

Crewe HS2 Hub Access Package Southern Link Road Bridge (SLRB) Access Options – Preferred Route Assessment

Preferred Route Assessment for Crewe HS2 Hub Access Package SLRB Access Options

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Crewe HS2 Hub Access Package SLRB Access Options

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1.1 Background

The arrival of HS2 brings huge opportunities for Crewe, the wider Borough and the North as a whole. Cheshire East Council (CEC) has prepared for the arrival of HS2 and the proposed new Crewe Hub Station by developing a new plan for Crewe; the Crewe HS2 Hub Area Action Plan (AAP).

The AAP sets out how we can manage and improve the local transport network in and around Crewe Station to reduce the congestion currently experienced at peak times, especially on Nantwich Road, and accommodate the impacts of the arrival of HS2 on the local network.

Even without the arrival of HS2 and the development of the Crewe HS2 Hub, traffic flows in Crewe are expected to increase. The six rail corridors passing through the town are a key constraint on the road network; creating bottlenecks and significant congestion due to a limited number of crossing opportunities. We have already delivered several road improvement schemes around Crewe to better manage traffic flows, together with improvements aimed at encouraging sustainable travel. More needs to be done to manage future traffic flows and reduce congestion to achieve our aim of making Crewe more attractive to visitors, shoppers and businesses. This is particularly relevant to Nantwich Road Bridge which is an important pedestrian and cyclist link between Crewe Station and the town centre.

An initial feasibility assessment was undertaken in 2018 to investigate potential locations for a new road bridge to provide an additional crossing over the railway corridor.

The preferred bridge location was confirmed as the Southern Link Road Bridge (SLRB); a proposed new road bridge south of Crewe Station between Weston Road and Gresty Road. The SLRB would provide an additional crossing point over the railway corridor, allowing us to better manage future traffic flows and reduce congestion around Crewe Station, including on Nantwich Road. This aligns with our aim of promoting an environment around Crewe Station that is safe, attractive and accessible for cyclists and pedestrians and other sustainable modes of transport.

Following confirmation of the preferred bridge location, eight access options were developed to connect SLRB to the local road network. Four access options were developed connecting SLRB to Gresty Road to the west and four connecting it to Weston Road to the east.

The eight access road options were presented at a Public Consultation in August / September 2019, with consultees requested to identify their preferred access option either side of the bridge. The intention of the Public Consultation was to gauge public interest in the scheme, capture public opinion of the eight access options presented and help identify any constraints/considerations which may have been previously overlooked. The Public Consultation strategy, key issues raised by members of the public and the results from a consultation questionnaire are presented in the Public Consultation Report.

1.2 Report Scope

This report brings together the findings and conclusions from previous assessment and appraisal work and establishes a Preferred Route for the SLRB access options.

This report documents the methodology used to define the Preferred Route. It provides the reasoning and justification for the decisions made in establishing the Preferred Route and explains the scoring/weighting system used to rank the eight options that were taken to Public Consultation.

Following feedback received from members of the public, modifications to the alignments taken to Public Consultation were developed. These alignment modifications were presented in the Public Consultation Report.

This report provides an assessment of the alignment modifications and provides reasoning and justification for any of the alignment modifications which have been incorporated into the Preferred Route Alignment.

1.3 Report Structure

Chapter 1 provides a background to the scheme and explains the scope of the report.

Chapter 2 provides an assessment of the eight access options taken to Public Consultation. A qualitative assessment is provided which appraises the access options against factors such as Access Option Cost, Local Business Community Endorsement, Public Endorsement, Engineering Constraints, Environmental Impacts and Traffic Constraints.

In addition, a corresponding quantitative assessment is presented, where scores have been assigned to each access option. Each of the assessment topics/factors have been weighted based on their relative importance and significance. The rationale used to weight the individual factors is also explained. Chapter 2 concludes by summarising the assessments and provides a decision as to which access options should be endorsed as the Preferred Route.

Chapter 3 documents the findings of the initial feasibility assessment undertaken in 2018 to confirm the preferred bridge location. This chapter also documents the alignment modifications which have been incorporated in the preferred route alignment following feedback from the Public Consultation. The alignment modifications which were shown to be an improvement on the existing design have been incorporated into the Preferred Route.

Chapter 4 summarises the local junction improvements on the surrounding highway network required in addition to SLRB to support delivery of the Area Action Plan (AAP).

Chapter 5 brings together the findings from the numerous assessments and appraisals which have been conducted and presents a Preferred Route for the Southern Link Road Bridge Access Options.

1.4 Purpose of Report

The purpose of this report is to inform a Preferred Route Announcement Cabinet Paper, which is to be prepared by Cheshire East Council in anticipation of the November 2019 Cabinet Meeting.

2

Assessment of Options Presented at Public Consultation

2.1 Introduction to Assessment

This Chapter documents the assessment of the eight access road options presented at the Public Consultation and provides a decision as to which options should be adopted as the Preferred Route.

2.2 Qualitative Assessment of Link Road Options

The qualitative assessment of the eight link road options was carried out using findings from other reports and sources of information. A description of the assessment criteria is provided below.

- **Access Option Cost** – anticipated comparative costs associated to land acquisition required for each access option*.
- **Disruption to Directly Impacted Local Businesses** – anticipated direct impact / disruption to local businesses including potential impacts to property and property accesses.
- **Local Business Community Endorsement** – taken from the Public Consultation Report.
- **Public Endorsement** – taken from the Public Consultation Report.
- **Accessibility (including Non-Motorised Users)** – provision of new infrastructure improving accessibility for Non-Motorised users (including length of alignment and vertical grade).
- **Engineering Constraints** – consideration of potential physical / environmental constraints and additional cost / risk items.
- **Road User Safety** - determined from design checks carried out on each access option road alignment design.
- **Constructability** - anticipated compatibility of proposed access option for launched bridge construction approach (including requirements for additional temporary works) and other constructability considerations.
- **Environmental Impacts** – taken from the Environmental Assessment Technical Note for the Preferred Route Assessment Report.
- **Traffic Constraints** - suitability of proposed junction location and anticipated strategic level impact to local road network performance.

** It is noted construction costs for each of the four western options are anticipated to be similar when considered in order of magnitude which is appropriate at this early stage of design. This is due to each option being generally similar in terms of overall length and vertical profile. The key item that will differentiate between the cost of each access option is associated land acquisition costs, and these initial land and compensation estimates are used for the purposes of comparative assessment of the*

access option costs as presented in this report. The same approach is applicable to the four eastern access options.







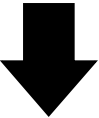
The eight access options were assigned indicative arrow symbols which signified how each option performed against each of the defined assessment criteria. The scoring was based on a simple 7-point scale as defined by the qualitative assessment table below.

The eight access road options as presented at a Public Consultation in August / September 2019 are provided for reference in Appendix A. The initial feasibility level access option engineering design drawings developed to validate design feasibility for each option are included in Appendix B.









Southern Link Road Bridge









Qualitative Assessment of Options Taken to Public Consultation









KEY









						
Extremely Beneficial	Significantly Beneficial	Beneficial	Neutral	Adverse	Significantly Adverse	Extremely Adverse





WEST ALIGNMENT OPTIONS





Topic / Factor	West 1	West 2	West 3	West 4
Access option cost				
Disruption to Directly Impacted Local Businesses				
	Impacts Unipart distribution warehouse and Crewe Alexandra car park. Possible disruption to Crewe Alexandra / Unipart HGV access off Gresty Road.	Impacts Unipart distribution warehouse and Crewe Alexandra car park. Impacts access to small businesses from Gresty Road.	Impacts small businesses accessed from Gresty Road. Impacts Unipart distribution warehouse and northern area of site.	Impacts small businesses accessed from Gresty Road. Impacts Unipart distribution warehouse and dissects wider Unipart site (likely requiring acquisition of full site).

Topic / Factor	West 1	West 2	West 3	West 4
Local Business Endorsement				
	<p>Summary of Engagement with Directly Impacted Local Businesses</p> <p>CEC held meeting with Crewe Alexandra on 14/06/2019. No formal consultation response received but indicated during meeting generally supportive of the overall scheme. No real preference on western alignment options.</p> <p>CEC met with Mr Bayman (landlord of plot containing several small business) at consultation event held on 08/08/2019. No formal consultation response received but indicated during discussions generally supportive of the overall scheme. No real preference on western alignment options.</p> <p>CEC held meetings with Unipart 17/05/2019 and 07/06/2019. Formal consultation response provided by Unipart indicating preference for West 1 or West 2. Least preferred option was West 4 due to alignment dissecting wider Unipart site, potentially requiring full relocation. Generally supportive of the overall scheme.</p> <p>Formal representations were made by Locomotive Storage Limited on 01/09/2019. Concerns were raised regarding how the proposed Southern Link Road overbridge crosses the northern end of their site. Also noted that locating of bridge related structures (e.g. piers) within the leasehold site would potentially curtail their present and future railway operations. Preference for cable stayed bridge option indicated due to potential to avoid requiring a bridge pier within the leasehold site. No preference indicated with regards to preferred alignment options.</p>			
Public Endorsement				
	Of all the questionnaire responses which indicated a preferred access option (i.e. excluding those that indicated no preference) 17% were in support of West 1. This information is taken from the Public Consultation Report.	Of all the questionnaire responses which indicated a preferred access option (i.e. excluding those that indicated no preference) 48% were in support of West 2. This information is taken from the Public Consultation Report.	Of all the questionnaire responses which indicated a preferred access option (i.e. excluding those that indicated no preference) 6% were in support of West 3. This information is taken from the Public Consultation Report.	Of all the questionnaire responses which indicated a preferred access option (i.e. excluding those that indicated no preference) 29% were in support of West 4. This information is taken from the Public Consultation Report.





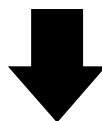
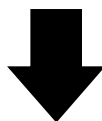


Topic / Factor	West 1	West 2	West 3	West 4
Accessibility (Non-Motorised Users)				
	<p>Provides new crossing of railway corridor with pedestrian and cyclist facilities, improving sustainable transport connectivity in the surrounding areas. Links well to Crewe Station.</p> <p>Third shortest route (205m) with equal second flattest approach gradient (4 to 5%).</p>	<p>Provides new crossing of railway corridor with pedestrian and cyclist facilities, improving sustainable transport connectivity in the surrounding areas. Links well to Crewe Station.</p> <p>Shortest route (180m) with steepest approach gradient (5 to 6%).</p>	<p>Provides new crossing of railway corridor with pedestrian and cyclist facilities, improving sustainable transport connectivity in the surrounding areas.</p> <p>Second shortest route (200m) with equal second flattest approach gradient (4 to 5%).</p>	<p>Provides new crossing of railway corridor with pedestrian and cyclist facilities, improving sustainable transport connectivity in the surrounding areas.</p> <p>Longest route (285m) with flattest approach gradient (2 to 3%).</p>
Engineering Constraints				
	<p>From review of available utilities search information, it is a similar level of impact to existing utilities is anticipated for each of the access options, with diversions required where SLRB ties back into Gresty Road.</p> <p>From review of Preliminary Sources Study Report (PSSR) BRJ10614-JAC-GEN-00-RP-CE-002, risks associated to contaminated land and unknown ground conditions are anticipated to be reasonably consistent across each of the access options.</p> <p>The vertical alignment of each option allows provision of an underpass arrangement with 5.4m vertical clearance at western end of SLRB. This maintains HGV access from Gresty Road to the wider Unipart site.</p>			









Topic / Factor	West 1	West 2	West 3	West 4
Road User Safety				
	<p>Tight horizontal geometry on approach to / departure from bridge. Adopts minimum radius of 41m (equivalent to 30mph (48kph) design speed and curve radius 4 steps below TD 9/93 desirable minimum in accordance with Manual for Streets 2 (MfS2) Table 8.1).</p> <p>Design speed (48kph) is equal to the posted speed (30mph), as per MfS2 Paragraph 8.2.3.</p> <p>Local verge widening likely to be required to achieve stopping sight distance (SSD) sight lines.</p>	<p>Straight alignment on approach to / departure from bridge without any horizontal curvature.</p> <p>Horizontal geometry suitable for design speed of 60kph (in accordance with TD 9/93 Table 2 based on 30mph posted speed).</p>	<p>Tight horizontal geometry on approach to / departure from bridge. Adopts minimum radius of 53m (equivalent to 30mph (48kph) design speed and curve radius 4 steps below TD 9/93 desirable minimum in accordance with Manual for Streets 2 (MfS2) Table 8.1).</p> <p>Design speed (48kph) is equal to the posted speed (30mph), as per MfS2 Paragraph 8.2.3.</p> <p>Local verge widening likely to be required to achieve stopping sight distance (SSD) sight lines.</p>	<p>Tight horizontal geometry on approach to / departure from bridge. Adopts minimum radius of 41m (equivalent to 30mph (48kph) design speed and curve radius 4 steps below TD 9/93 desirable minimum in accordance with Manual for Streets 2 (MfS2) Table 8.1).</p> <p>Design speed (48kph) is equal to the posted speed (30mph), as per MfS2 Paragraph 8.2.3.</p> <p>Local verge widening likely to be required to achieve stopping sight distance (SSD) sight lines.</p>
Constructability				









