; and
- ST2: Sensitivity model 2 in which West Cheltenham development zones are connected to a new through West Cheltenham Link Road.

8.2.2. This traffic data is summarised in Table 8.1 below:-

Table 8.1 – West Cheltenham Link Road Summary of Forecast Flows

Scenario	2041 AM Peak Hour (PCU)		2041 PM Peak Hour (PCU)	
	N/B	S/B	N/B	S/B
Stage 3 Option 2	253	271	346	194
ST1	384	669	568	359
ST2	396	491	551	391

8.3. Cross Section Requirements

8.3.1. TAG[3] provides guidance on lane capacities by road type and area.

8.3.2. Table A5 of this guidance suggests an average capacity for a rural 'B category' road as 1150 PCU per lane km per hour.

8.3.3. Table A6 of this guidance also suggests that the average capacity of an urban 'B category' road for Area 7 (Cheltenham is in Area Type 7 according to Table A2) is 1050 PCU per lane km per hour.

8.3.4. Based on the forecast flows in Table 8.1 the highest northbound flow is 568 PCU and the highest southbound flow is 669 PCU. These figures correspond to 49% and 58% utilisation of the suggested average lane capacity for a rural 'B category' road and 54% and 64% utilisation of the suggested average lane capacity for an urban 'B category' road.

8.3.5. Since the peak flows in both directions are below the suggested average lane capacity it is considered that a single carriageway layout would provide sufficient capacity for these forecast flows.

8.3.6. As a secondary check the recommended flow ranges contained within TA 46/97 - Traffic Flow Ranges For Use In The Assessment Of New Rural Roads have been referred to. This advice note was withdrawn in March 2020 but remains a useful comparison in this instance as new DMRB guidance does not include such information. The advice suggests

[3] TAG Unit A5.4 -Marginal External Costs - May 2020
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/934770/tag-a5-4-marginal-external-costs.pdf

that a single carriageway (S2) can provide capacity for up to 13,000 AADT based on opening year forecasts and that a dual carriageway (D2AP) provides capacity for a range between 11,000 and 39,000 AADT. The Stage 3 forecast 2041 AADT flow is 4,943 vehicles. This shows that a single carriageway would be suitable for the forecast flows even when design year forecasts are considered instead of opening year forecasts.

8.3.7. From DMRB guidance CD 127 *Cross-sections and headroom*, there are two main options for a single carriageway layout. These are an S2 layout for a rural all-purpose road (Figure 8.1) or a SU2 for an urban all-purpose road (Figure 8.2). As the proposed West Cheltenham Link Road does not carry traffic directly towards Cheltenham and links to the rural B4634, it is suggested that a S2 layout would be the most appropriate cross section standard for this link.

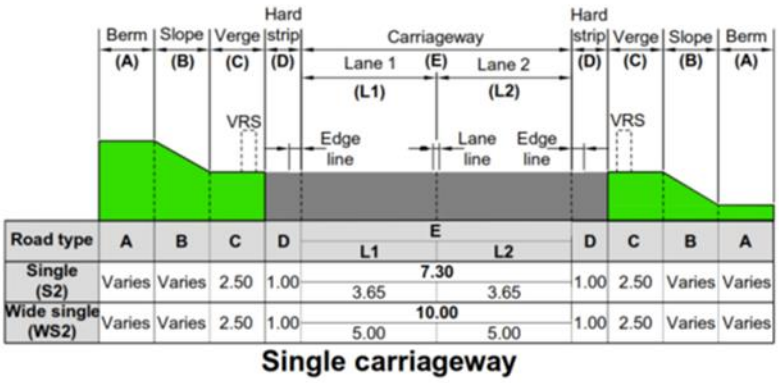

Figure 8.1 – Single S2 layout (rural)

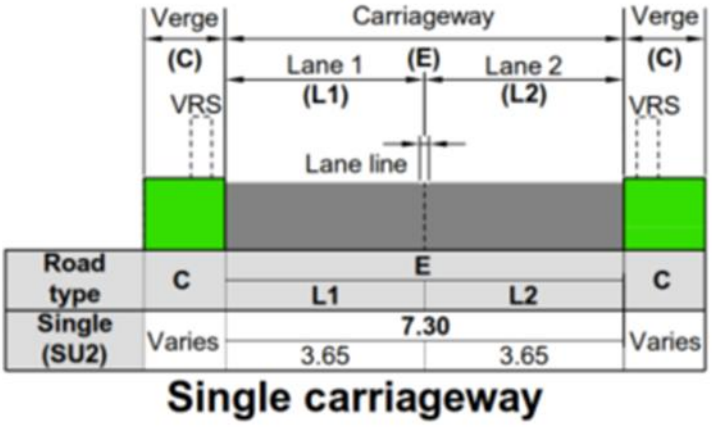

Figure 8.2 – Single SU2 layout (urban)

8.3.8. It is noted that CD 127 provides an option for a wide single (WS2) carriageway cross-section for a rural all-purpose road, as shown in Figure 8.1. However, it is considered that having two 5m wide lanes would provide the potential for up to four vehicles to travel side by side and may lead to conflicts between opposing overtaking movements. This would therefore raise potential safety concerns and, as such, it is suggested that a S2 layout is the preferred layout for the West Cheltenham Link Road.

8.3.9. DMRB CD 109 *Highway link design* states that the minimum overtaking value for rural S2 roads shall be 30%, where the overtaking value is the length of overtaking sections expressed as a percentage of the route. Although the West Cheltenham Link Road would not be a Trunk Road, the design would apply the DMRB standards as closely as possible. It is considered that the proposed alignment has the potential to provide the minimum 30% overtaking value required, subject to further preliminary and detailed design.

8.3.10. It should be noted that consideration was also made to providing a wide single 2+1 (WS2+1) carriageway layout for the West Cheltenham Link Road, to provide overtaking opportunities. DMRB CD 109 specifies that the minimum length for an overtaking lane section shall be 800m. The total length of the proposed West Cheltenham Link Road is approximately 1400m. It would therefore not be possible to provide the minimum length overtaking lane section in both directions on the West Cheltenham Link Road. Only providing an overtaking lane in one direction could cause frustration to drivers in the opposing single lane section, which may increase the potential for performing illegal overtaking manoeuvres using the additional centre lane.

8.3.11. DMRB CD 123 *Geometric design of at-grade priority and signal-controlled junctions* also states that direct accesses shall not be provided on WS2+1 roads. It is anticipated that direct accesses for fields either side of the River Chelt will be required, which would further constrain the use of a WS2+1 layout. It was therefore considered that a WS2+1 layout would not be suitable.

8.3.12. Pedestrian and cycling provision along the West Cheltenham Link Road route was also considered and it is suggested that the same facilities as those proposed for the A4019 are included in order to provide route continuity. A 6m wide corridor is proposed for walking, cycling and horse-riding facilities in the northern verge of the A4019. It is therefore suggested that the same provision be included along one side of the West Cheltenham Link Road, connecting to the A4019 facilities via a crossing at the A4019/ West Cheltenham Link Road junction. At the West Cheltenham Link Road junction with the B4634, consideration could be made to connect the facilities to the development site access located on the southern side of the B4634.

8.3.13. To summarise, the suggested cross section for the West Cheltenham Link Road is a single S2 carriageway with a 6m wide corridor for walking, cycling and horse-riding facilities provided on one side.

8.4. Vertical Alignment

8.4.1. The vertical alignment for the West Cheltenham Link Road will be designed in accordance with DMRB standards. The proposed elevation will be minimised as far as reasonably practicable, however, this will be constrained by the need to be above the high flood level of the River Chelt and the surrounding floodplain.

8.4.2. A new structure will be required over the River Chelt. A minimum headroom of 3.7m will be required beneath this structure to accommodate 4m wide field access tracks either side of the watercourse. These tracks will also serve as a Public Right of Way and provide maintenance access for the Environment Agency.

8.4.3. A structure will also be required to carry the West Cheltenham Link Road over a floodplain to the north of the River Chelt, to ensure hydraulic connectivity and limit the flood impact. Detailed hydraulic modelling will be developed in the next stages of design to quantify the depth, extent and flow velocities in this region. The outcome of this will determined the location, capacity and elevation requirements for any structure.

9. Existing Road Proposals (if new link provided)

9.1. Withybridge Lane as Alternative Route

9.1.1. With the proposed construction of a new route along Option 3 from route corridor 3, the retention of Withybridge Lane would have the following potenitial benefits:-

- Would continue to be used as a route between A4019 and B4634 whilst West Cheltenham Link Road is constructed.
- Potential diversion route during construction works on A4019;
- Future diversionary route for when planned maintenance or emergencies require the closure of the West Cheltenham Link Road.

9.2. ‘Quiet Lane’ designation for Withybridge Lane

9.2.1. The potential for designating Withybridge Lane as a ‘Quiet Lane’ for further enhancement to the walking, cycling and horse-riding facilities in the area, could also be considered.

9.2.2. LTN 1-20 Cycle infrastructure design states that ‘the requirement for formal Quiet Lanes designation is fewer than 1000 vehicles per day’. It also suggests that it may be appropriate on rural lanes where actual speeds are under 40mph.

9.2.3. The forecast 2041 AADT flows on Withybridge Lane is 2534 (veh/day).

9.2.4. Traffic calming and traffic management measures would be required to achieve the guideline traffic and speed conditions, and these should be designed to be in keeping with the local environment but also still be effective.

9.2.5. Potential traffic calming options could range from physically narrowing the existing lane to a single lane track with passing places, using the width of the redundant carriageway for walking, cycling and horse-riding facilities, to simpler traffic signs and road marking enhancements.

9.2.6. Physical narrowing of the road may have implications on the future use of the road as a diversionary route for planned maintenance and emergencies. The suitability for use of the road as a diversionary route after designation as a Quite Lane would also need to be investigated as this would increase traffic flows during the diversion period.

10. Conclusions and recommendations

10.1.1. This report initially considered four route corridors which could be used to connect the A4019 with the B4634 and onwards to the proposed West Cheltenham development. The assessment of these route corridors concluded that Corridors 2 and 3 provided the greatest overall benefits under the assessment criteria.

10.1.2. Route options were then developed and assessed for each of the two shortlisted route corridors. This assessment concluded that the best performing option in Corridor 3 was Option 3 and that the environmental impacts associated with the construction of this route would be less than those associated with the construction of a suitable route within corridor 2.

10.1.3. It is therefore recommended that Option 3 from route corridor 3 is taken forward as the preferred option for connectivity.

10.1.4. Forecast traffic flows were then considered as part of determining the most appropriate form of cross section for the West Cheltenham Link Road. This assessment concluded that a single S2 carriageway with a 6m wide corridor for walking, cycling and horse-riding facilities should be provided.

10.1.5. Key constraints to the vertical alignment of the West Cheltenham Link Road were identified. A main constraint is the provision of a structure over the River Chelt with minimum headroom of 3.7m beneath this structure to accommodate 4m wide field access tracks either side of the watercourse. The other main constraint is a structure to carry the West Cheltenham Link Road over a floodplain to the north of the River Chelt. Detailed hydraulic modelling will be developed in the next stages of design to inform the height, length and form of any structure, which will in turn inform the vertical alignment at this location.

10.1.6. Finally, the report considered the future use of Withybridge Lane following the construction of the proposed West Cheltenham Link Road. This recommended that Withybridge Lane could have benefits for temporary traffic diversions both during and after construction. It also recommended the potential for designating Withybridge Lane as a ‘Quiet Lane’ for further enhancement to the walking, cycling and horse-riding facilities in the area, could be considered.