Topic / Factor	West 1	West 2	West 3	West 4
	<p>Significant temporary works likely to be required for launched bridge construction.</p> <p>Craned construction solution may be preferred, potentially requiring increased construction duration.</p>	<p>No significant temporary works required for launched bridge construction. Design alignment would allow earthworks embankment to be utilised during launching operations.</p>	<p>Significant temporary works likely to be required for launched bridge construction.</p> <p>Craned construction solution may be preferred, potentially requiring increased construction duration.</p>	<p>Significant temporary works likely to be required for launched bridge construction.</p> <p>Craned construction solution may be preferred, potentially requiring increased construction duration.</p>
Environmental Impacts				
	<p>Whilst each access option has been ranked, it is noted that the material differences between the impacts of each option are largely nominal in the overall scheme of the project. The notable difference to this is the potential impacts of West 3 and West 4 to local heritage assets and for this reason these options are considered as adverse in their assessment.</p>			
	<p>Ranked second out of four western options in terms of lowest environmental impact.</p> <p>Refer Environmental Technical Note for Crewe HS2 Hub Access Package SLRB Access Options (BRJ10614-JAC-EGN-00-RP-LE-0001).</p>	<p>Ranked first out of four western options in terms of lowest environmental impact.</p> <p>Refer Environmental Technical Note for Crewe HS2 Hub Access Package SLRB Access Options (BRJ10614-JAC-EGN-00-RP-LE-0001).</p>	<p>Ranked third of four western options in terms of lowest environmental impact.</p> <p>Impacts a local heritage asset.</p> <p>Refer Environmental Technical Note for Crewe HS2 Hub Access Package SLRB Access Options (BRJ10614-JAC-EGN-00-RP-LE-0001).</p>	<p>Ranked fourth of four western options in terms of lowest environmental impact.</p> <p>Impacts a local heritage asset.</p> <p>Refer Environmental Technical Note for Crewe HS2 Hub Access Package SLRB Access Options (BRJ10614-JAC-EGN-00-RP-LE-0001).</p>









Topic / Factor	West 1	West 2	West 3	West 4
Traffic Performance / Constraints				
	Traffic Performance Overview High level strategic model assessments have been undertaken to assess the benefits associated with the introduction of a SLRB to a scenario with HS2, Crewe Hub and AAP growth. The introduction of the SLRB will improve the performance of the network, with reduced flows and less delay on the network in comparison to a scenario without the SLRB. At strategic level all the options would perform to a similar level in terms of benefits recognised through network performance. Each option will have local impacts to the traffic network. Measures would be put in place to manage impacts on the local road network. This could include visual screening, noise barriers, traffic calming measures and Controlled Parking Zones (CPZs) to regulate on-street parking and enforce authorised car parking.			
	Preferred junction location in terms of proximity to Nantwich Road / Crewe Station and anticipated traffic flows. Option located away from existing junctions accessing Gresty Road and provides longer right turn lane if required.	New junction required on Gresty Road, with access from St Clair Street likely to be closed.	Existing Laura Street junction modified to provide SLRB connection to Gresty Road.	Existing Laura Street junction modified to provide SLRB connection to Gresty Road.





EAST ALIGNMENT OPTIONS





Topic / Factor	East 1	East 2	East 3	East 4
Access option cost				
Disruption to Directly Impacted Local Businesses				
	<p>Impacts Euro Garages Limited, Royal Mail Estate Limited, MECX, Egertons Recovery Limited, Storage King Limited, TRAX Commercial Limited and OLS Rail Limited.</p> <p>Possible disruption to junction access to existing train station car park.</p>	<p>Impacts Royal Mail Estate Limited, MECX, Egertons Recovery Limited, Storage King Limited, TRAX Commercial Limited and OLS Rail Limited.</p> <p>Existing junction access to businesses from Weston Road closed, replaced by new local access provided by SLRB link road. Less desirable access arrangement than existing.</p>	<p>Impacts Brewers Fayre, Polemarch Industrial Limited, Wardchoice Limited and Storage Boost Limited.</p> <p>Access to car parking area south of Royal Mail building via exiting access road requires new underpass arrangement to allow movement under road alignment.</p>	<p>Impacts Polemarch Industrial Limited, Wardchoice Limited, Storage Boost Limited and Cheshire East Council Land.</p> <p>Access to car parking area south of Royal Mail building via exiting access road requires new underpass arrangement to allow movement under road alignment.</p>

Topic / Factor	East 1	East 2	East 3	East 4
Local Business Endorsement				
	<p>Summary of Engagement with Directly Impacted Local Businesses</p> <p>CEC held meeting with Royal Mail Group Limited (RMG) on 25/06/2019. Formal representations were provided by Royal Mail Group Limited and their tenants MECX Group to CEC on 03/09/2019. Royal Mail Group strongly objected to all options but noted objection to East 1 and East 2 (which would require relocation of RMG) in the strongest possible way.</p> <p>CEC held meeting with Polemarch on 14/06/2019. Formal email correspondence was provided by Polemarch to CEC on 19/06/2019. Polemarch noted that all four options presented would likely impact their land and buildings on Weston Way. No specific route preference was indicated in this correspondence.</p> <p>CEC held meeting with TRAX Commercial Limited and OLS Rail Limited on 17/06/2019.</p> <p>CEC held meeting with Storage King Limited on 20/08/2019. At this meeting Storage King expressed a lack of preference for East 1, which intersects their building, and East 2, which cuts across the front of their building and presents access issues.</p>			
Public Endorsement				
	Of all the questionnaire responses which indicated a preferred access option (i.e. excluding those that indicated no preference) 9% were in support of East 1. This information is taken from the Public Consultation Report.	Of all the questionnaire responses which indicated a preferred access option (i.e. excluding those that indicated no preference) 9% were in support of East 2. This information is taken from the Public Consultation Report.	Of all the questionnaire responses which indicated a preferred access option (i.e. excluding those that indicated no preference) 16% were in support of East 3. This information is taken from the Public Consultation Report.	Of all the questionnaire responses which indicated a preferred access option (i.e. excluding those that indicated no preference) 66% were in support of East 4. This information is taken from the Public Consultation Report.

Topic / Factor	East 1	East 2	East 3	East 4
Accessibility (Non-Motorised Users)				
	<p>Provides new crossing of railway corridor with pedestrian and cyclist facilities, improving sustainable transport connectivity in the surrounding areas. Links well to Crewe Station.</p> <p>Longest route (220m) with flattest approach gradient (3 to 4%).</p>	<p>Provides new crossing of railway corridor with pedestrian and cyclist facilities, improving sustainable transport connectivity in the surrounding areas. Links well to Crewe Station.</p> <p>Third shortest route (190m) with second flattest approach gradient (4 to 5%).</p>	<p>Provides new crossing of railway corridor with pedestrian and cyclist facilities, improving sustainable transport connectivity in the surrounding areas.</p> <p>Shortest route (170m) with steepest approach gradient (5 to 6%).</p>	<p>Provides new crossing of railway corridor with pedestrian and cyclist facilities, improving sustainable transport connectivity in the surrounding areas.</p> <p>Second shortest route (180m) with third flattest approach gradient (5 to 6%).</p>
Engineering Constraints				
	<p>From review of available utilities search information, it is a similar level of impact to existing utilities is anticipated for each of the access options, with diversions required where SLRB ties back into Weston Road.</p> <p>From review of Preliminary Sources Study Report (PSSR) BRJ10614-JAC-GEN-00-RP-CE-002, risks associated to contaminated land and unknown ground conditions are anticipated to be reasonably consistent across each of the access options.</p> <p>The vertical alignment of access options East 1 and East 2 allows provision of an underpass arrangement with 5.4m vertical clearance at eastern end of SLRB. The vertical alignment of access options East 3 and East 3 allows provision of an underpass arrangement with 4.5m vertical clearance at a separate underpass structure located approximately 50m away from the eastern end of SLRB. Provision for vehicle requirements / future land use to be confirmed in future design stages.</p>			

Topic / Factor	East 1	East 2	East 3	East 4
Road User Safety				
	<p>Tight horizontal geometry on approach to / departure from bridge. Adopts minimum radius of 41m (equivalent to 30mph (48kph) design speed and curve radius 4 steps below TD 9/93 desirable minimum in accordance with Manual for Streets 2 (MfS2) Table 8.1).</p> <p>Design speed (48kph) is equal to the posted speed (30mph), as per MfS2 Paragraph 8.2.3.</p> <p>Local verge widening likely to be required to achieve stopping sight distance (SSD) sight lines.</p>	<p>Tight horizontal geometry on approach to / departure from bridge. Adopts minimum radius of 41m (equivalent to 30mph (48kph) design speed and curve radius 4 steps below TD 9/93 desirable minimum in accordance with Manual for Streets 2 (MfS2) Table 8.1).</p> <p>Design speed (48kph) is equal to the posted speed (30mph), as per MfS2 Paragraph 8.2.3.</p> <p>Local verge widening likely to be required to achieve stopping sight distance (SSD) sight lines.</p>	<p>Generous horizontal geometry on approach to / departure from bridge. Adopts minimum radius of 200m.</p> <p>Horizontal geometry suitable for design speed of 60kph (in accordance with TD 9/93 Table 2 based on 30mph posted speed).</p>	<p>Generous horizontal geometry on approach to / departure from bridge. Adopts minimum radius of 178m.</p> <p>Horizontal geometry suitable for design speed of 60kph (in accordance with TD 9/93 Table 2 based on 30mph posted speed).</p>
Constructability				

Topic / Factor	East 1	East 2	East 3	East 4
	<p>Significant temporary works likely to be required for launched bridge construction.</p> <p>Craned construction solution may be preferred, potentially requiring increased construction duration.</p>	<p>Significant temporary works likely to be required for launched bridge construction.</p> <p>Craned construction solution may be preferred, potentially requiring increased construction duration.</p>	<p>No significant temporary works required for launched bridge construction. Design alignment would allow earthworks embankment to be utilised during launching operations.</p>	<p>No significant temporary works required for launched bridge construction. Design alignment would allow earthworks embankment to be utilised during launching operations.</p>
Environmental Impacts				
	<p>Whilst each access option has been ranked, it is noted that the material differences between the impacts of each option are nominal in the overall scheme of the project and for this reason are all considered as neutral in their assessment.</p>			
	<p>Ranked equal second out of four western options in terms of lowest environmental impact.</p> <p>Refer Environmental Technical Note for Crewe HS2 Hub Access Package SLRB Access Options (BRJ10614-JAC-EGN-00-RP-LE-0001).</p>	<p>Ranked fourth out of four western options in terms of lowest environmental impact.</p> <p>Refer Environmental Technical Note for Crewe HS2 Hub Access Package SLRB Access Options (BRJ10614-JAC-EGN-00-RP-LE-0001).</p>	<p>Ranked equal second out of four western options in terms of lowest environmental impact.</p> <p>Refer Environmental Technical Note for Crewe HS2 Hub Access Package SLRB Access Options (BRJ10614-JAC-EGN-00-RP-LE-0001).</p>	<p>Ranked first of four western options in terms of lowest environmental impact.</p> <p>Refer Environmental Technical Note for Crewe HS2 Hub Access Package SLRB Access Options (BRJ10614-JAC-EGN-00-RP-LE-0001).</p>

Topic / Factor	East 1	East 2	East 3	East 4
				
Traffic Performance / Constraints	Traffic Performance Overview High level strategic model assessments have been undertaken to assess the benefits associated with the introduction of a SLRB to a scenario with HS2, Crewe Hub and AAP growth. The introduction of the SLRB will improve the performance of the network, with reduced flows and less delay on the network in comparison to a scenario without the SLRB. At strategic level all the options would perform to a similar level in terms of benefits recognised through network performance. Each option will have local impacts to the traffic network. Measures would be put in place to manage impacts on the local road network. This could include visual screening, noise barriers, traffic calming measures and Controlled Parking Zones (CPZs) to regulate on-street parking and enforce authorised car parking.			
	Junction location not as suitable for traffic flows to/from the south on Weston Road. Junction location likely to impact other existing signalised junctions on Weston Road. Junction location may not be compatible with future multi storey car park development at this location.	Junction location not as suitable for traffic flows to/from the south on Weston Road. Junction location may not be compatible with future multi storey car park development at this location.	Junction location provides a logical access route for anticipated traffic flows to/from the south on Weston Road.	Junction location provides a logical access route for anticipated traffic flows to/from the south on Weston Road. This junction is also furthest away from potential accesses to the new multi storey car park on Weston Road, allowing a more efficient junction operation.

2.3 Quantitative Assessment of Access Options

In addition to the qualitative assessment presented in Section 2.2, a quantitative assessment of the eight link road options was carried out. The quantitative assessment formed part of the agenda for a Preferred Route Alignment (PRA) Workshop, which was held on the 9th September 2019. The workshop was attended by members of the Jacobs UK Ltd Project Team and members of Cheshire East Council.

At the PRA Workshop, it was decided that scores should be assigned to the access options relative to their performance against each of the assessment criteria. This would allow a quantitative comparison of the eight options, and also allow them to be ranked in order of performance against the assessment criteria.

The 5-point scale used in Section 2.2 was subsequently adapted and the following scores were assigned: Extremely Beneficial (+3); Significantly Beneficial (+2); Beneficial (+1); Neutral (0); Adverse (-1); Significantly Adverse (-2), and; Extremely Adverse.

Weighting was also assigned to each assessment topic/factor so that the relative importance of each could be established (i.e. so that the factors considered most important had a larger influence on the overall assessment).

The weighting for each assessment topic/factor was discussed and confirmed at the PRA Workshop. It was vital that Cheshire East Council had input into the weighting process so that the assessment topics/factors were weighted in a manner that was consistent with the Council's priorities and aspirations.

The quantitative assessment of the eight link road options is shown overleaf. The Total Weighted Score produced from the quantitative assessment for each option is as follows:

WESTERN OPTIONS (CONNECTING TO GRETTY ROAD)

- Total Weighted Score of WEST 1: **5.5**
- Total Weighted Score of WEST 2: **8.25**
- Total Weighted Score of WEST 3: **1.00**
- Total Weighted Score of WEST 4: **1.25**

EASTERN OPTIONS (CONNECTING TO WESTON ROAD)

- Total Weighted Score of EAST 1: **0.75**
- Total Weighted Score of EAST 2: **0.5**
- Total Weighted Score of EAST 3: **4.25**
- Total Weighted Score of EAST 4: **6.25**

Figure 1 - Quantitative Assessment of West Access Options

Topic / Factor	Weighting	Unweighted Scores				Weighted Scores				Unweighted Scoring Key
		West 1	West 2	West 3	West 4	West 1	West 2	West 3	West 4	
Access Option Cost	1	0	0	-1	-1	0	0	-1	-1	3 Significantly Beneficial
Disruption to Directly Impacted Local Businesses	1	-1	-1	-2	-3	-1	-1	-2	-3	2 Significantly Beneficial
Local Business Community Endorsement	2	1	1	1	1	2	2	2	2	1 Beneficial
Public Endorsement	1	1	2	0	1	1	2	0	1	0 Neutral
Accessibility (including Non-Motorised Users)	0.25	2	1	2	3	0.5	0.25	0.5	0.75	-1 Adverse
Engineering Constraints	0.25	0	0	0	0	0	0	0	0	-2 Significantly Adverse
Road User Safety	1	0	1	0	0	0	1	0	0	-3 Extremely Adverse
Constructability	1	0	2	0	0	0	2	0	0	
Environmental Impacts	0.5	0	0	-1	-1	0	0	-0.5	-0.5	
Traffic Constraints	1	3	2	2	2	3	2	2	2	
		Total Unweighted Scores				Total Weighted Scores				
		3	8	1	2	5.5	8.25	1	1.25	

Figure 2 - Quantitative Assessment of East Access Options

Topic / Factor	Weighting	Unweighted Scores				Weighted Scores				Unweighted Scoring Key
		East 1	East 2	East 3	East 4	East 1	East 2	East 3	East 4	
Access Option Cost	1	-1	-1	-2	-1	-1	-1	-2	-1	3 Extremely Beneficial
Disruption to Directly Impacted Local Businesses	1	-3	-3	-1	-1	-3	-3	-1	-1	2 Significantly Beneficial
Local Business Community Endorsement	2	1	1	1	1	2	2	2	2	1 Beneficial
Public Endorsement	1	1	1	1	2	1	1	1	2	0 Neutral
Accessibility (including Non-Motorised Users)	0.25	3	2	1	1	0.75	0.5	0.25	0.25	-1 Adverse
Engineering Constraints	0.25	0	0	0	0	0	0	0	0	-2 Significantly Adverse
Road User Safety	1	-1	-1	0	0	-1	-1	0	0	-3 Extremely Adverse
Constructability	1	0	0	1	1	0	0	1	1	
Environmental Impacts	0.5	0	0	0	0	0	0	0	0	
Traffic Constraints	1	2	2	3	3	2	2	3	3	
		Total Unweighted Scores				Total Weighted Scores				
		0	1	4	6	0.75	0.5	4.25	6.25	

2.3.1 Explanation of Weighting

It should be appreciated that assigning weighting to the assessment topics/factors was a subjective process, and that the weighing system was developed so that the factors deemed most important to Cheshire East Council and their future aspirations for Crewe were given a higher weighting to reflect their relative importance. All assessment topics/factors were given a weighting score of between 0 and 2.

Access Option Cost was given a weighting of 1. Funding options are currently being explored (one idea is for the projects to be delivered as part of a Growth Area bid alongside government grants and funding from new developments within the surrounding area). A relatively low scheme cost will mean that the SLRB and access roads are more competitive when compared to other projects elsewhere in the LEP area and would therefore be more likely to receive funding. Conversely, relatively high scheme costs will mean that the link road is less competitive and would therefore be less likely to receive funding.

Disruption to Directly Impacted Local Businesses was given a weighting of 1. Each of the eight access options will have some direct impact to local businesses but to varying degrees. It is acknowledged SLRB will likely have an impact on both the businesses themselves and the people they employ and so minimising disruption to local businesses is considered a key factor.

Local Business Community Endorsement – was given a weighting of 2. An extensive Public Consultation was carried out to capture local business community opinion of SLRB scheme and eight access options. Local business community endorsement of the access options was considered an important factor when appraising the options as the scheme would have a significant effect on business located in Crewe. One of the key Scheme Objectives is to manage future traffic flows and reduce congestion to make Crewe more attractive to visitors, shoppers and businesses. For this reason, an option which satisfies the Scheme Objectives and was also supported by the local business community was highly desirable.

Public Endorsement – was given a weighting of 1. An extensive Public Consultation was carried out to assess both public interest in the SLRB scheme and to capture public opinion of the eight access options. Public endorsement of the access options was considered an important factor when appraising the options as the scheme would have a significant effect the town of Crewe. For this reason, an option which satisfies the Scheme Objectives and was also supported by the public was desirable.

Accessibility (including Non-Motorised Users) was given a weighting of 0.25. Each of the eight access options provides a new crossing of railway corridor with pedestrian and cyclist facilities, significantly improving sustainable transport connectivity in the surrounding areas. There are differences in terms of the facilities provided between the options in terms of length of access option and vertical gradient, but all options will be designed to relevant standards. There is therefore minimal differentiation between each of the eight access options and this is reflected in the proposed weighting.

Engineering Constraints – was given a weighting of 0.25. The engineering constraints and challenges specific to each option are important and should be considered. However, it is felt that all eight link road options are deliverable from a technical perspective, and none of the engineering constraints identified at this early stage of design would prevent the scheme from being constructed.

Road User Safety was given a weighting of 1. All eight options have been designed to standard and do not feature relaxations or departures from standard based on assumed design parameters. However, relaxations can be added at the discretion of the designer with relatively little impact on road user safety. Additionally, if departures from standard are necessary, their impact can be reduced through effective mitigation measures. Essentially, it is felt that relaxations or departures from standard could be introduced if necessary without compromising road user safety.

Constructability – was given a weighting of 1. The SLRB will be constructed over the existing railway corridor and the programme and duration of these works will be critical to successful delivery and minimising construction costs. The SLRB can be constructed at the same time as the changes that are required to accommodate HS2 at Crewe Station. Coordinating the construction of these activities would minimise disruption to Network Rail and the local community by reducing the number of railway line closures required. This also presents a unique opportunity to gain significant efficiencies through reduced construction costs when compared to trying to build the SLRB at a different time.

Environmental Impacts – have been given a weighting of 0.5. Due to the proximity of the access options to one another and the environment in which they are located (i.e. commercial / industrial land use) there is limited differentiation between each access option in terms of its environmental impact. Whilst the environmental impacts are considered a key factor, a weighting of 0.5 was considered appropriate for the assessment of the access options.

Traffic Constraints - the introduction of SLRB will improve the performance of the network, with reduced flows and less delay on the network in comparison to a scenario without the SLRB. At strategic level all the options would perform to a similar level in terms of benefits recognised through network performance. The location at which the access roads tie back into the existing highway network is considered important in respect of accommodating anticipated traffic flows. It is also acknowledged that some access options may have greater impact at a local level in terms of the re-routing of vehicle trips. For these reasons **Traffic Constraints** was given a weighting of 1.

2.3.2 Sensitivity Testing

In order to confirm that the results which were obtained from the assessment in Section 2.3 were robust, a series of sensitivity tests were carried out. The tests were used to investigate whether the outcome/results of the quantitative assessment would be altered if the weighing values were adjusted i.e. whether the results were sensitive to changes in the weighing values assigned to each assessment topic/factor.

Sensitivity tests were carried out by varying the weighting assigned to each assessment topic/factor. Weighting was varied by using the '=RAND()' function in Microsoft Excel to generate random % changes to each weighting value.

Three sensitivity tests were carried out in total. Test 1 limited the % change of the weighting to a maximum of +/-10% of its original value, Test 2 limited the % change of the weighting to a maximum of +/-25% of its original value and Test 3 limited the % change of the weighting to a maximum of +/-40% of its original value. The original weighting values are those which are shown in the quantitative assessment table on Page 17.

For each test, a total of 10 iterations (different scenarios) were investigated (i.e. by generating 10 sets of weighting values and applying them to the 'Unweighted Scores' shown in the assessment table in Section 2.3.

Each test could be viewed as a limited Monte Carlo Simulation (with only 10 iterations,) where the only variable was the '% change to the original weighting' value. Microsoft Excel was used to generate the random variable. It is assumed that these followed a discrete uniform probability distribution.

(a) Western Access Options

Test 1 (where the weighting of each assessment topic was randomly varied by a maximum of +/-10% of its original value) showed that the West 2 was the highest scoring options in all in all 10 iterations investigated, outscoring West 1 (2nd highest ranked option) by an average of 2.73 points. Further to this, West 1 comfortably outscored West 3 (by an average of 4.49 points) and West 4 (by an average of 4.25 points) across all 10 iterations investigated.

Test 2 (where the weighting of each assessment topic was randomly varied by a maximum of +/-25% of its original value) showed that the West 2 was the highest scoring options in all in all 10 iterations investigated, outscoring West 1 (2nd highest ranked option) by an average of 2.64 points. Further to this, West 1 comfortably outscored West 3 (by an average of 4.48 points) and West 4 (by an average of 4.19 points) across all 10 iterations investigated.

Test 3 (where the weighting of each assessment topic was randomly varied by a maximum of +/-40% of its original value) showed that the West 2 was the highest scoring options in all in all 10 iterations investigated, outscoring West 1 (2nd highest ranked option) by an average of 2.70 points. Further to this, West 1 comfortably outscored West 3 (by an average of 4.49 points) and West 4 (by an average of 4.28 points) across all 10 iterations investigated.

(b) Eastern Access Options

Test 1 (where the weighting of each assessment topic was randomly varied by a maximum of +/-10% of its original value) showed that the East 4 was the highest scoring options in all in all 10 iterations investigated, outscoring East 3 (2nd highest ranked option) by an average of 2.01 points. Further to this, East 3 comfortably outscored East 1 (by an average of 3.40 points) and East 2 (by an average of 3.65 points) across all 10 iterations investigated.

Test 2 (where the weighting of each assessment topic was randomly varied by a maximum of +/-25% of its original value) showed that the East 4 was the highest scoring options in all in all 10 iterations investigated, outscoring East 3 (2nd highest ranked option) by an average of 2.09 points. Further to this, East 3 comfortably outscored East 1 (by an average of 3.47 points) and East 2 (by an average of 3.71 points) across all 10 iterations investigated.

Test 3 (where the weighting of each assessment topic was randomly varied by a maximum of +/-40% of its original value) showed that the East 4 was the highest scoring options in all in all 10 iterations investigated, outscoring East 3 (2nd highest ranked option) by an average of 2.11 points. Further to this, East 3 comfortably outscored East 1 (by an average of 3.53 points) and East 2 (by an average of 3.74 points) across all 10 iterations investigated.

2.3.3 Sensitivity Testing Conclusion

The results from the sensitivity tests confirm that the conclusions reached in Section 2.3 are robust and are not sensitive to variations in the weighting values assigned to the assessment topics. The results of the sensitivity tests show that the outcome of the assessment (West 2 and East 4 being the highest scoring options followed by West 1 and East 3) remains consistent even when the weighting values' maximum range is set at +/-40% (Test 3). Results tables showing the outcome of the sensitivity tests can be found in Appendix D.

2.4 Summary and Recommendations

A quantitative and qualitative assessment of the eight access options taken to Public Consultation has been carried out. The qualitative assessment describes how the eight access options perform against the assessment topics/factors identified, while the quantitative assessment assigns scores to each link road option to allow them to be ranked in order of performance (where the highest score indicates the best option).

The total weighted scores from the quantitative assessment for the western access options are as follows:

- Total Weighted Score of West 1: **5.50** (2nd highest scoring option)
- Total Weighted Score of West 2: **8.25** (Highest scoring option)
- Total Weighted Score of West 3: **1.00** (Lowest scoring option)
- Total Weighted Score of West 4: **1.25** (3rd highest scoring option)

The total weighted scores from the quantitative assessment for the eastern access options are as follows:

- Total Weighted Score of East 1: **0.75** (3rd highest scoring option)
- Total Weighted Score of East 2: **0.50** (Lowest scoring option)

- Total Weighted Score of East 3: **4.25** (2nd highest scoring option)
- Total Weighted Score of East 4: **6.25** (Highest scoring option)

It can be seen from the results of the assessment West 2 and West 1 outscore West 3 and West 4 by a significant margin, and East 4 and East 3 outscore East 1 and East 2 by a significant margin. The sensitivity tests carried out in Section 2.3.2 confirm that the results obtained are robust, meaning that there is confidence in the assessment procedure which has been used.

Considering feedback received during consultation regarding concerns related to potential impacts to the local road network related to the proposed junction location of West 2, it would seem rational to further review the strengths of West 1 and West 2 further to understand if an improved solution can be developed.

Both the West 1 and West 2 access options have been shown to have different strengths. West 1 performs particularly well in the area of Traffic Constraints which is reflective of the fact that the junction location is the most logical in terms of anticipated traffic flows. It also allows an extended right turn lane length to be accommodated for northbound movements from Gresty Road to SLRB.

West 2 performs particularly well in the areas of Road Safety and Constructability which is reflective of its horizontal geometry on approach to the bridge.

It should therefore be concluded that the optimum or 'best' option would be a combination of the West 1 and West 2 access options. It is recommended that the West 2 is taken forward as the Preferred Route but is modified to move its proposed junction location further north to sit somewhere between West 1 and West 2. This will partially address some of the concerns raised during consultation and will also allow an extended length of right turn lane to be accommodated. This option would essentially combine the strengths of the two highest performing options. As part of this alignment development it will be important to consider constructability and where possible minimise the temporary works that would be required to provide a launched bridge construction.

The alternative alignment developed is discussed further in Section 3.2.

3.1 Feasibility Assessment of Proposed Bridge Location

An initial feasibility assessment was undertaken to investigate potential locations for a new road bridge to provide an additional crossing over the railway corridor. Three locations were investigated; Tommy's Lane Road Bridge (north of Crewe Station); Southern Link Road Bridge (SLRB) (south of Crewe Station), and Cowley Way Road Bridge (south of Crewe Station). Assessment of the options (including consideration of Network Rail track changes required for HS2 and future HS2 tunnel alignments) found the SLRB was the preferred option. Refer Section 3 for further details of the bridge location feasibility assessment work previously undertaken.