Appendices

Appendix A. Traffic Sensitivity Test Plots

A.1. Sensitivity Test 1 WC development flow difference

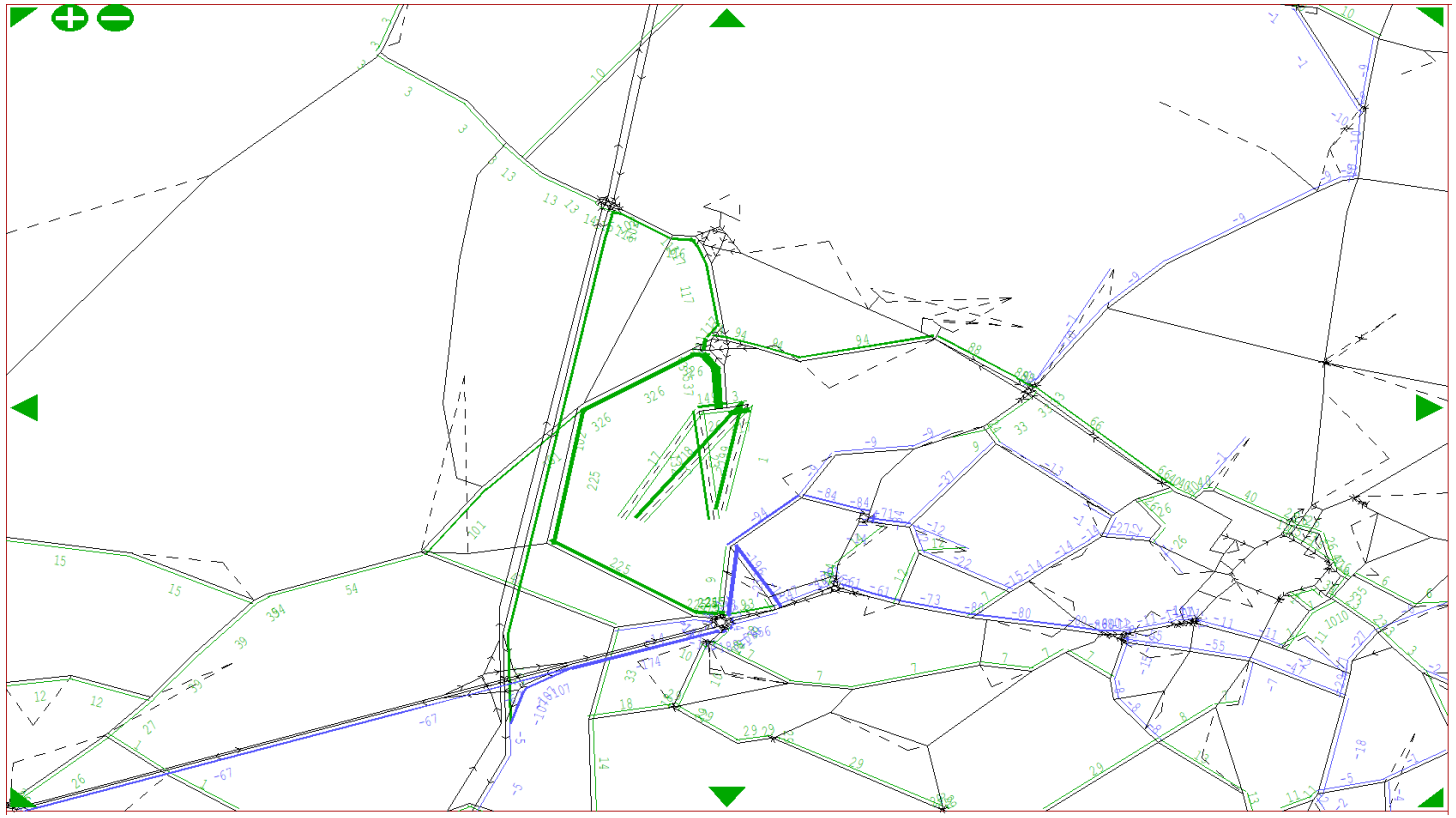

Figure A1.1 – West Cheltenham Development Zones Origin SLA Actual Flow Difference Plot, AM 2041 (Sensitivity Test 1 minus Core)

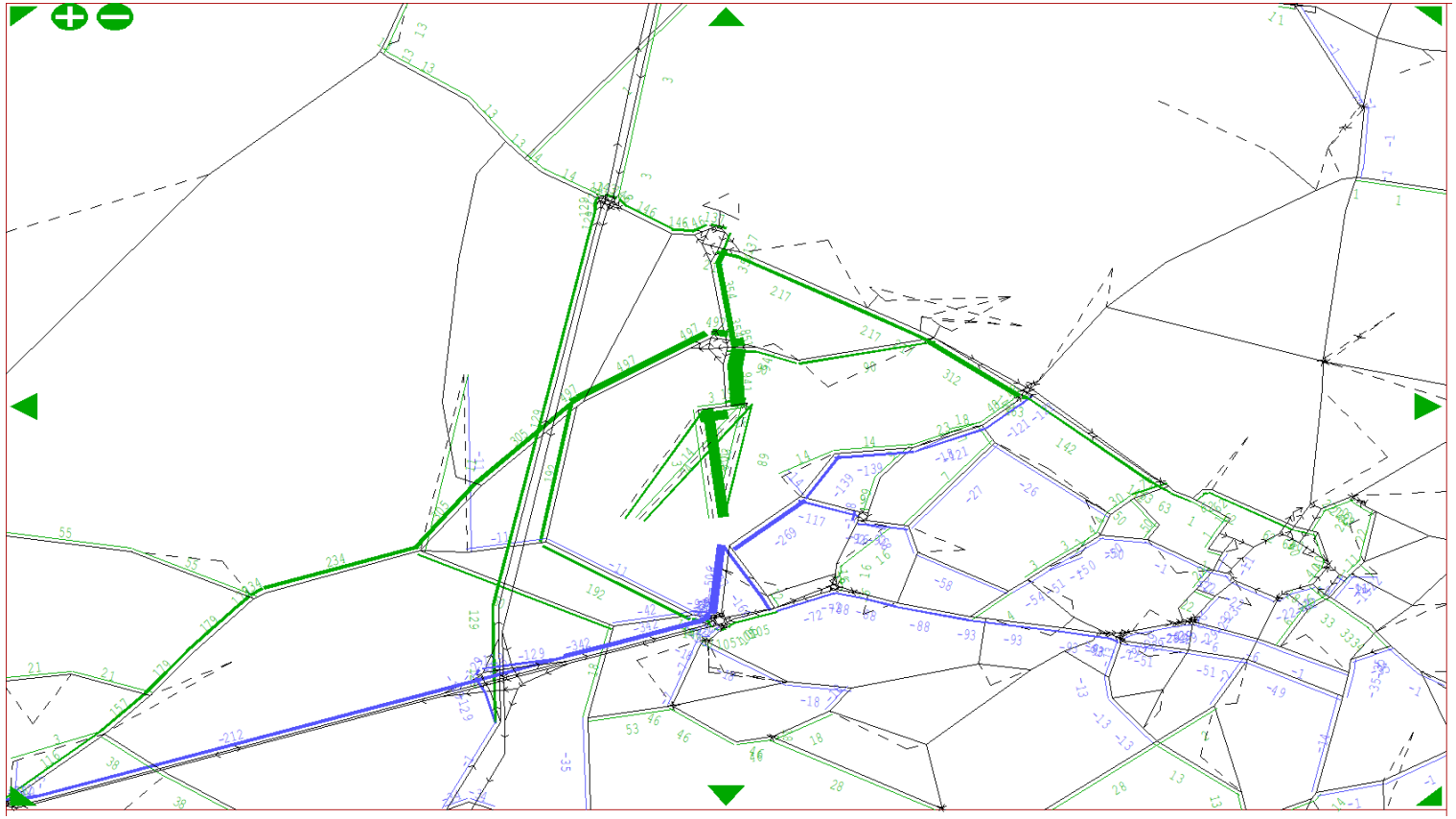

Figure A1.2 – West Cheltenham Development Zones Destination SLA Actual Flow Difference Plot, AM 2041(Sensitivity Test 1 minus Core)

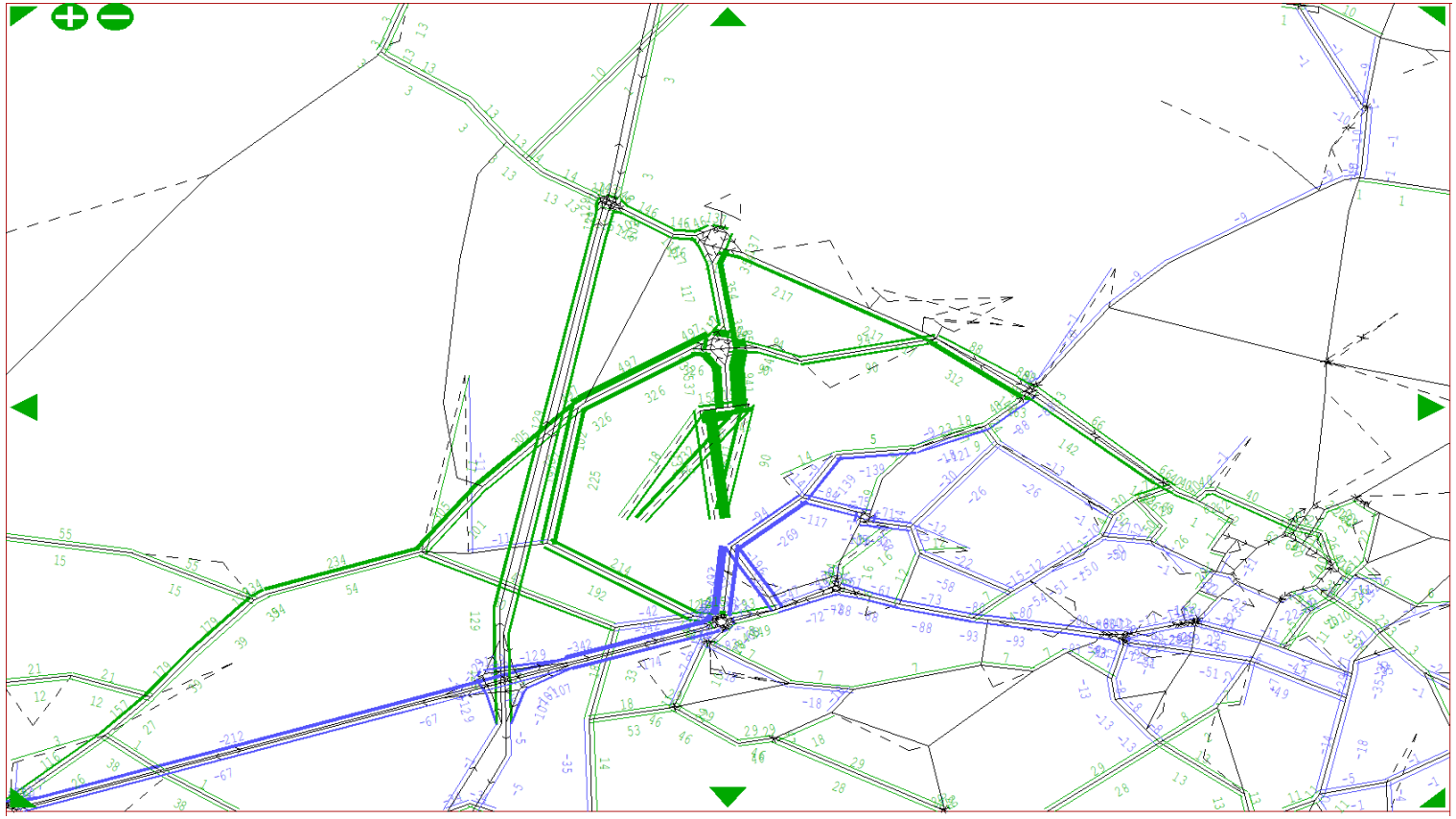

Figure A1.3 – West Cheltenham Development Zones SLA Actual Flow Difference Plot, AM 2041(Sensitivity Test 1 minus Core)

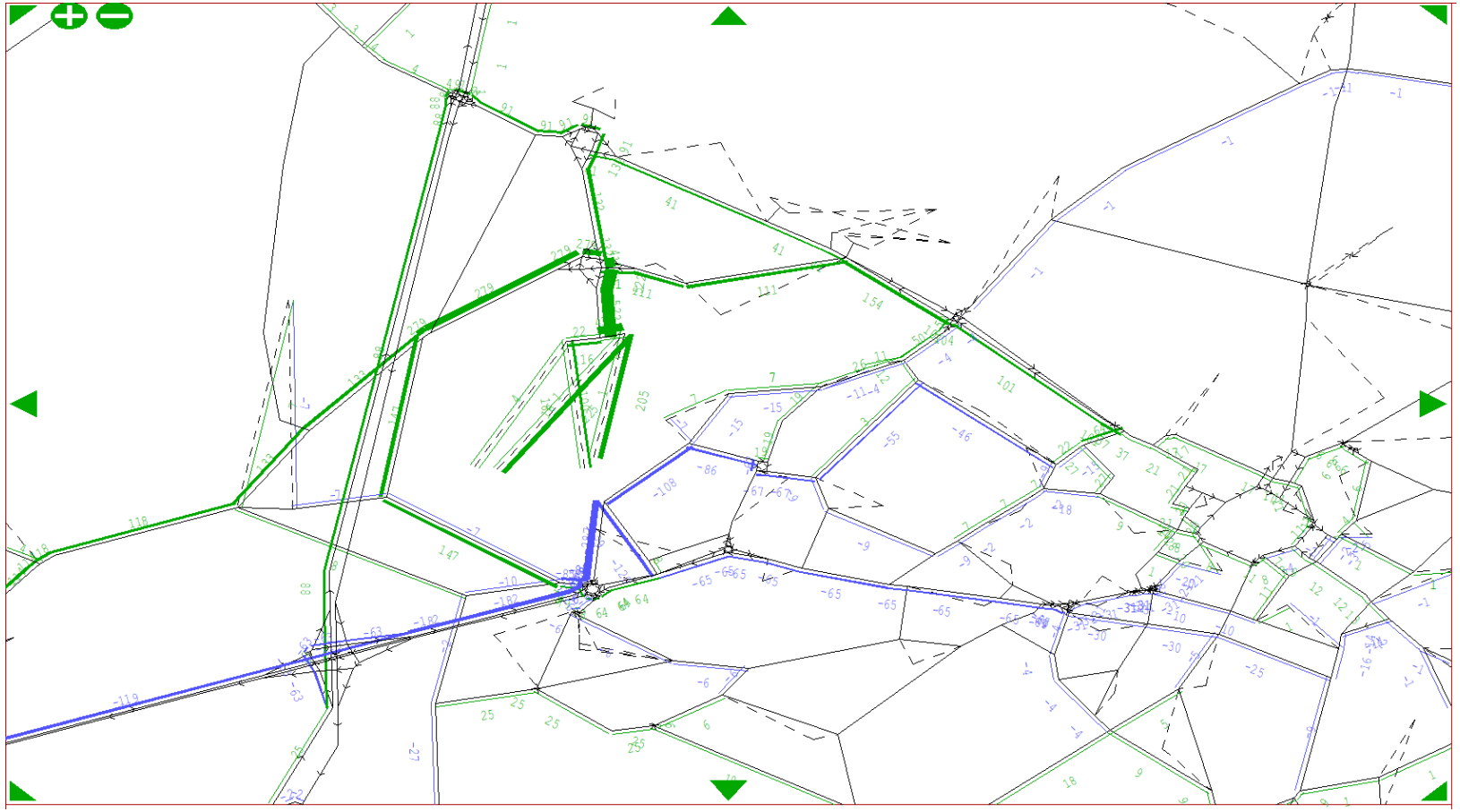

Figure A1.4 – West Cheltenham Development Zones Origin SLA Actual Flow Difference Plot, PM 2041 (Sensitivity Test 1 minus Core)

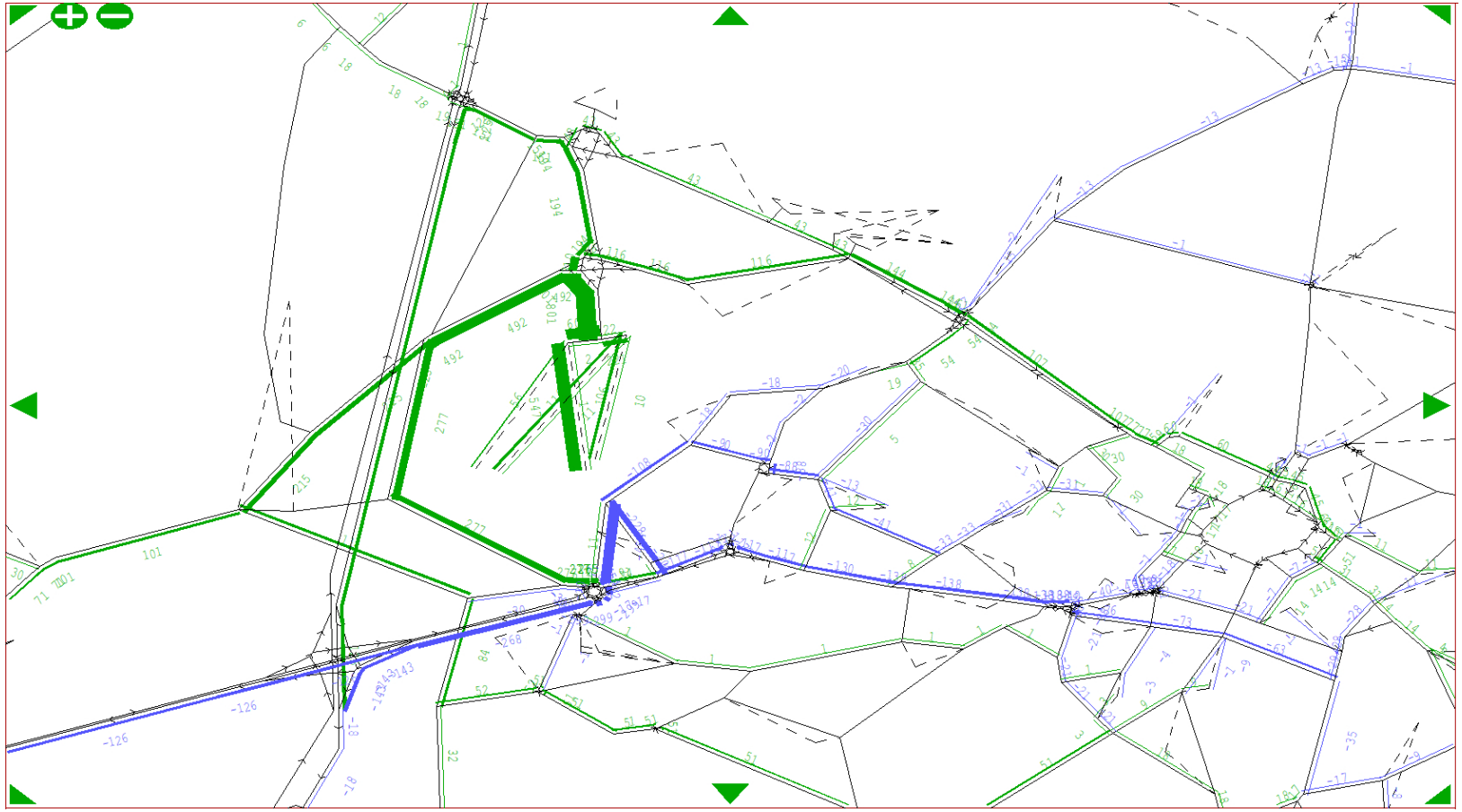

Figure A1.5 – West Cheltenham Development Zones Destination SLA Actual Flow Difference Plot, PM 2041(Sensitivity Test 1 minus Core)

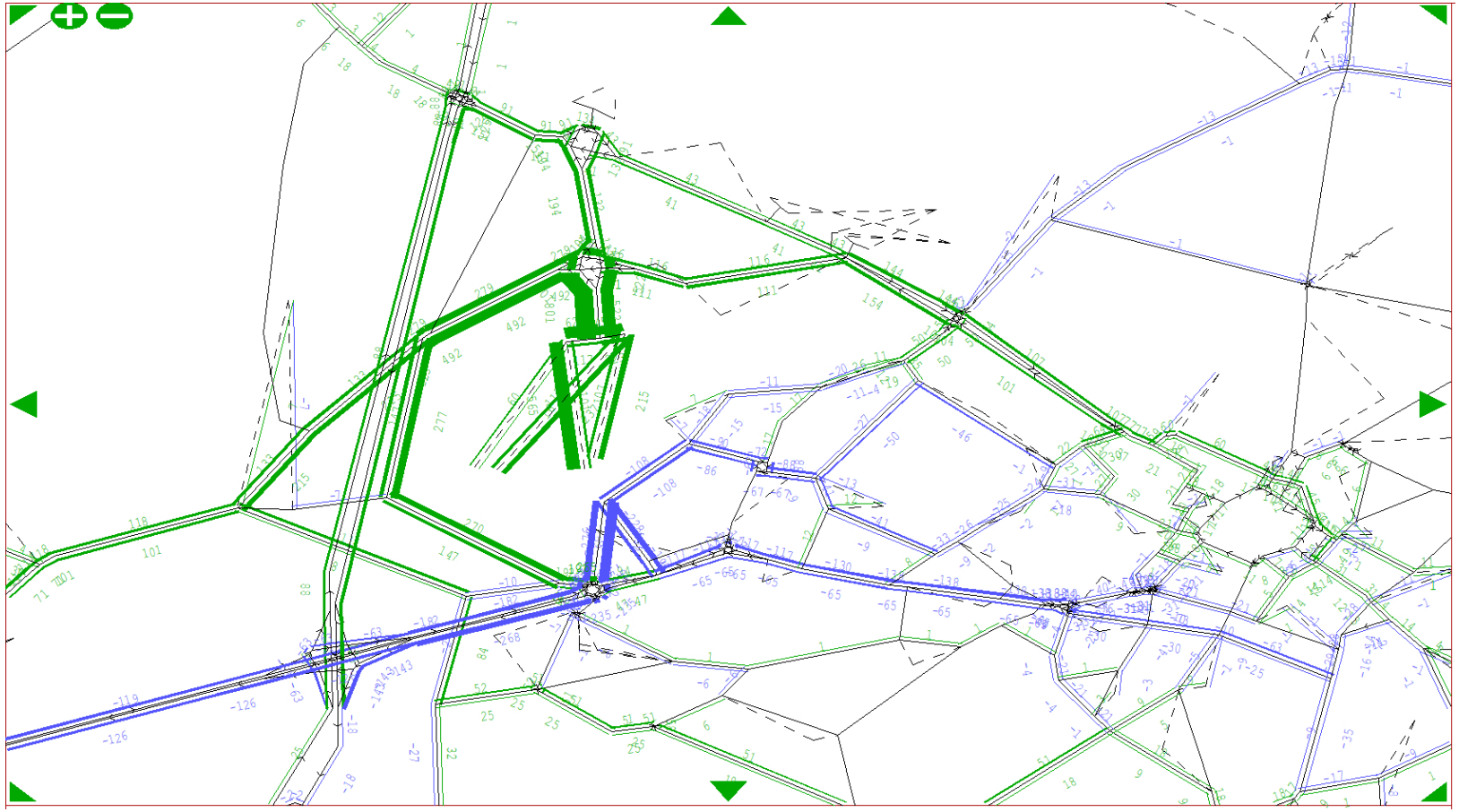

Figure A1.6 – West Cheltenham Development Zones SLA Actual Flow Difference Plot, PM 2041(Sensitivity Test 1 minus Core)