3.1.1 Tommy's Lane Road Bridge

A feasibility assessment looking at options to provide a crossing of the railway corridor north of Crewe Station was undertaken by Mott MacDonald in August 2016 (report reference 146197/MMD/REP/ECV/000002). This assessment looked at options to link Crewe Arms roundabout on Nantwich Road to Mill Street. Due to the existing physical constraints within the railway corridor (such as the existing rail track alignment), it was determined one of the bridge spans would need to be around 88m in length. A pier would need to be constructed with the rail corridor between the existing rail tracks to support the western end of this span.

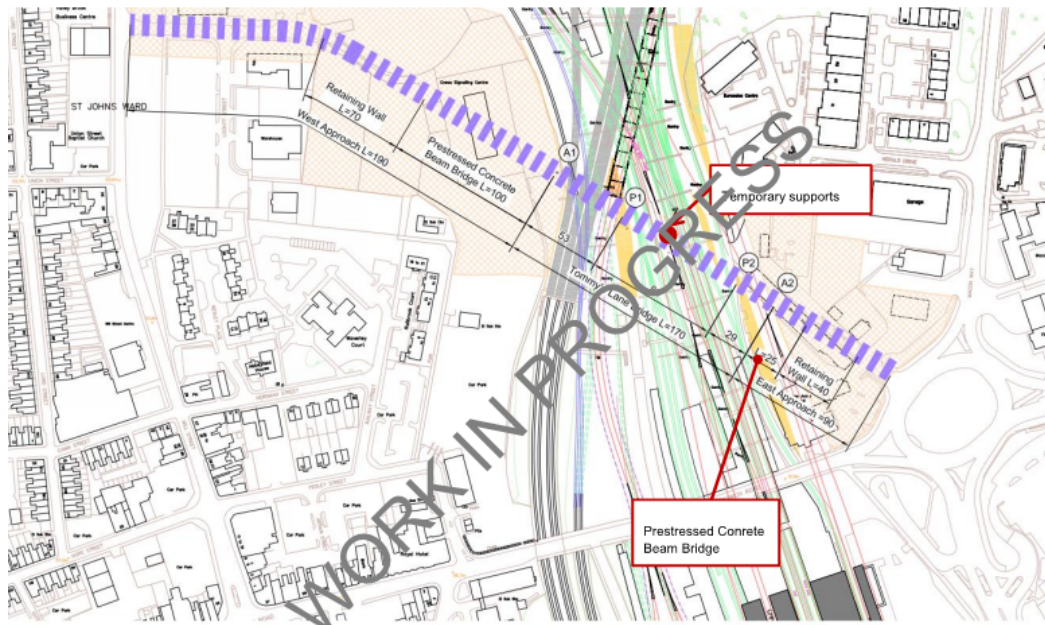


Figure 3 - Tommy's Lane Road Bridge Option

To enable the large span required to cross the existing railways a configuration of truss spans was considered the best option. The proposed structure consisted of two approach spans on the west side and one approach span of the east side consisting of precast concrete beam deck construction.

This option was discounted for the following reasons:

- Expensive when considered against traditional steel plate girder form of structure due to long span arrangement;
- Large bridge skew arrangement (40 degrees) is less desirable as it increases construction costs;
- Limited benefit in terms of relieving congestion on Nantwich Road Bridge (the key traffic constraint for Crewe Station);
- Likely to increase congestion at the already busy Crewe Arms Roundabout.

3.1.2 Cowley Way Road Bridge

A feasibility assessment looking at options to provide a crossing of the railway corridor south of Crewe Station was undertaken by Mott MacDonald in August 2016 (report reference 146197/MMD/REP/ECV/000003). This assessment looked at options to link Gresty Road to Weston Road. One of the options investigated was a road bridge connecting from Claughton Avenue on Gresty Road to Cowley Way on Weston Road.

Due to the existing physical constraints within the railway corridor (such as the existing rail track alignment), it was determined multiple short bridge spans would be required. The section of the railway corridor is heavily congested with railway tracks meaning there are a limited number of locations where bridge piers can be located, which in effect determines the span arrangement. This option proposed to provide a seven span arrangement with six piers to be constructed with the rail corridor.

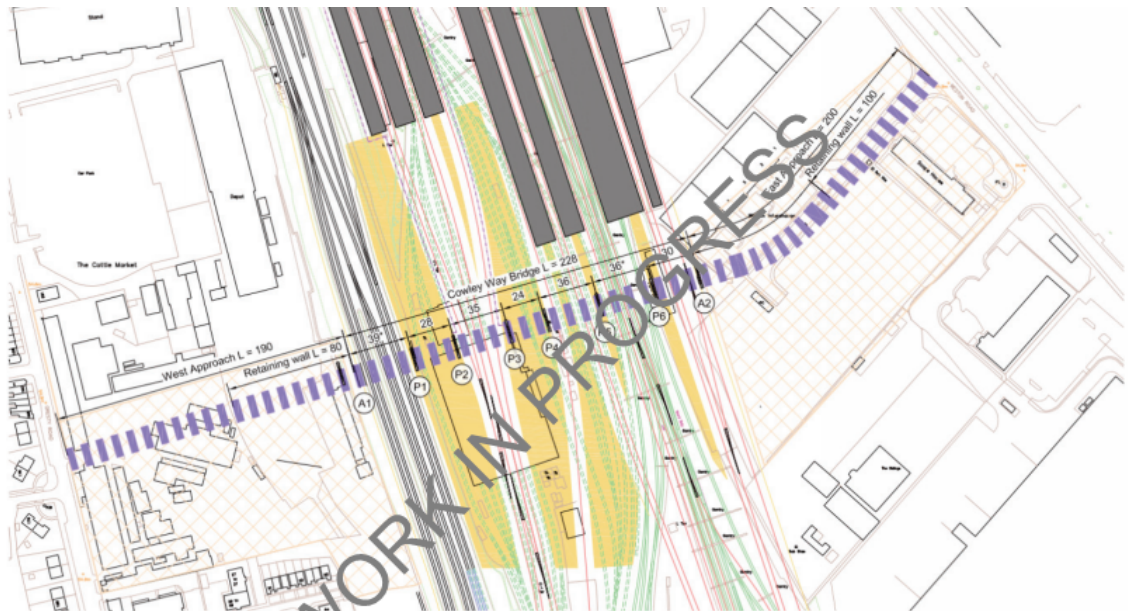


Figure 4 - Cowley Way Road Bridge Option

A composite steel girder bridge was considered the best option because this option enables the duration of track possessions for construction to be minimised, which, in turn, reduces the risk of affecting existing operational service.

This option was discounted for the following reasons:

- Expensive and difficult to construct due to heavily constrained working space within rail corridor for construction of bridge piers;
- The distance between tracks in this heavily congested area does not allow for the provision of minimum clearance between the track and the required intermediate bridge supports and would have interfered with existing rail infrastructure;
- Multiple extended track possessions would be required to allow pier construction;
- Bridge arrangement would either impact the LNWR Heritage building located within the railway corridor or would need to span over the building which would be expensive and impractical in terms of tying back into the local road network.

3.1.3 Options South of Cowley Way

There is a housing estate located directly south of the Unipart Site and north of Gresty Road Railway Bridge. Any options in this area would require residential property demolition, which is considered a last resort choice and for this reason has not be investigated further.

3.1.4 Options South of Gresty Road Railway Bridge

The existing railway configuration constraints in this area mean this option is not considered feasible due to prohibitively high construction costs and potential impacts to exiting rail infrastructure. Any new crossing would have to cross the Basford Hall sidings, The West Coast Mainline and then the Crewe to Derby Lines. As a guide, a new crossing in this area would require a structure in the region of 370 metres long compared to the proposed route which requires a structure around 220 metres long.

3.1.5 Southern Link Road Bridge

A feasibility assessment looking at options to provide a crossing of the railway corridor south of Crewe Station was undertaken by Mott MacDonald in September 2018 (report reference 146197-MMD-REP-ECV-000043). This assessment looked at alternative options (to the Cowley Way assessment) to link Gresty Road to Weston Road. Options considered included:

- An alignment from Laura Street on Gresty Road crossing perpendicular to the railway corridor and to Weston Road on Cowley Way;
- An alignment from Laura Street on Gresty Road crossing the railway corridor at an angle connecting to Gresty Road opposite First Avenue.

The first option was discounted as the distance between tracks is heavily congested in the area and does not allow for the provision of minimum clearance between the track and the required intermediate bridge supports and would have interfered with existing rail infrastructure.

The second option was investigated further as part of the feasibility assessment. The proposed alignment was 'optimised' and it was determined that three piers could be positioned within the rail corridor on Network Rail land to provide an even span arrangement. This results in a four-span structure with abutments either side of the rail corridor and internal piers.

The proposed alignment and pier spacing also considered both the existing tracks and proposed HS2 tunnel alignments based on available information, allowing for the installation of pier footings and piles. We do note that at the time of writing the HS2 scheme is under review.

One of the key constraints identified was the vertical clearance requirements to existing Network Rail Overhead Line Equipment (OLE) where the bridge crosses the railway corridor and the need to tie the road design alignment back into the exiting road network. These constraints and the proposed vertical alignment meant bridge deck construction depths would need to be minimised to ensure vertical alignment gradients weren't excessively steep either side of the railway corridor.

In the Mott MacDonald feasibility assessment report three forms of bridge structure were considered for SLRB including; Half Through / Braced Truss; Bow-String Arch, and; and Cable Stayed. The Mott MacDonald feasibility assessment identified that the Half Through / Braced Truss arrangement would likely be the most cost efficient of the three options and would be able to be launched into place, minimising rail possession requirements.

As part of the review of this information an initial Order of Magnitude cost plan was prepared by Jacobs (Document Reference: *SLRB_Phase 1_Class 5 (OoM) Cost Plan_01*) for each of these options to provide a high level comparison of estimated construction costs. This assessment found Order of Magnitude Costs to be as follows:

- Half Through / Braced Truss - £48.9M
- Bow-String Arch - £55.9M
- Cable Stayed - £67.5M

The proposed SLRB alignment from Laura Street on Gresty Road crossing the railway corridor at an angle connecting to Gresty Road opposite First Avenue is shown in Figure 5 below.



Figure 5 – Southern Link Road Bridge Option

3.1.6 Preferred Bridge Location

The Southern Link Road Bridge (SLRB) was identified by CEC and Network Rail as the preferred bridge location following completion of the feasibility assessment. The SLRB provides a solution that is constructible with consideration of the railway corridor constraints, with piers located in accordance with Network Rail horizontal clearance requirements to track infrastructure. The solution also provides a reasonable span arrangement, allowing a cost efficient and practical design approach which will allow disruption and rail closures required during construction to be minimised.

The location of connections to the local road network also provides a logical access route for anticipated traffic flows to/ from the south on Weston Road and would serve to reduce congestion on Nantwich Road Bridge by reroute existing traffic.

The Tommy's Lane Road Bridge and Cowley Way Road Bridge options (as well as routes further to the south as described) were discounted for the reasons described above; primarily due to existing constraints within the railway corridor rendering these options unfeasible.

3.1.7 Preferred Bridge Location Refinement

As part of the access option development phase (i.e. this phase), the preferred bridge location was reviewed and optimised to improve span arrangement and improve efficiency in design.



Figure 6 – Southern Link Road Bridge Refined Alignment

The refined aligned (shown above in green) removed the skew of the previous alignment option (shown above in magenta) across the railway corridor, improving design efficiency and constructability. An even span arrangement was also achieved which again provides cost and constructability benefits. The proposed alignment and pier spacing also considers the existing tracks and proposed HS2 tunnel alignments based on available information, allowing for the installation of pier footings and piles. This is subject to ongoing review as the HS2 tunnel and at surface track realignment works arrangements are further developed.

The refined bridge alignment also avoids directly impacting the existing Royal Mail Group building on the eastern side of the railway corridor, whereas the previous alignment directly impacted this building.

In addition to the above, the vertical highway alignment was refined to introduce a constant vertical crest curve across the bridge in lieu of the straight grade provided in the Mott MacDonald feasibility assessment. This optimisation allowed a construction depth of 2.5m minimum to be achieved above the Network Rail OLE whilst minimising road vertical alignment gradients either side of the bridge structure. Achieving a design that allowed a 2.5m construction depth meant a more conventional composite steel/concrete plate girder bridge solution could be considered.

3.1.8 Preferred Bridge Form

Through design development and optimisation of both the horizontal and vertical alignment of the preferred bridge location it was identified that a conventional

composite steel/concrete plate girder bridge solution could be considered. An Order of Magnitude Cost Plan was developed for this option and it was determined to be significantly less expensive than all other forms of structure assessed (£40.1M against £48.9M for the least expensive of the other forms). Details of the initial cost estimate for the composite steel/concrete plate girder bridge solution are provided in Section 5.2.

In addition to having a significantly lower construction cost than the original option forms, the conventional steel/concrete plate girder bridge solution also provides flexibility in terms of construction methodology, with either a launched or craned methodology considered feasible (subject to further design development).

For these reasons, the preferred form of structure was identified as a conventional steel/concrete plate girder bridge solution (either Ladder Bridge or Multi-Girder type with both to be assessed further).

3.2 Reason for Alternative Access Option West 5 Development

As discussed in Section 2 of this report preferred access options were identified as West 2 and East 4.

Following feedback received from members of the public throughout the consultation period, it was necessary to consider investigating further modifications to the alignments presented at Public Consultation. The principle issue raised by a number of respondents was concern about the bridge resulting in more traffic using the local road network off Gresty Road. The main locations of concern were the residential streets of Manor Way, Davenport Avenue and Bedford Street.