A.2. Sensitivity Test 2 WC development flow difference

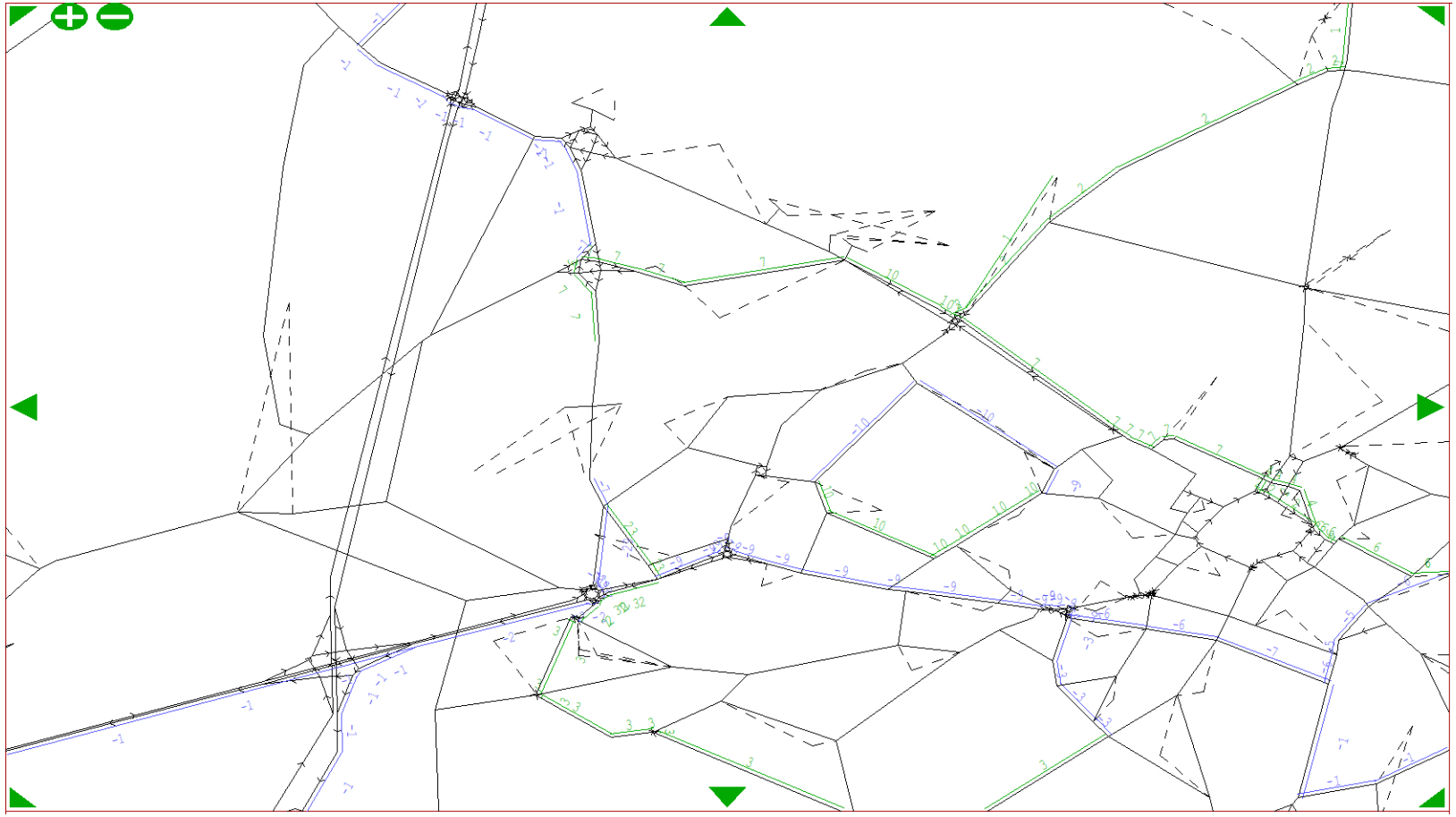

Figure A2.1 – West Cheltenham Development Zones Origin SLA Actual Flow Difference Plot, AM 2041 (Sensitivity Test 2 minus Core)

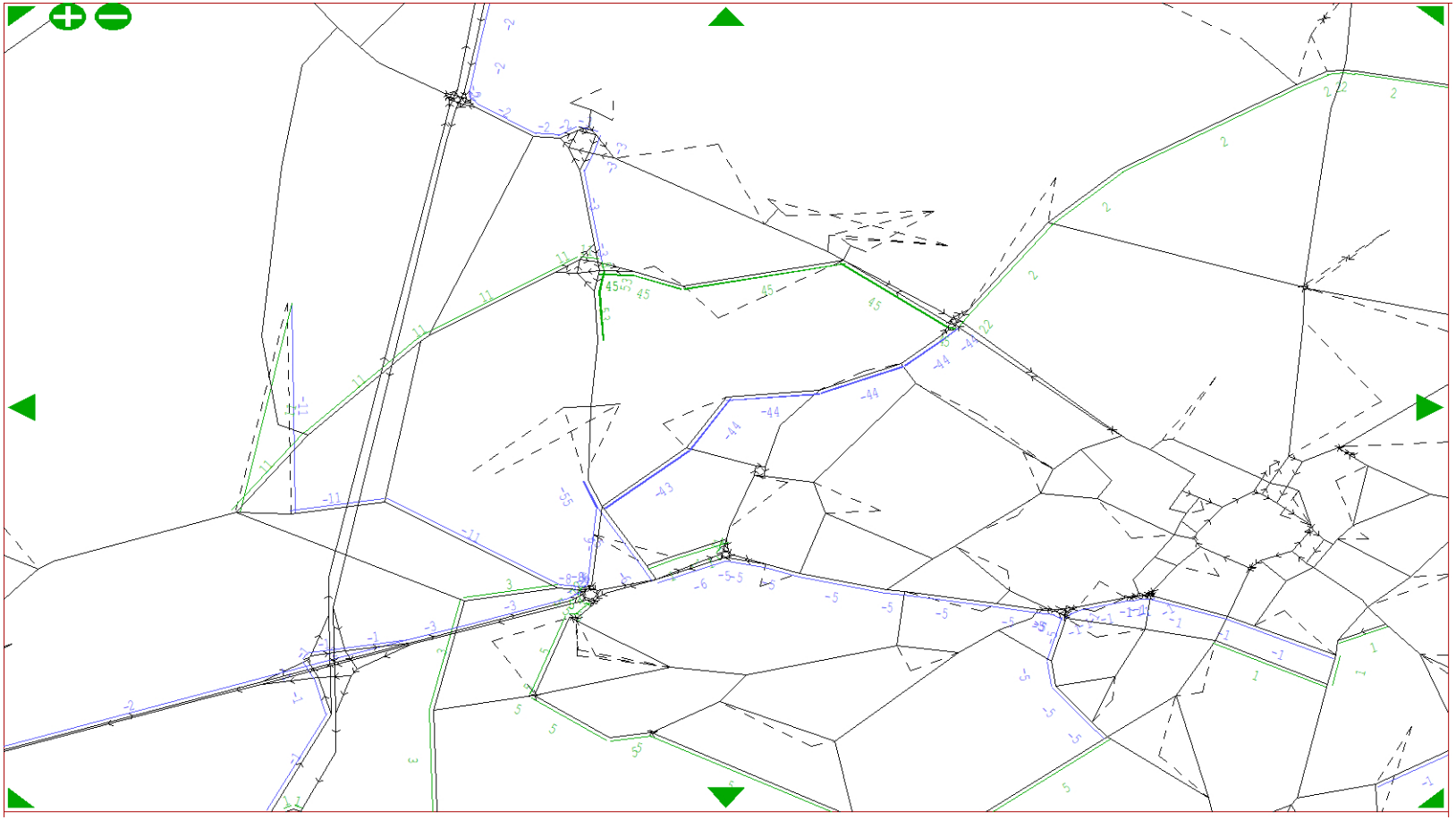

Figure A2.2 – West Cheltenham Development Zones Destination SLA Actual Flow Difference Plot, AM 2041 (Sensitivity Test 2 minus Core)

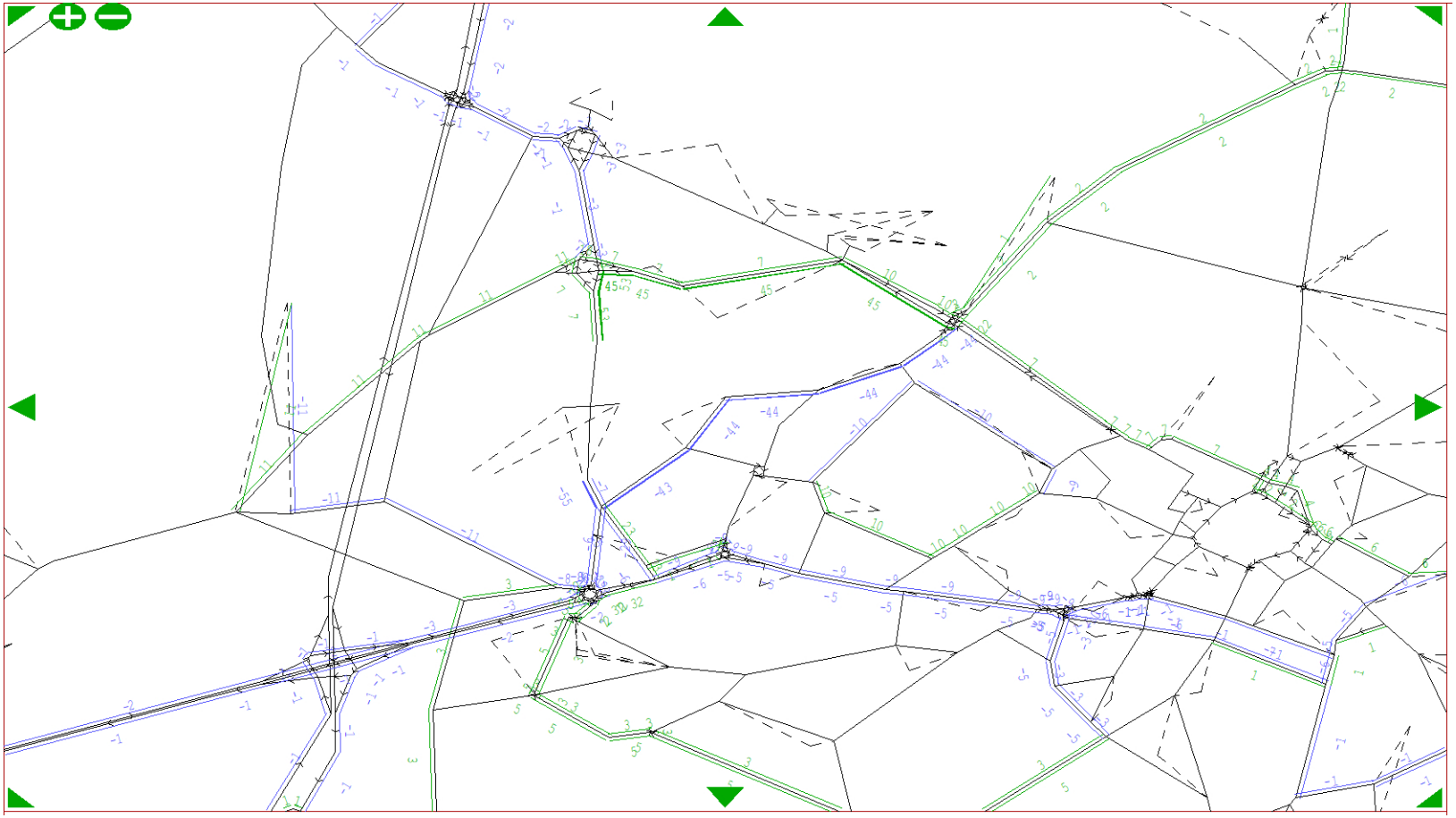

Figure A2.3 – West Cheltenham Development Zones SLA Actual Flow Difference Plot, AM 2041 (Sensitivity Test 2 minus Core)