In reflection of the concerns raised, an alternative access option West 5 was developed to move the junction with Gresty Road further north towards Nantwich Road. The junction on Gresty Road for this option lies between access options West 1 and West 2, moving the junction further away from St Clair Street.

An appraisal of the alternative access option West 5 was undertaken with comparison of its advantages and disadvantages considered against access options West 1 and West 2. Refer Table 1 below for details.

3.3 Appraisal of Alternative 'West 5' Access Option

Table 1 - Appraisal of Alternative Access Option West 5

Option	Advantages	Disadvantages	Verdict
West 1	<ul style="list-style-type: none"> ▪ Junction located furthest north of all the options, providing logical route for anticipated traffic movements and assumed to minimise traffic volumes passing dwellings on Gresty Road ▪ Provides flatter approach gradient ▪ Minimises impacts to existing businesses, with only Unipart distribution building and Crewe Alexandra car park directly impacted 	<ul style="list-style-type: none"> ▪ Least desirable horizontal geometry with tight horizontal curve on approach to / departure from SLRB ▪ Only achieves design speed of 48kph ▪ Option requiring most significant temporary works for launched bridge construction, increasing construction costs ▪ Full acquisition of Gresty Road car park likely to be required ▪ Location of junction may impact existing junction to access road immediately south of Crewe Alexandra stadium 	Option taken to Public Consultation will not be taken forward as part of the Preferred Route as Access Option East 5 is considered a better performing alignment by comparison.
West 2	<ul style="list-style-type: none"> ▪ Option can be constructed using launched construction without additional temporary work, minimising construction costs and providing construction flexibility ▪ Achieves a design speed of 60kph ▪ Second best performing of west options in terms of minimising direct impacts to existing businesses ▪ Provides second most logical route for anticipated traffic movements and assumed to minimise traffic volumes passing dwellings on Gresty Road 	<ul style="list-style-type: none"> ▪ Feedback from consultation has highlighted concerns about potential impacts to the local road network as a result of providing a new junction on Gresty Road opposite St Clair Street ▪ Approach gradient slightly steeper than desirable maximum of 5% 	Option taken to Public Consultation will not be taken forward as part of the Preferred Route as Access Option East 5 is considered a better performing alignment by comparison.

<p>West 5</p>	<ul style="list-style-type: none"> ▪ Achieves a design speed of 60kph ▪ Minimises impacts to existing businesses, with only Unipart distribution building and Crewe Alexandra car park directly impacted ▪ Acknowledges concerns raised during consultation regarding potential impacts to the local road network by moving junction further north (compared to West 2) ▪ Provides improved vertical alignment gradient of 5% on both approaches when compared to West 2 ▪ Provides horizontal geometry on approach to SLRB which may assist with controlling vehicle speeds when compared to straight approach ▪ Achieves extended length of right turn lane for northbound movements from Gresty Road to SLRB ▪ Avoids impacting cultural heritage asset building on Gresty Road and also minimises impacts to access to existing group of small businesses 	<ul style="list-style-type: none"> ▪ Option likely to require some temporary works for launched construction approach, but significantly less than West 1 ▪ Increased impact to Gresty Road car park when compared to West 2 	<p>Access Option West 5 will be taken forward as part of the Preferred Route. It is an improvement on the West 2 Access Option (identified as the public's preferred option during Public Consultation) and has addresses some of the key concerns raised.</p>
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Based on the above appraisal alternative access option West 5 was is shown to be an improvement on the designs taken to Public Consultation and for this reason will be integrated into the Preferred Route. The key benefit of access option West 5 is that it acknowledges concerns raised by residents and will help to go some way to mitigating impacts to the local road network. Nevertheless, it is also acknowledged that as the project development continues it is critical that a package of traffic calming measures and controls for these areas is developed alongside the scheme to manage and control any additional traffic in the area. This will be a key area of focus in the next phase of design development.

Locating West 5 further north also has an added benefit in that allows a longer right turn lane to SLRB for northbound movements on Gresty Road to be provided at the junction without impacting buildings of historic merit. Early stage traffic modelling has shown that additional right turn lane length will assist in operational performance of the junction, further mitigating impacts to the local road network.

3.4 Preferred Route Alignment Geometry

3.4.1 Horizontal Alignment

The horizontal geometry of the Preferred Route Alignment has been designed in accordance with Manual for Streets 2 (MfS2) with a design speed of 60kph. The design speed has been adopted in accordance with TD 9/93 Table 2 based on 30mph posted speed.

MfS2 Table 8.1 requires a minimum horizontal curve of 64m (which is 4 steps below the desirable minimum for a horizontal curve for 60kph design speed as required by TD 9/93).

The minimum horizontal curves adopted are 90m and 75m to the west and east of the bridge respectively.

3.4.2 Vertical Alignment

The vertical alignment has been developed in accordance with MfS2 Section 8.4.2, which nominates a desirable maximum gradient of 6% and suggests a gradient of 5% is desirable where it is anticipated facilities will be used by a significant number of pedestrians.

The vertical alignment design is largely driven by vertical clearance requirements over the railway corridor and the need to provide underpass facilities either side of the corridor to allow for anticipated vehicle movements.

To the west of SLRB an underpass is provided immediately west of the abutment to allow 5.4m vertical clearance. This arrangement allows existing HGV movements from Gresty Road to the Unipart site to be maintained.

To the east of SLRB an underpass is provided approximately 40 metres east of the eastern bridge abutment. This arrangement allows 4.5m vertical clearance and maintains access on the existing access road to the Royal Mail Group car parking area. This would otherwise be rendered inaccessible by the Preferred Route Alignment.

The vertical alignment has a maximum grade of 5.49% and 5.77% west and east of SLRB respectively. A large 3250 metre vertical crest curve radius is provided between these two grades, with the crest curve continuous across the SLRB structure.

The vertical alignment will be refined at the next design stage with options investigated to assess if approach gradients less than 5% can be achieved.

3.5 Proposed Carriageway Cross Section

The proposed cross section of the Preferred Route Alignment and on SLRB is summarised below.

- 2 metre wide footway on the southern side
- 2 x 3.65m traffic lanes
- 3m wide cycleway on the northern side

This provides an overall total cross section of 12.3m as shown in the below cross section taken on the proposed bridge structure. The bridge corridor is heavily constrained by existing buildings which has dictated what is feasible in terms of maximum cross section.

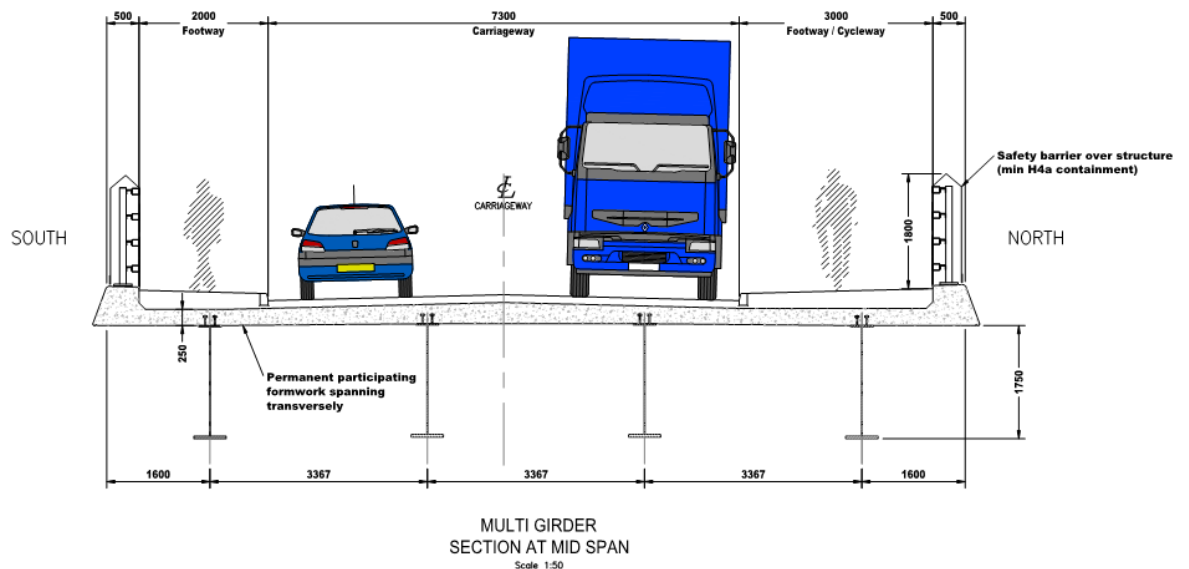


Figure 7 – Preferred Route Alignment Cross Section on SLRB (Multi Girder Type)

The pedestrian and cyclist facilities will tie into existing footways at Gresty Road and Weston Road, improving connectivity by providing a new crossing of the railway corridor with high quality off carriageway facilities. This is a significant betterment to the existing facilities on Nantwich Road Bridge where cyclists are on carriageway on a heavily congested section of the road network.

4

Local Junction Improvements

Initial traffic assessments in the Area Action Plan (AAP) area have been undertaken to see how the flow of traffic can be improved. The findings indicate that, in addition to a new bridge, improvements to 11 key junctions around Crewe Station are required to support delivery of the AAP. The chosen locations were based on addressing the worst 'hotspots' identified through this initial traffic modelling.

The proposed measures will reduce traffic flows at locations where uptake of sustainable modes of transport are to be promoted, such as Nantwich Road Station entrance. This will assist in creating a more pedestrian and cyclist friendly environment whilst helping to reduce congestion and delays at key locations. This aligns with the overall aim of promoting an environment around Crewe Station that is safe, attractive and accessible for cyclists and pedestrians and other sustainable modes of transport.

The junctions to be improved are listed below and presented in Appendix E.

- Crewe Green Roundabout (further improvements to A534 approach / exit only)
- Gresty Road / Bedford Street Junction
- Nantwich Road / South Street Junction
- Gresty Road / St Clair Street Junction
- Nantwich Road / Gresty Road Junction
- Gresty Road / Laura Street Junction
- Crewe Arms Roundabout
- Weston Road / First Avenue Junction
- Crewe Road / Gateway Junction
- Weston Road / University Way Roundabout (including limited dualling of the approaches and exits from the junction)
- Gresty Road / South Street Junction

Initial feedback from the public consultation was very supportive of the proposed to provide junction improvements at these locations to improve the highway network. Future work will develop detailed options on how these improvements might work and will be subject to further public consultation.

5 Summary and Conclusions

5.1 Summary

This report documents an assessment of the eight SLRB access options presented at the Public Consultation. The eight access options were initially assessed qualitatively, by identifying the main features and characteristics of each option and appraising them against a set of assessment topics/factors.

Further to this, a quantitative assessment of the eight access options was conducted, where the scores which were assigned to each link road option related to how the option performed against the assessment topic/factors. Weighting for the assessment topics/factors was determined at a PRA Workshop with input from Cheshire East Council.

The total weighted scores from the quantitative assessment for the western access options are as follows:

- Total Weighted Score of West 1: **5.50** (2nd highest scoring option)
- Total Weighted Score of West 2: **8.25** (Highest scoring option)
- Total Weighted Score of West 3: **1.00** (Lowest scoring option)
- Total Weighted Score of West 4: **1.25** (3rd highest scoring option)

The total weighted scores from the quantitative assessment for the eastern access options are as follows:

- Total Weighted Score of East 1: **0.75** (3rd highest scoring option)
- Total Weighted Score of East 2: **0.50** (Lowest scoring option)
- Total Weighted Score of East 3: **4.25** (2nd highest scoring option)
- Total Weighted Score of East 4: **6.25** (Highest scoring option)

West 2 and West 1 outscore West 3 and West 4 by a significant margin, and East 4 and East 3 outscore East 1 and East 2 by a significant margin.

Considering feedback received during consultation regarding concerns related to potential impacts to the local road network related to the proposed junction location of West 2, it was decided to further review the strengths of West 1 and West 2 further to understand if an improved solution can be developed.

It was concluded the optimum or 'best' option would be a combination of the West 1 and West 2 access options. It is recommended that the West 2 is taken forward as the Preferred Route but is modified to move its proposed junction location further north to sit somewhere between West 1 and West 2. This alternative access option is named West 5.

West 5 access option partially address some of the concerns raised during consultation and allows an extended length of right turn lane to be accommodated. This option combines the strengths of the two highest performing western options.