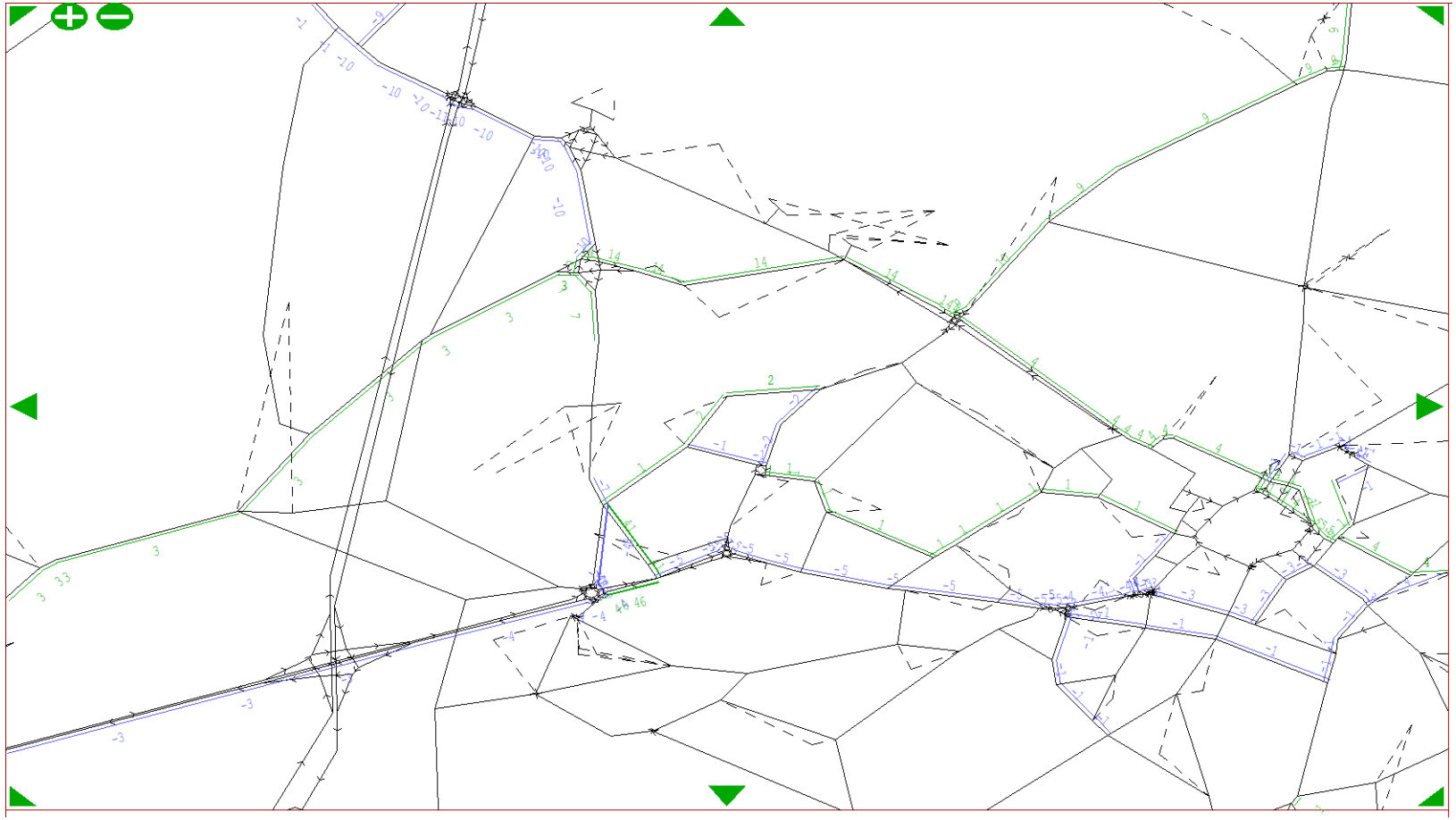

Figure A2.4 – West Cheltenham Development Zones Origin SLA Actual Flow Difference Plot, PM 2041 (Sensitivity Test 2 minus Core)

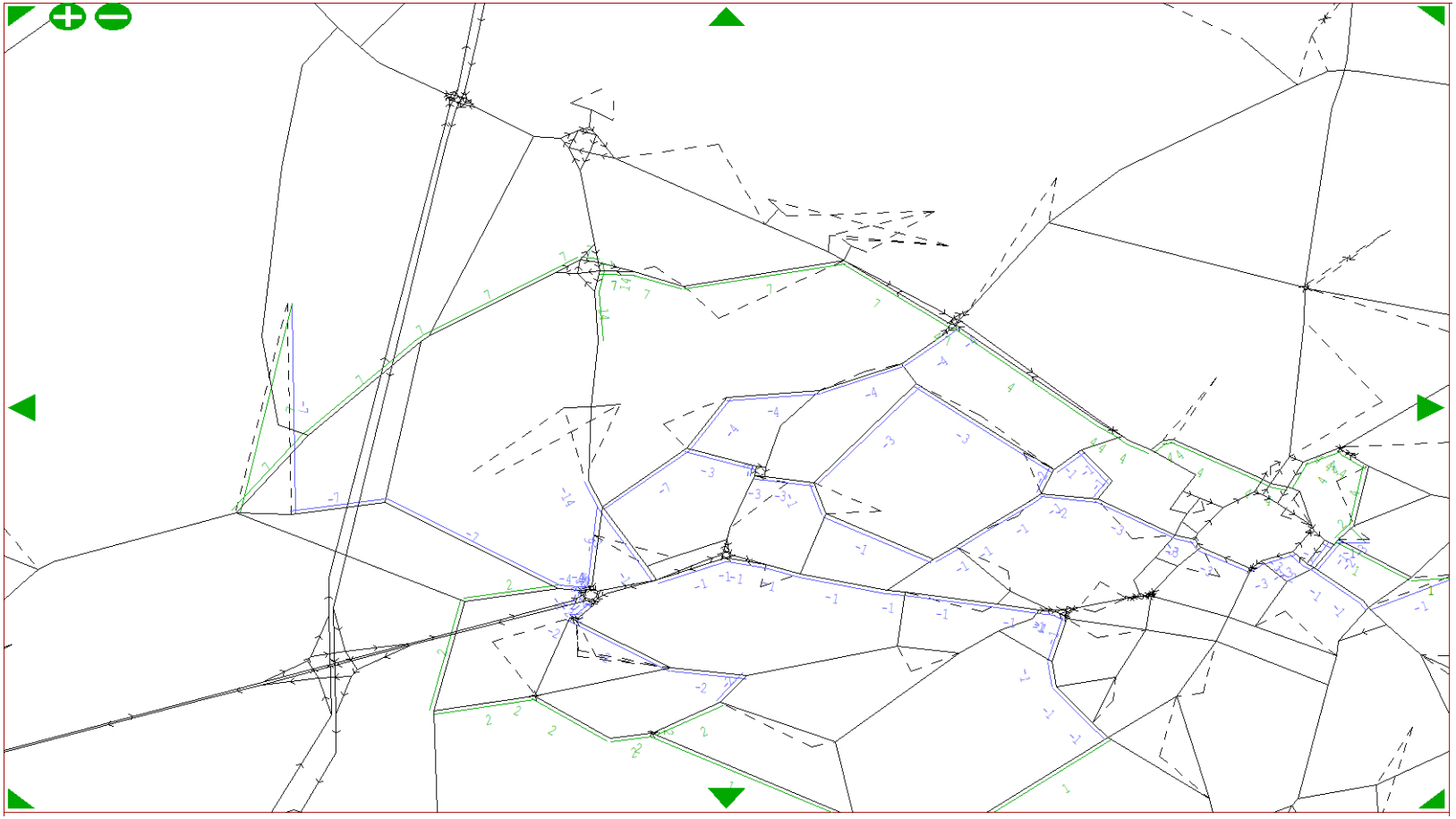

Figure A2.5 – West Cheltenham Development Zones Destination SLA Actual Flow Difference Plot, PM 2041 (Sensitivity Test 2 minus Core)

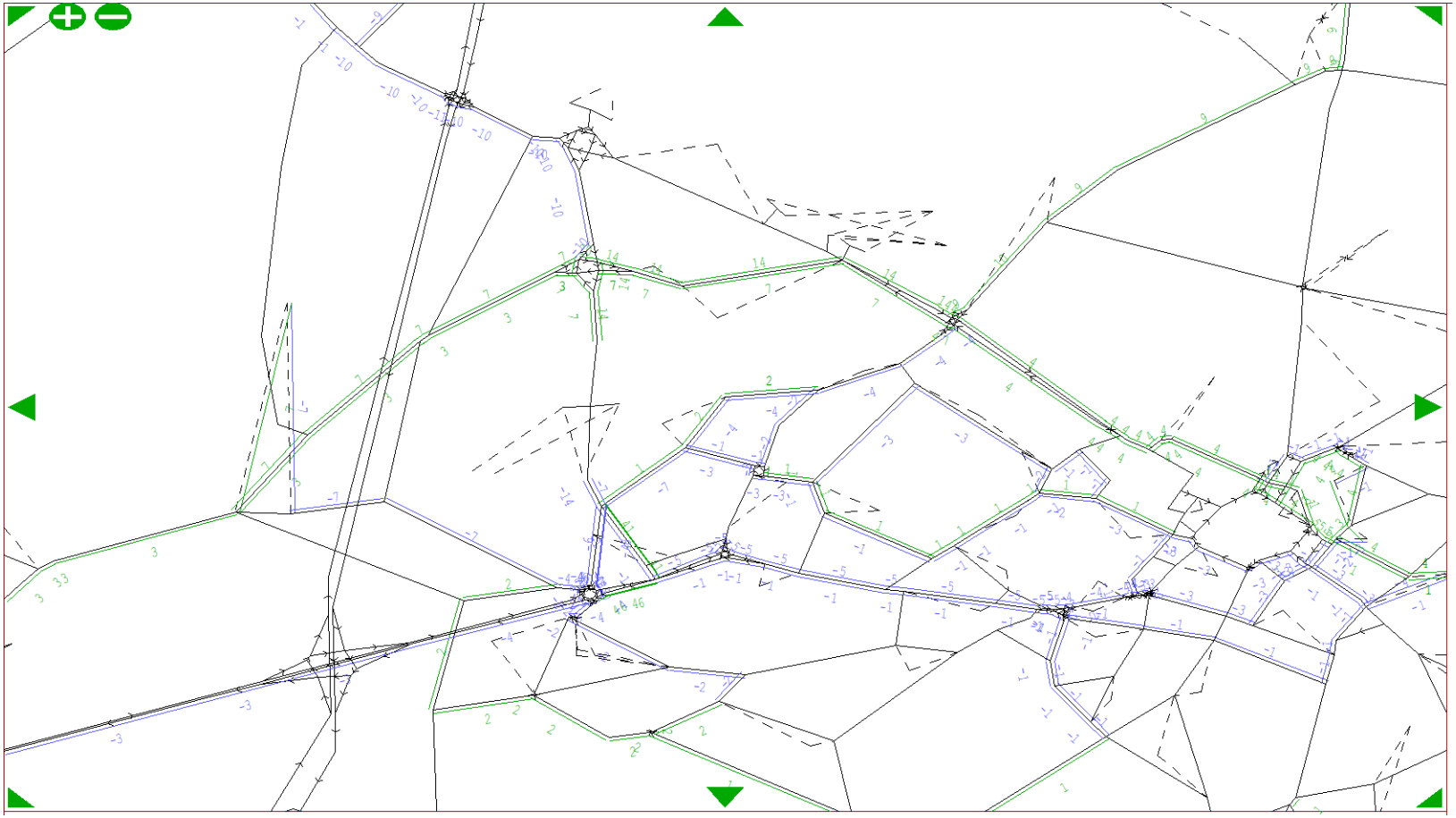

Figure A2.6 – West Cheltenham Development Zones SLA Actual Flow Difference Plot, PM 2041 (Sensitivity Test 2 minus Core)

Appendix B. West Cheltenham Link Road Route Corridors Drawing

B.1. West Cheltenham Link Road Route Corridor Assessment {Ref. GCCM5J10-ATK-HGN-L2-SK-CH-001004_C01}

DO NOT SCALE

Millimetres 0 10 100

1600m

700m

450m

100m

No Route Corridors in this location due to avoidance of direct property impacts

Link Road Corridor 4
1. Distance from M5J10 to West Cheltenham Access is 3400m
2. Route corridor length is 700m

Link Road Corridor 1
1. Distance from M5J10 to West Cheltenham Access is 2700m
2. Route corridor length is 2000m

Link Road Corridor 2
1. Distance from M5J10 to West Cheltenham Access is 2500m
2. Route corridor length is 1700m

Link Road Corridor 3
1. Distance from M5J10 to West Cheltenham Access is 2100m
2. Route corridor length is 1400m

Scheduled Monument

WEST CHELTENHAM DEVELOPMENT ACCESS

A 4019

M 5

B 4634

OLD GLOUCESTER ROAD

Hayden

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.

KEY

FLOOD ZONE 2 (1000 YEAR FLOODING)

FLOOD ZONE 3 (100 YEAR FLOODING)

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description: First Issue

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	C01	SL	NKRP	CJ	LJ	09/04/21

Drawing Suitability: APPROVED - PUBLISHED — Status: A1

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Client: Gloucestershire County Council

Project Title: M5 J10 Improvements Scheme

Drawing Title: LINK ROAD ROUTE CORRIDOR ASSESSMENT

Drawing Number

Project	Originator	Volume	Location	Type	Role	Number
GCCM5J10 - L2	ATK	- HGN -		SK	CH	001004

Original Size:	Scale:	Project Ref. No:	Sheet:	Rev:
A1	NTS	5197035	1 of 1	C01

This Drawing is saved on ProjectWise. Plotted: 12/04/2021 11:30:32 By: PALL5496

Appendix C. Withybridge Lane Option Drawings

C.1. Withybridge Lane Option 1 (Sheet 1 of 2) {Ref. GCCM5J10-ATK-HGN-L2-SK-CH-001002_C02}

C.2. Withybridge Lane Option 1 (Sheet 2 of 2) {Ref. GCCM5J10-ATK-HGN-L2-SK-CH-001003_C02}

C.3. Withybridge Lane Option 2 (Sheet 1 of 2) {Ref. GCCM5J10-ATK-HML-L2-SK-CH-001006_C02}

C.4. Withybridge Lane Option 2 (Sheet 2 of 2) {Ref. GCCM5J10-ATK-HML-L2-SK-CH-001007_C02}

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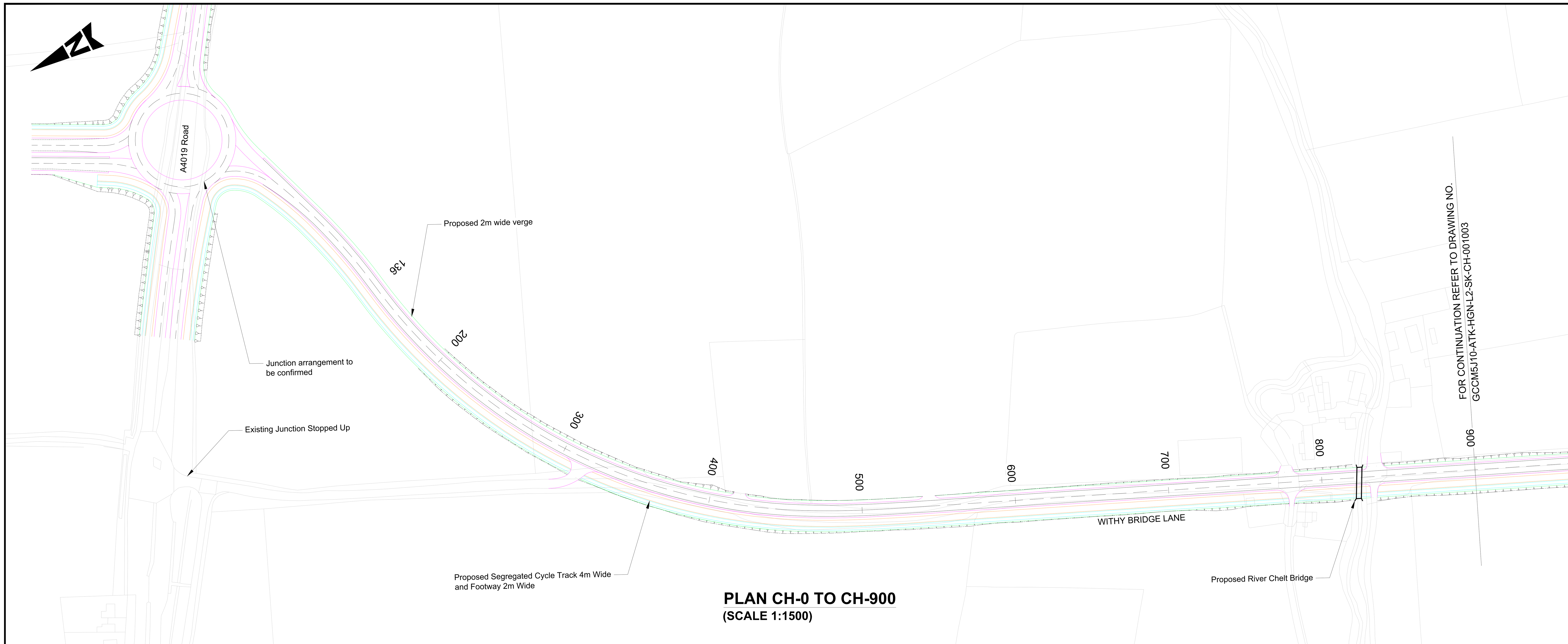

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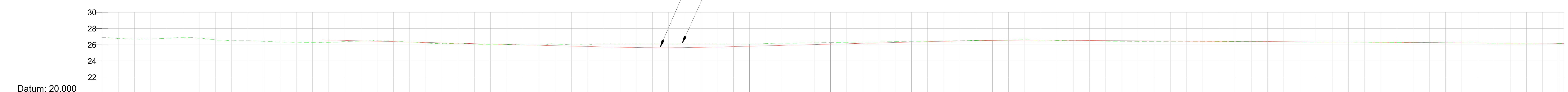

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CHAINAGE	DESIGN LEVELS	EXISTING LEVELS
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180.000	26.391	26.468
190.000	26.341	26.329
200.000	26.291	26.222
210.000	26.241	26.143
220.000	26.191	26.167
230.000	26.141	26.078
240.000	26.091	26.055
250.000	26.041	26.038
260.000	25.991	25.996
270.000	25.941	25.951
280.000	25.891	26.092
290.000	25.841	26.002
300.000	25.791	25.967
310.000	25.741	26.128
320.000	25.692	26.126
330.000	25.656	26.125
340.000	25.637	26.124
350.000	25.634	26.122
360.000	25.649	26.121
370.000	25.679	26.128
380.000	25.726	26.126
390.000	25.776	26.125
400.000	25.826	26.124
410.000	25.876	26.122
420.000	25.926	26.121
430.000	25.976	26.119
440.000	26.026	26.118
450.000	26.076	26.116
460.000	26.126	26.115
470.000	26.176	26.144
480.000	26.226	26.190
490.000	26.276	26.218
500.000	26.326	26.247
510.000	26.376	26.447
520.000	26.426	26.476
530.000	26.471	26.505
540.000	26.508	26.534
550.000	26.535	26.562
560.000	26.554	26.591
570.000	26.564	26.619
580.000	26.564	26.573
590.000	26.556	26.533
600.000	26.544	26.506
610.000	26.531	26.479
620.000	26.519	26.452
630.000	26.506	26.425
640.000	26.493	26.397
650.000	26.481	26.402
660.000	26.468	26.410
670.000	26.456	26.409
680.000	26.443	26.402
690.000	26.431	26.394
700.000	26.418	26.386
710.000	26.406	26.379
720.000	26.393	26.371
730.000	26.381	26.363
740.000	26.368	26.355
750.000	26.356	26.348
760.000	26.343	26.336
770.000	26.330	26.324
780.000	26.318	26.312
790.000	26.305	26.300
800.000	26.293	26.288
810.000	26.280	26.275
820.000	26.268	26.263
830.000	26.255	26.251
840.000	26.243	26.239
850.000	26.230	26.227
860.000	26.218	26.215
870.000	26.205	26.203
880.000	26.193	26.190
890.000	26.180	26.178
900.000	26.167	26.166

PROFILE CH-0 TO CH-900
(SCALE H = 1:1000
V = 1:200)

Scale 1:1250
10m 0m 10m 30m 50m 70m 90m

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NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. ROAD MARKINGS ARE INDICATIVE.

Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description: First Issue						
Status A1	Revision C01	Drawn NKRP	Checked AV	Reviewed CCR	Authorised LJ	Issue Date 26/01/21
Description: ROUNDABOUT GEOMETRY UPDATED						
Status A1	Revision C02	Drawn AG	Checked HV	Reviewed CJ	Authorised LJ	Issue Date 12/04/21

Drawing Suitability: APPROVED - PUBLISHED
Status: A1

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Client
Gloucestershire COUNTY COUNCIL

Project Title
M5 J10 Improvements Scheme

Drawing Title
PLAN AND PROFILE
WITHY BRIDGE LANE
OPTION 1

Drawing Number
Project GCCM5J10 - Originator ATK - Volume HGN -
Location L2 - Type SK - Role CH - Number 001002

Original Size: A1 | Scale: AS SHOWN | Project Ref. No: 5197035 | Sheet: 1 of 2 | Rev: C02

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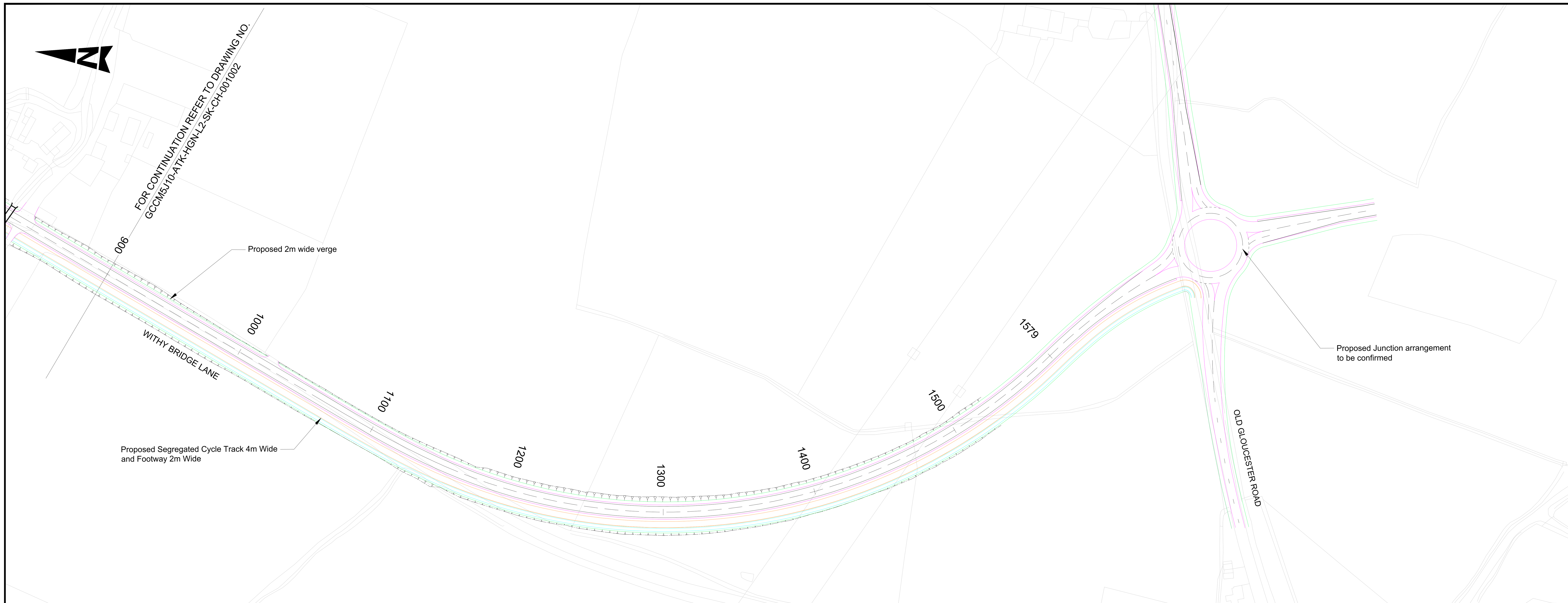