5.2 Cost

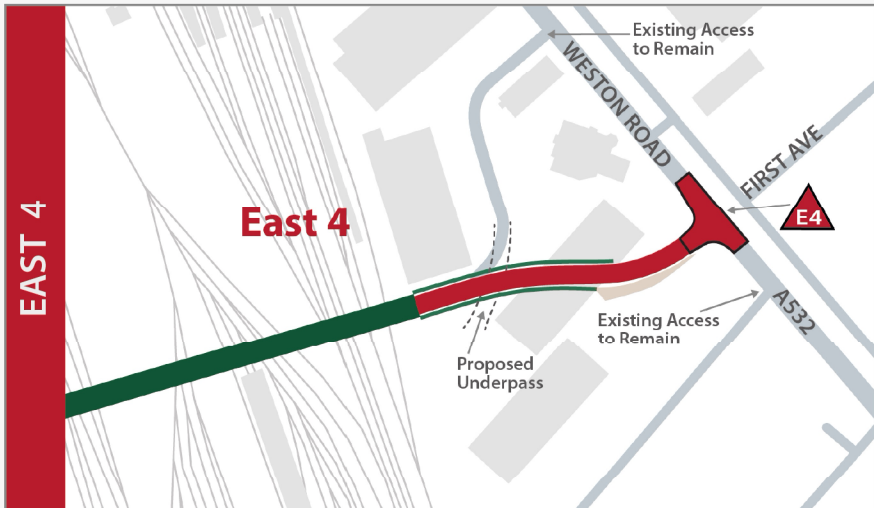
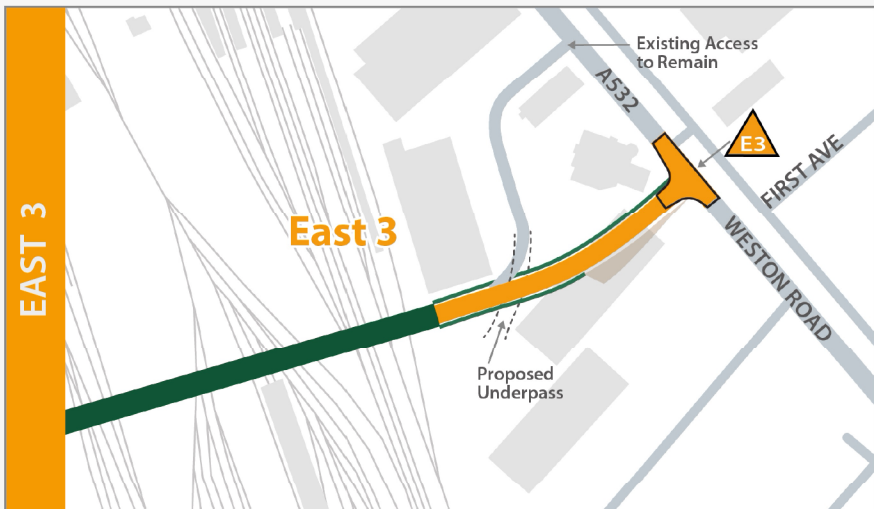
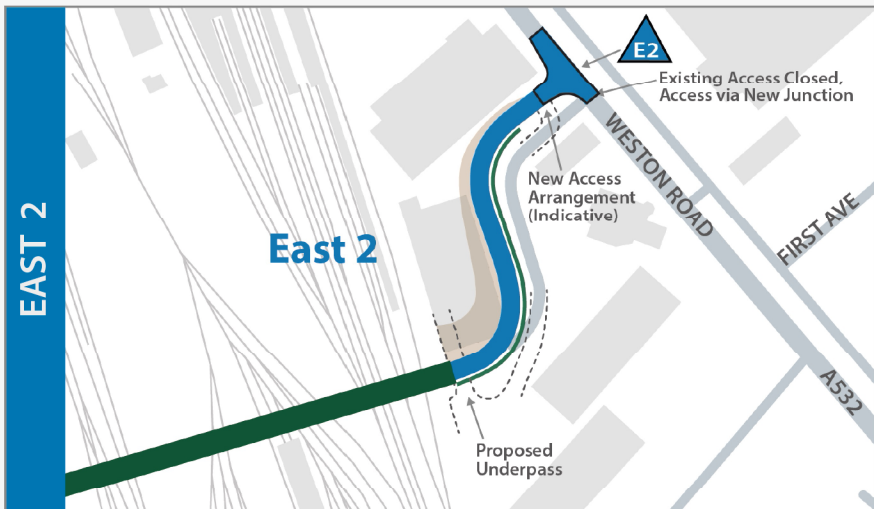
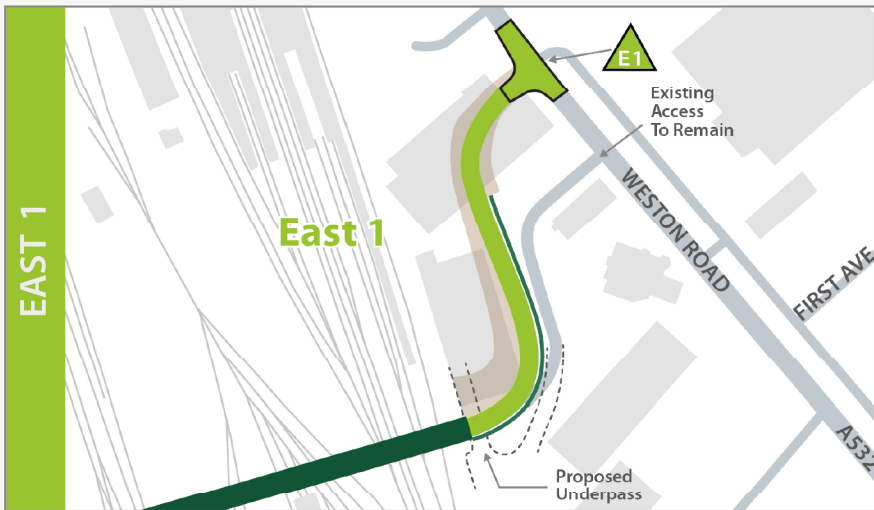
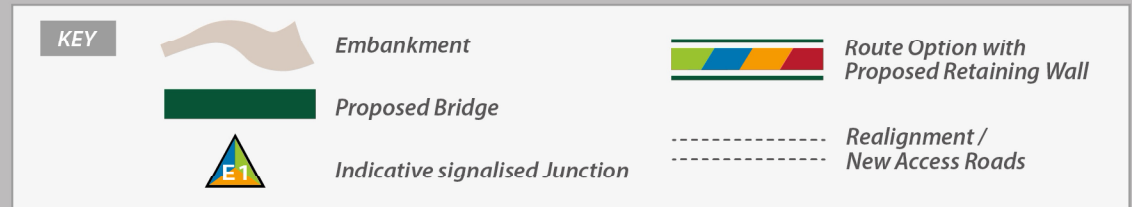
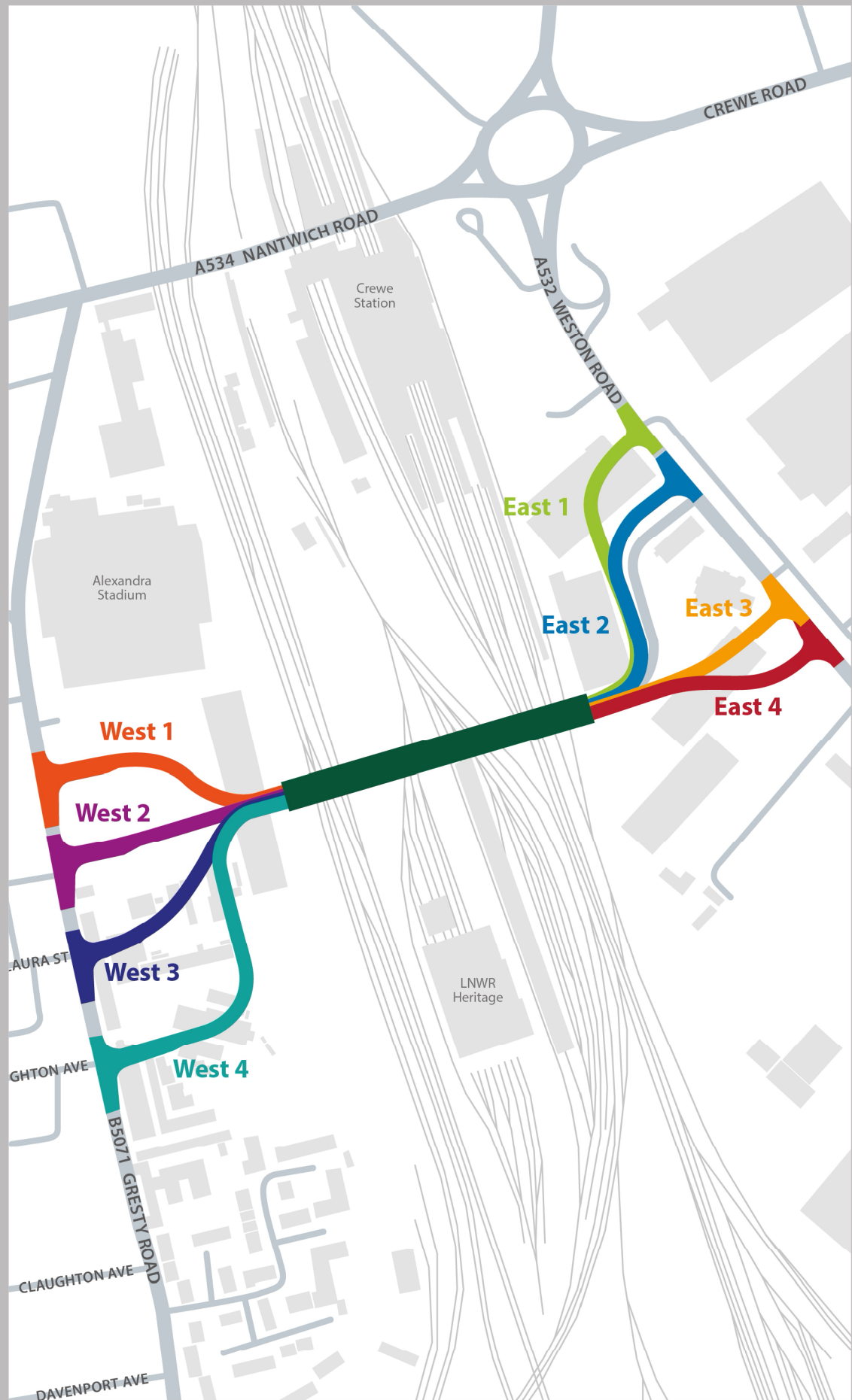
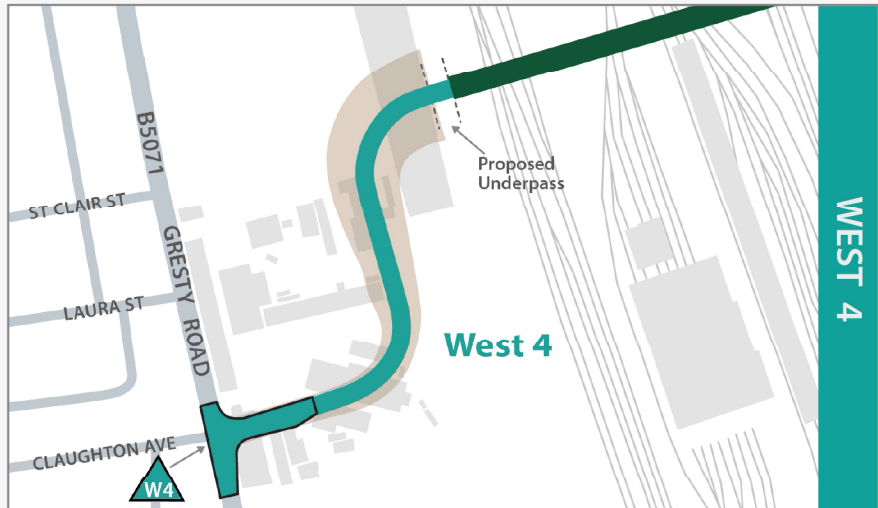
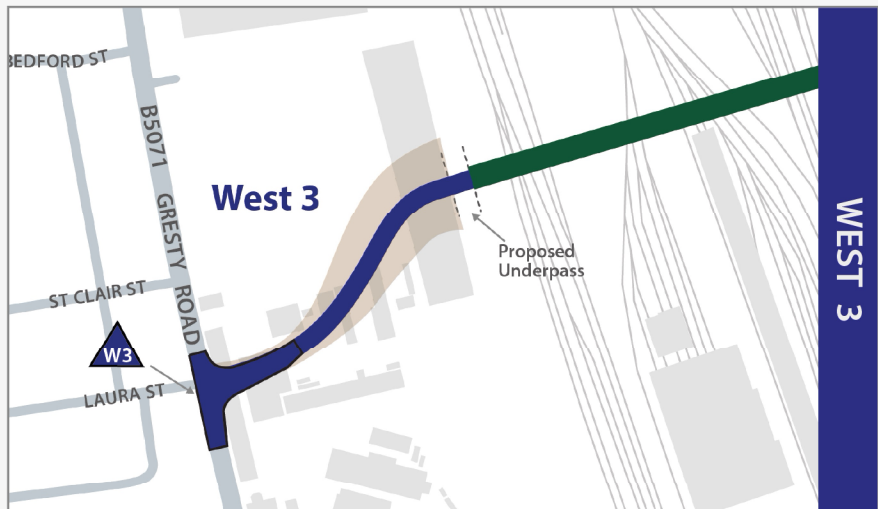
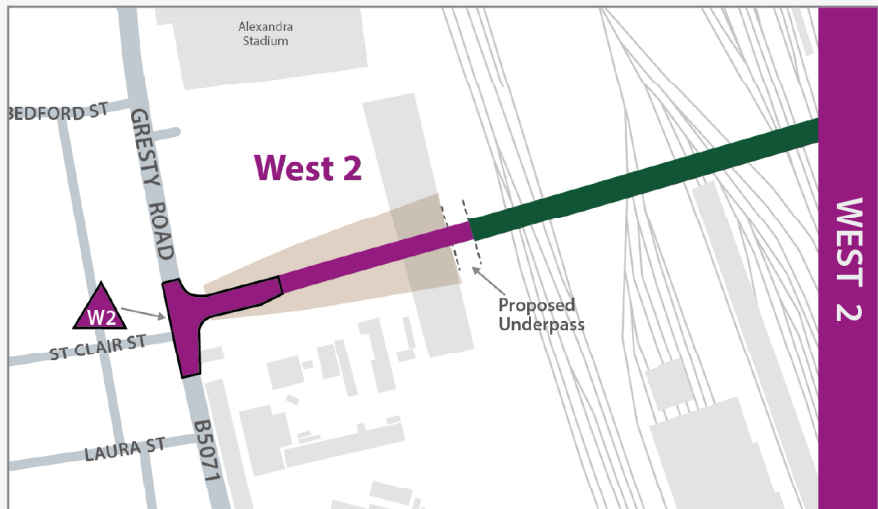
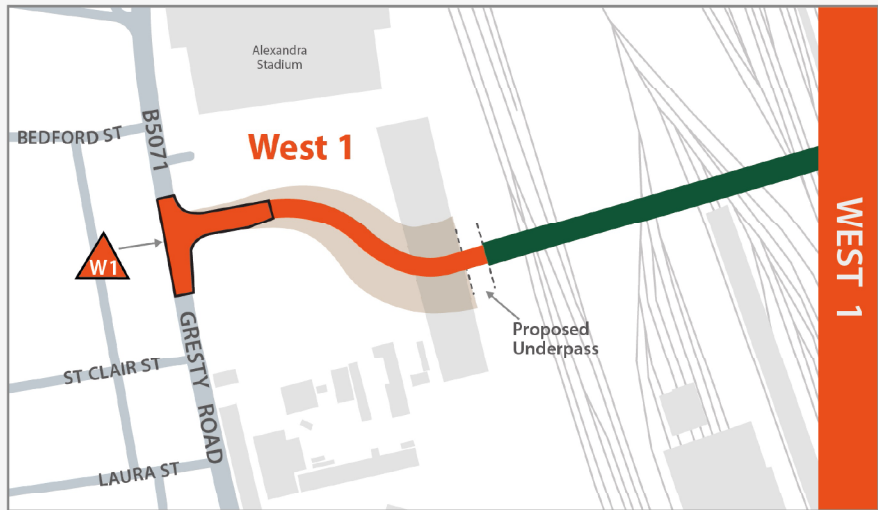
A scheme cost estimate has been developed following the determination of a Preferred Route. The Preferred Route has been estimated to have an outturn scheme cost of approximately £40.1 Million. This excludes costs for land acquisition and compensation at this stage.