PLAN CH-900 TO CH-1709
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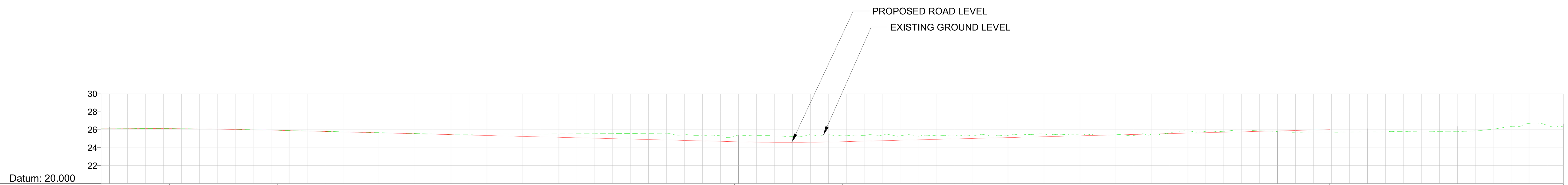

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HORIZONTAL CURVES: L: 93.000; R: 360.000, L: 423.113; JUNCTION AREA

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920.000	26.142	26.142
930.000	26.130	26.130
940.000	26.116	26.117
950.000	26.096	26.105
960.000	26.070	26.093
970.000	26.038	26.056
980.000	25.999	26.008
990.000	25.954	25.961
1000.000	25.905	25.914
1010.000	25.855	25.867
1020.000	25.805	25.820
1030.000	25.755	25.773
1040.000	25.705	25.725
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1060.000	25.604	25.631
1070.000	25.554	25.584
1080.000	25.504	25.537
1090.000	25.454	25.491
1100.000	25.404	25.500
1110.000	25.354	25.509
1120.000	25.304	25.518
1130.000	25.254	25.527
1140.000	25.204	25.536
1150.000	25.154	25.545
1160.000	25.104	25.554
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1370.000	24.975	25.396
1380.000	25.025	25.314
1390.000	25.075	25.315
1400.000	25.125	25.370
1410.000	25.175	25.479
1420.000	25.225	25.530
1430.000	25.275	25.494
1440.000	25.325	25.513
1450.000	25.375	25.397
1460.000	25.425	25.471
1470.000	25.475	25.356
1480.000	25.525	25.515
1490.000	25.575	25.648
1500.000	25.625	25.880
1510.000	25.675	25.818
1520.000	25.725	25.824
1530.000	25.775	25.972
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PROFILE CH-900 TO CH-1709
(SCALE H = 1:1000
V = 1:200)

Scale 1:1250
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This Drawing is saved on ProjectWise. Plotted: 12/04/2021 18:29:05 By: PALL5496

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. ROAD MARKINGS ARE INDICATIVE.

Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
First Issue						
A1	C01	NKRP	AV	CCR	LJ	26/01/21
ROUNDABOUT GEOMETRY UPDATED						
A1	C02	AG	HV	CJ	LJ	12/04/21

Drawing Suitability: APPROVED - PUBLISHED
Status: A1

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Client: Gloucestershire COUNTY COUNCIL

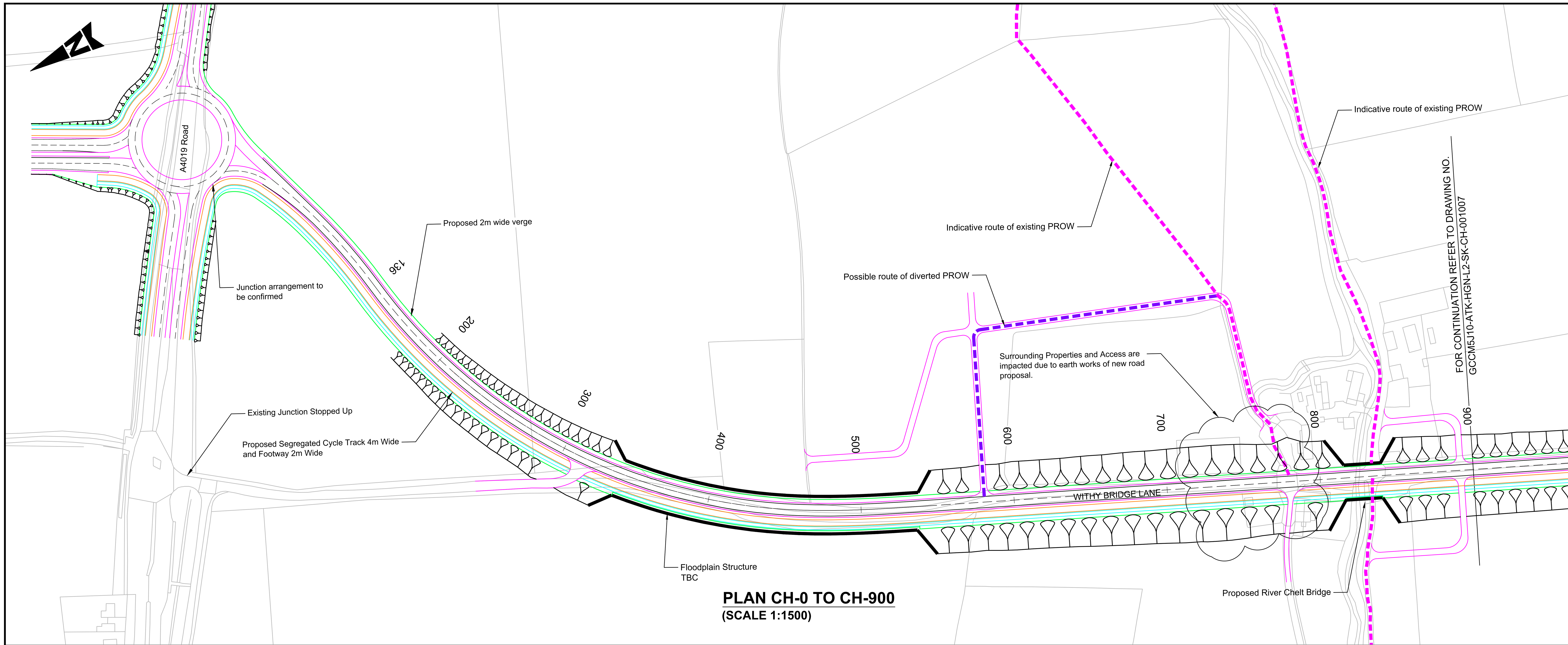
Project Title: M5 J10 Improvements Scheme

Drawing Title: PLAN AND PROFILE WITHY BRIDGE LANE OPTION 1

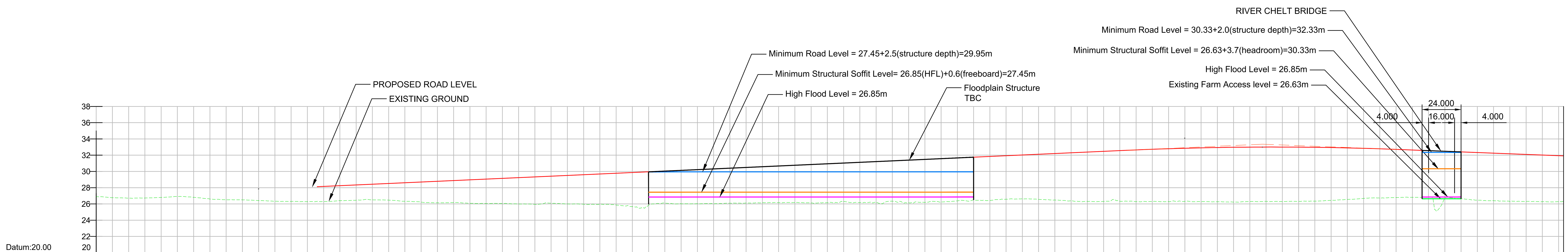
Drawing Number
Project: GCCM5J10 - Originator: ATK - Volume: HGN - Location: L2 - Type: SK - Role: CH - Number: 001003

Original Size: A1 | Scale: AS SHOWN | Project Ref. No: 5197035 | Sheet: 2 of 2 | Rev: C02

DO NOT SCALE



PLAN CH-0 TO CH-900
(SCALE 1:1500)



VERTICAL ALIGNMENT: JUNCTION AREA | G =0.900% L =504.150 | R =10000.000 L =167.243

HORIZONTAL CURVES: JUNCTION AREA | R: 360.000 L: 313.954 | L: 93.000 | L =519.933

CHAINAGE	DESIGN LEVELS	EXISTING LEVELS
140.000	28.151	26.293
150.000	28.241	26.402
160.000	28.331	26.453
170.000	28.421	26.502
180.000	28.511	26.468
190.000	28.601	26.329
200.000	28.691	26.222
210.000	28.781	26.143
220.000	28.871	26.167
230.000	28.961	26.078
240.000	29.051	26.055
250.000	29.141	26.038
260.000	29.231	25.996
270.000	29.321	25.951
280.000	29.411	26.092
290.000	29.501	26.002
300.000	29.591	25.967
310.000	29.681	25.959
320.000	29.771	25.869
330.000	29.861	25.667
340.000	29.951	25.851
350.000	30.041	26.119
360.000	30.131	26.023
370.000	30.221	26.022
380.000	30.311	26.016
390.000	30.401	26.084
400.000	30.491	26.118
410.000	30.581	26.137
420.000	30.671	26.156
430.000	30.761	26.171
440.000	30.851	26.111
450.000	30.941	26.143
460.000	31.031	26.293
470.000	31.121	26.173
480.000	31.211	26.152
490.000	31.301	26.339
500.000	31.391	26.138
510.000	31.481	26.195
520.000	31.571	26.223
530.000	31.661	26.373
540.000	31.751	26.497
550.000	31.841	26.434
560.000	31.931	26.578
570.000	32.021	26.617
580.000	32.111	26.558
590.000	32.201	26.478
600.000	32.291	26.386
610.000	32.381	26.323
620.000	32.471	26.314
630.000	32.561	26.343
640.000	32.649	26.277
650.000	32.728	26.301
660.000	32.798	26.290
670.000	32.857	26.317
680.000	32.906	26.275
690.000	32.945	26.265
700.000	32.974	26.225
710.000	32.993	26.295
720.000	33.002	26.318
730.000	33.002	26.283
740.000	32.991	26.324
750.000	32.970	26.338
760.000	32.939	26.422
770.000	32.898	26.551
780.000	32.847	26.678
790.000	32.787	26.728
800.000	32.716	26.781
810.000	32.639	26.816
820.000	32.561	26.813
830.000	32.484	26.712
840.000	32.407	26.634
850.000	32.330	26.470
860.000	32.252	26.392
870.000	32.175	26.299
880.000	32.098	26.309
890.000	32.021	26.283
900.000	31.943	26.274

PROFILE CH-0 TO CH-900
(SCALE H = 1:1000
V = 1:200)

Scale 1:1250 — 10m 0m 10m 30m 50m 70m 90m

This Drawing is saved on ProjectWise. Plotted: 12/04/2021 18:32:25 By: PALL5496

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. ROAD MARKINGS ARE INDICATIVE.