The scheme cost estimate for the Preferred Route has been developed as a Class 4 (Study or Feasibility) estimate which is suitable for level of detail provided at this early stage of design. The Preferred Route Scheme Cost Estimate Report (Document Reference: *SLRB Preferred Route Alignment Class 4 Cost Plan*) details the assumptions made when developing the cost estimate.

5.3 Conclusion

The final Preferred Route Alignment, which is to be recommended to Cheshire East Council, has been determined through various assessments which are documented in Sections 2 and 3 of this report. The Preferred Route is shown in Appendix C.

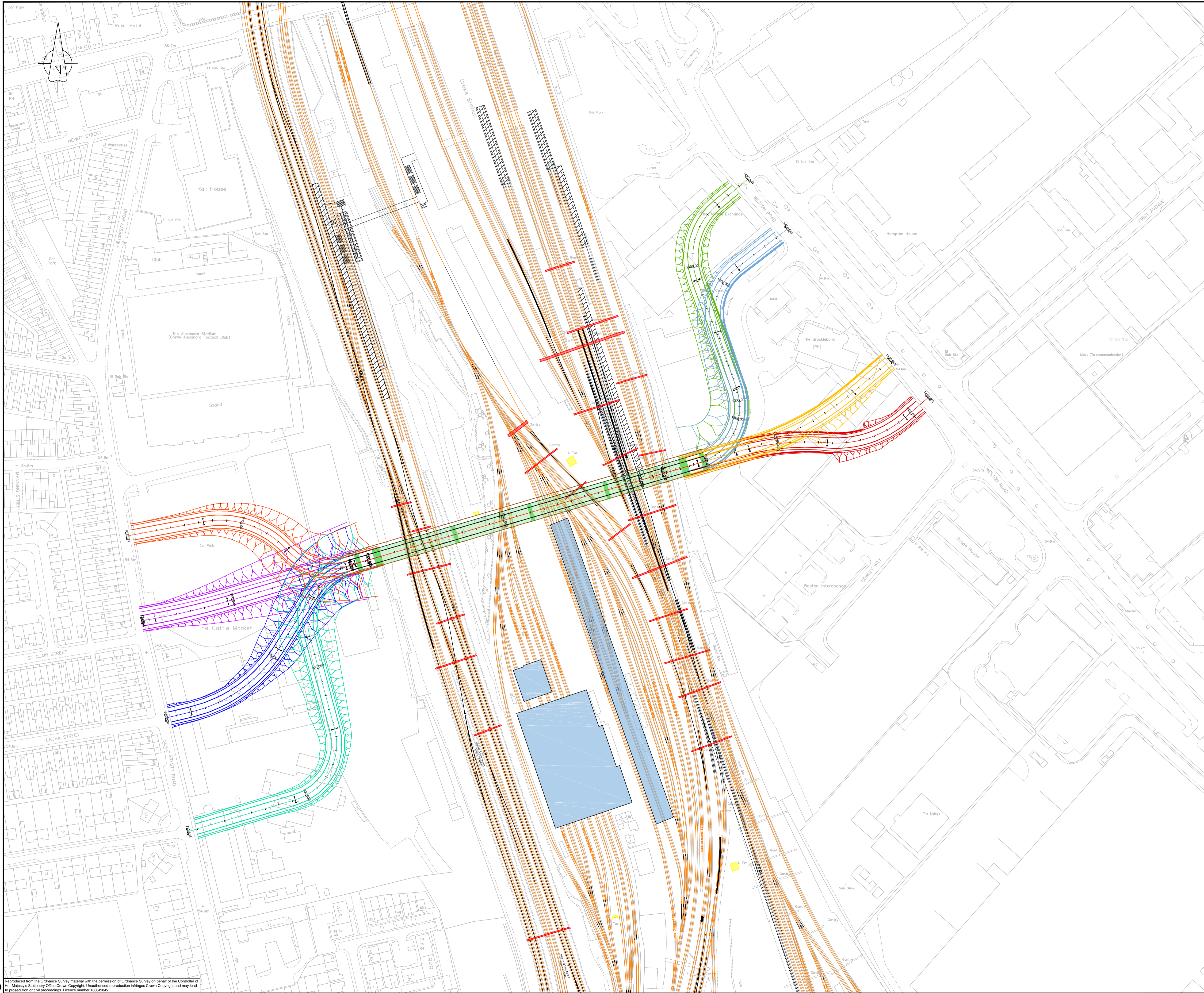
Appendix A – Access Road Options Presented at Consultation



Appendix B – Initial Feasibility Design Access Options

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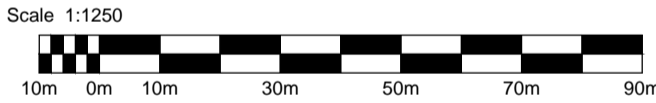


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Key

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- Revised Option 2 for Proposed Bridge Deck
- Option West 1
- Option West 2
- Option West 3
- Option West 4
- Option East 1
- Option East 2
- Option East 3
- Option East 4
- Existing Gentries
- Existing Lighting Towers
- Indicative Location of New Train Care Building



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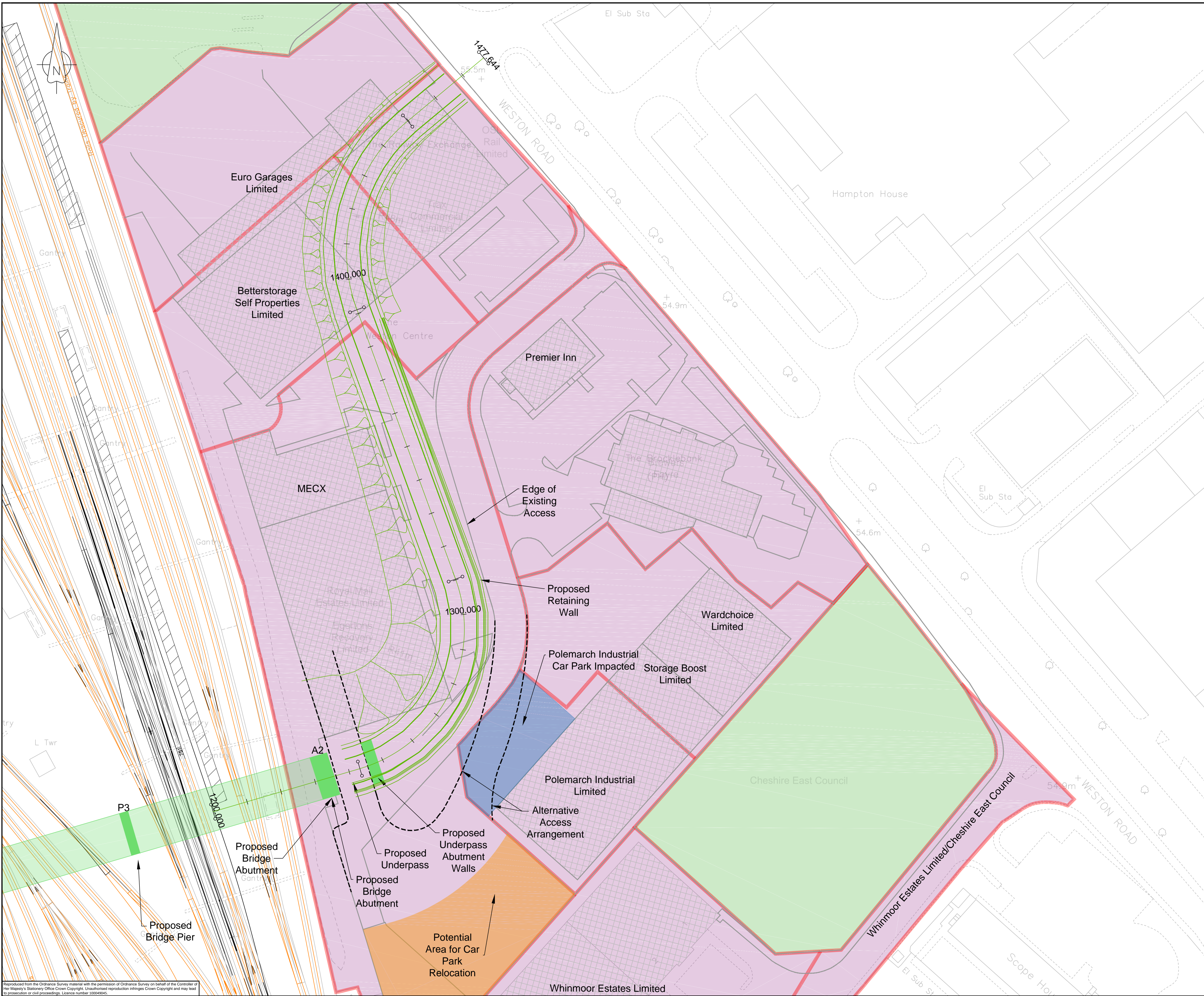
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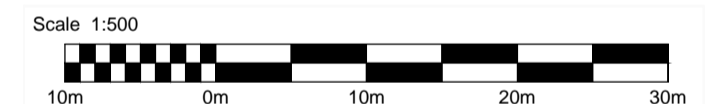


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- Council Owned Land
- Rail Tracks
- Proposed Bridge Pier
- Proposed Bridge Deck