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
First Issue	A1	C01	NKRP	AV	CCR	LJ	26/01/21
ROUNDABOUT GEOMETRY UPDATED	A1	C02	AG	HV	CJ	LJ	12/04/21

Drawing Suitability: APPROVED - PUBLISHED — Status: A1

ATKINS
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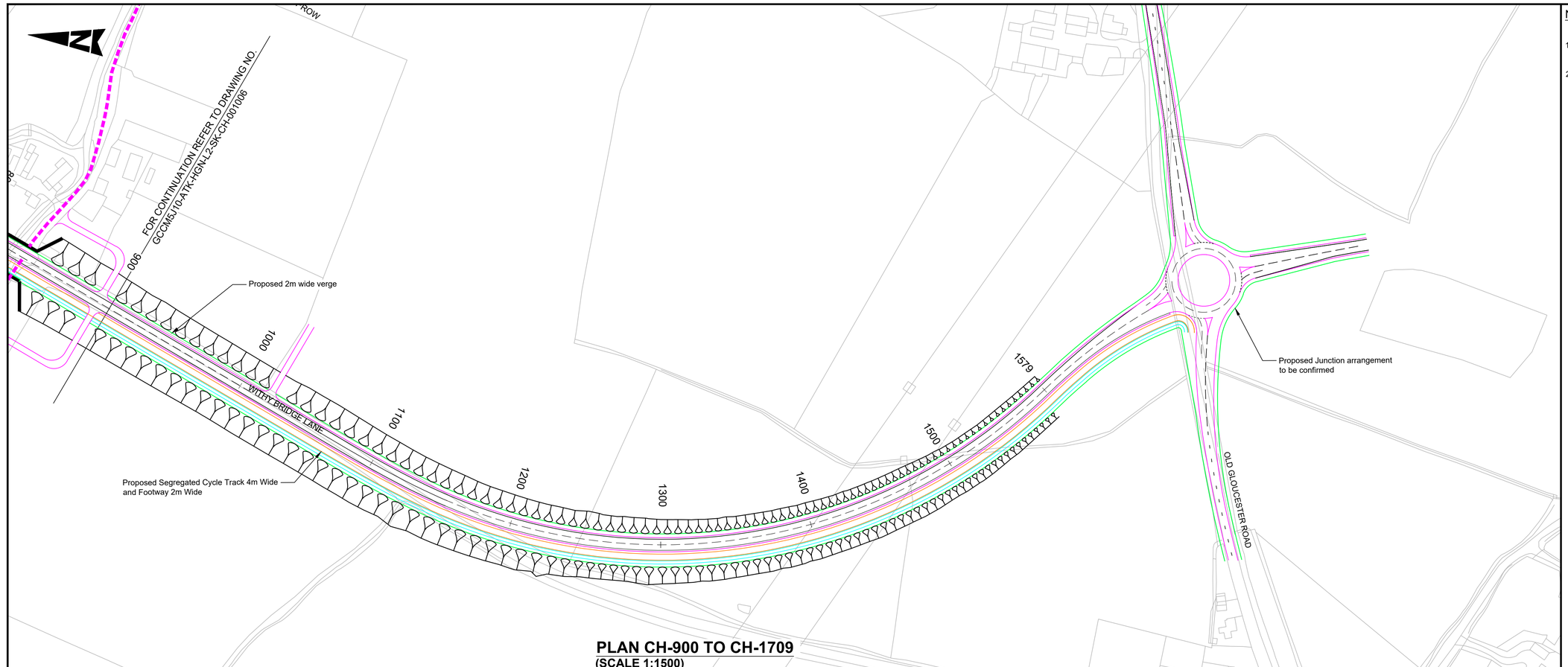
Client: Gloucestershire COUNTY COUNCIL

Project Title: M5 J10 Improvements Scheme

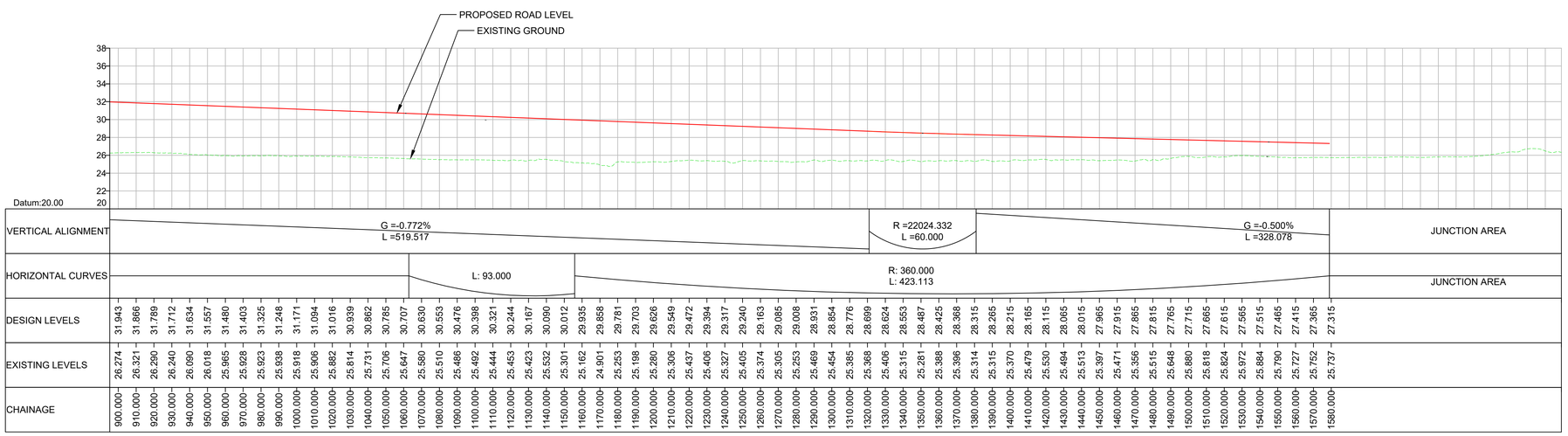
Drawing Title: PLAN AND PROFILE WITHY BRIDGE LANE OPTION 2

Drawing Number: Project GCCM5J10 - Originator ATK - Volume HML - Location L2 - Type SK - Role CH - Number 001006

Original Size: A1 | Scale: AS SHOWN | Project Ref. No: 5197035 | Sheet: 1 of 2 | Rev: C02



PLAN CH-900 TO CH-1709
(SCALE 1:1500)



PROFILE CH-900 TO CH-1709
(SCALE H = 1:1000
V = 1:200)

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. ROAD MARKINGS ARE INDICATIVE.

Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description	First Issue					
A1	C01	NKRP	AV	CCR	LJ	26/01/21
Description	ROUNDABOUT GEOMETRY UPDATED					
A1	C02	AG	HV	CJ	LJ	12/04/21

Drawing Suitability: APPROVED - PUBLISHED
Status: A1

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Client: Gloucestershire County Council

Project Title: M5 J10 Improvements Scheme

Drawing Title: PLAN AND PROFILE WITHY BRIDGE LANE OPTION 2

Drawing Number
Project: GCCM5J10 - Originator: ATK - Volume: HML - Location: L2 - Type: SK - Role: CH - Number: 001007

Original Size: A1 | Scale: AS SHOWN | Project Ref. No: 5197035 | Sheet: 2 of 2 | Rev: C02

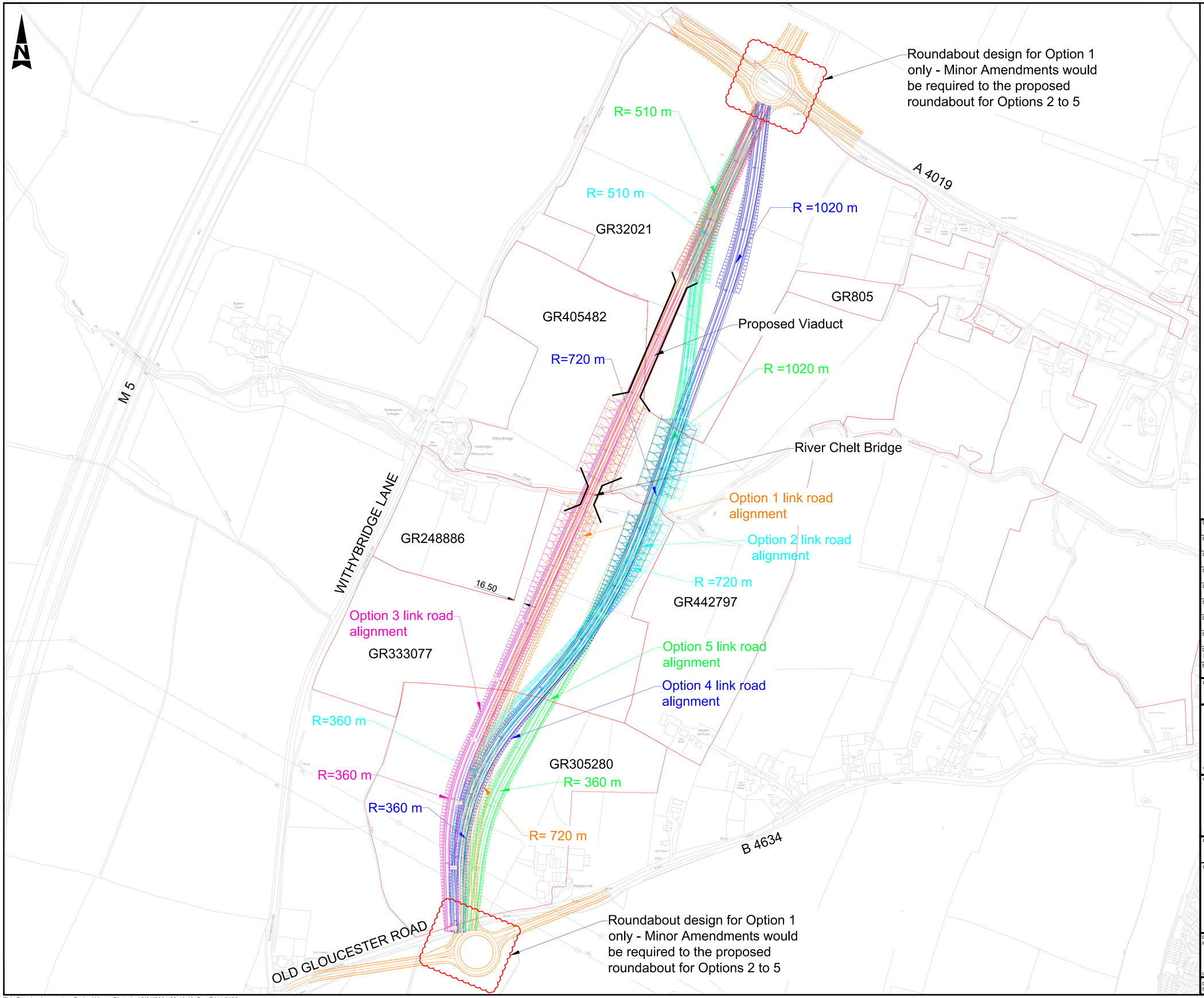
Scale 1:1250
10m 0m 10m 30m 50m 70m 90m

Appendix D. Route Corridor 3 West Cheltenham Link Road Alignment Options Drawing

D.1. West Cheltenham Link Road Horizontal Alignment Options {Ref. GCCM5J10-ATK-HGN-L2-SK-CH-001001_C01}

DO NOT SCALE

Millimetres 0 10 100



NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.

KEY:

- OPTION 1 ALIGNMENT
- OPTION 2 ALIGNMENT
- OPTION 3 ALIGNMENT
- OPTION 4 ALIGNMENT
- OPTION 5 ALIGNMENT

Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description	First Issue					
A1	C01	NKRP	CJ	CCR	LJ	15/01/21

Drawing Suitability: APPROVED - PUBLISHED

Status: A1

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Client: Gloucestershire County Council

Project Title: M5 J10 Improvements Scheme

Drawing Title: WEST CHELTENHAM LINK ROAD HORIZONTAL ALIGNMENTS OPTIONS

Drawing Number: Project GCCM5J10 L2 - Originator ATK - Volume HGN - - SK - CH - 001001

Location | Type | Role | Number

Original Size: A1 | Scale: NTS | Project Ref. No: 5197035 | Sheet: 1 of 1 | Rev: C01

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