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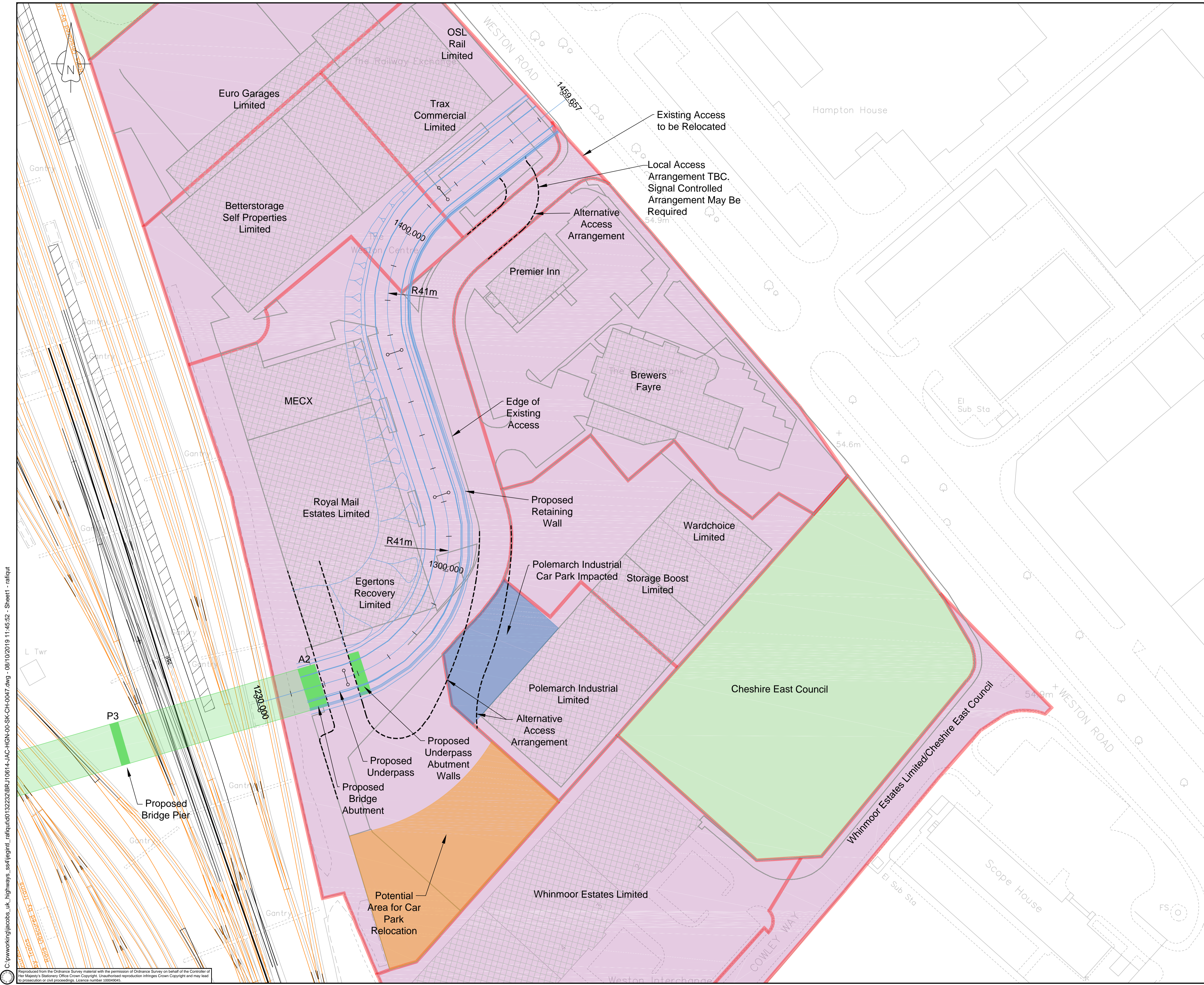
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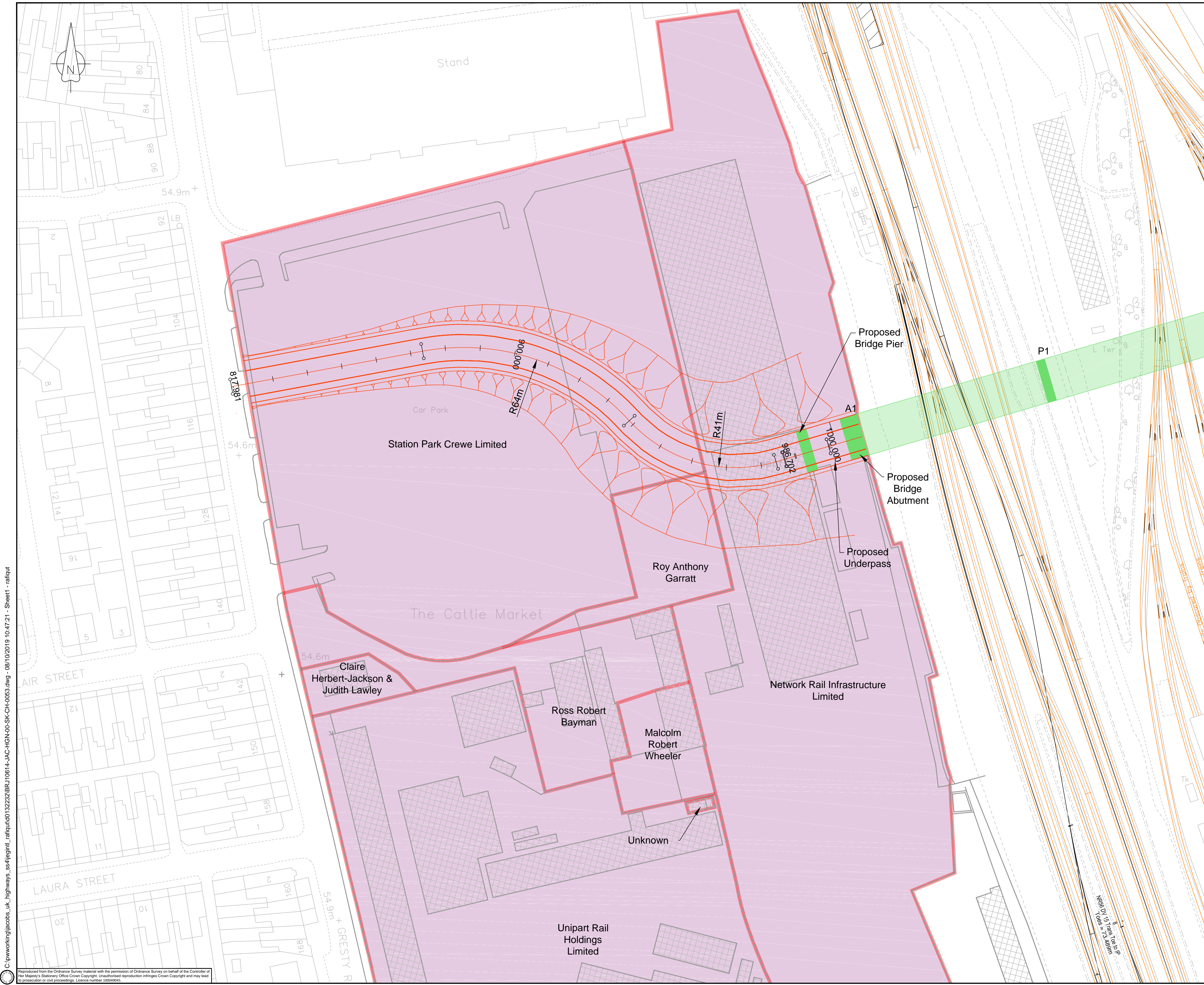
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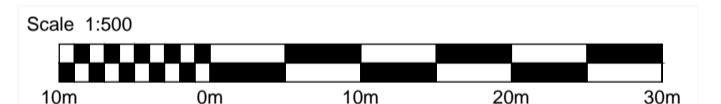


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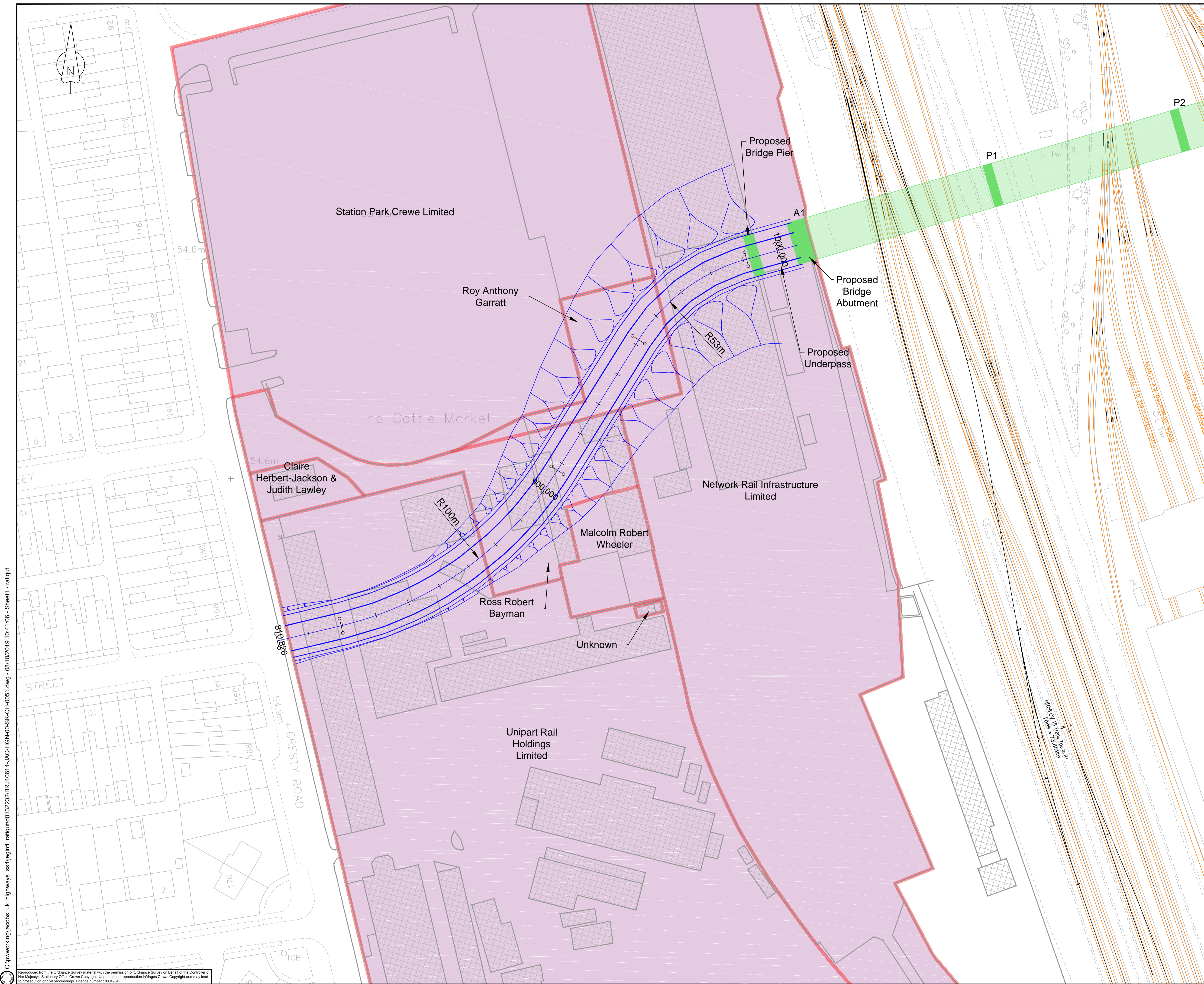
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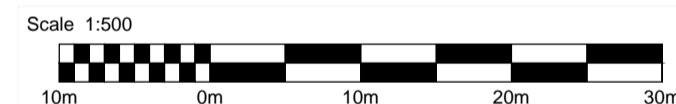


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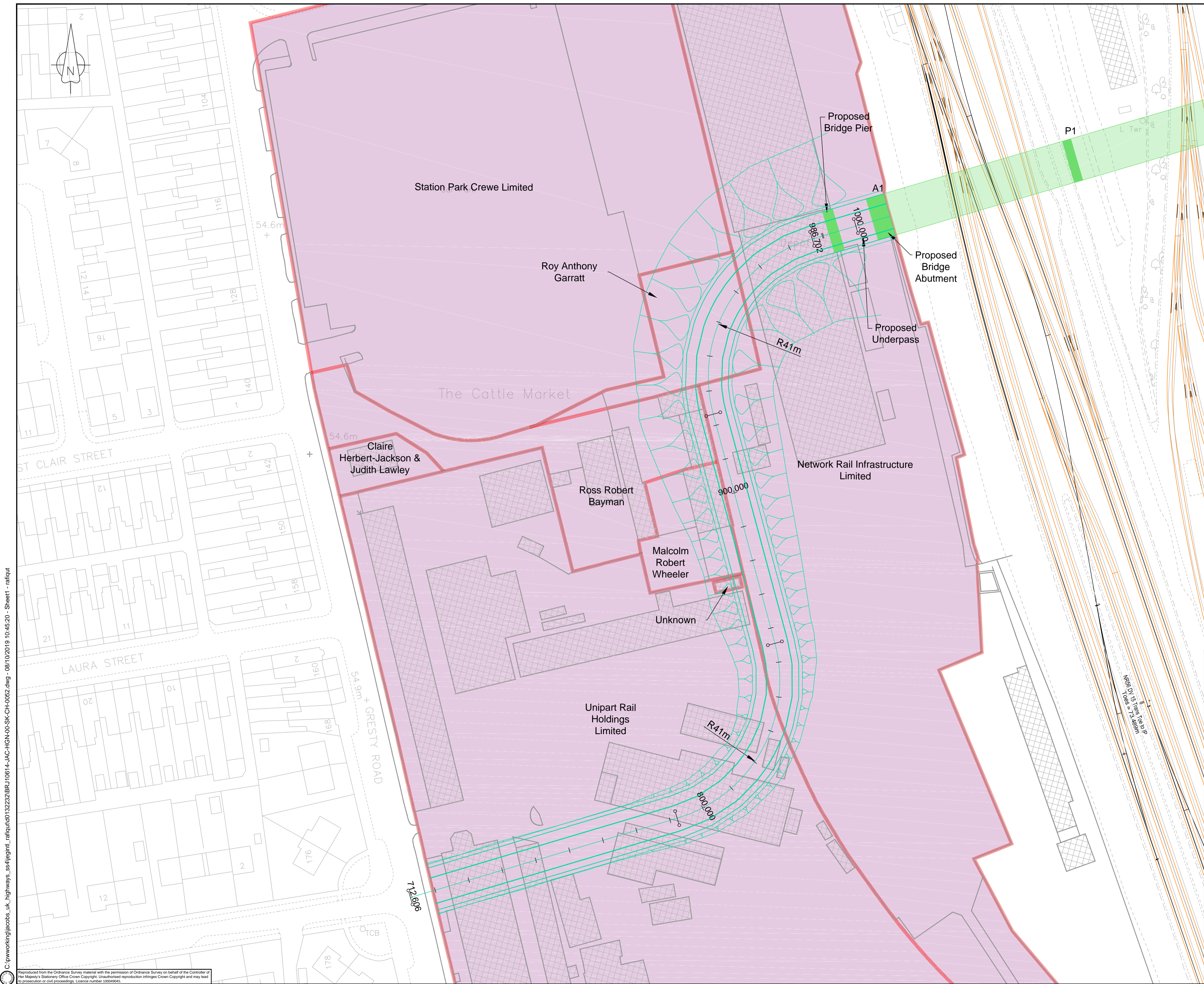
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C:\pwworking\jacobs_uk_highways_ss4\legintl_rail\ac0132232\BRJ10614-JAC-HGN-00-SK-CH-0052.dwg - 08/10/2019 10:45:20 - Sheet1 - railcut

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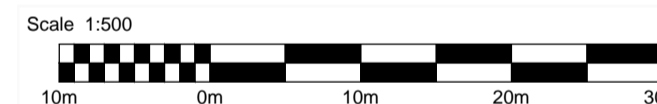


Notes

1. Do not scale from this drawing
2. All dimensions in metres unless otherwise noted

Key

- Indicative Land Boundary
- Indicative Property/Building Outline
- Existing Businesses
- Council Owned Land
- Rail Tracks
- Proposed Bridge Pier
- Proposed Bridge Deck



P00	08/10/19	FOR INFORMATION	TR	GW	GW	PS
Rev	Rev. Date	Purpose of revision	Drawn	Checked	Rev'd	Apprv'd

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Client



Project

CREWE HS2 HUB
ACCESS PACKAGE

Drawing title

OPTION WEST 4
ALIGNMENT

Drawing status
S2 - SUITABLE FOR INFORMATION

Scale 1:500@A1 DO NOT SCALE

Jacobs No. Rev P00

Client no.

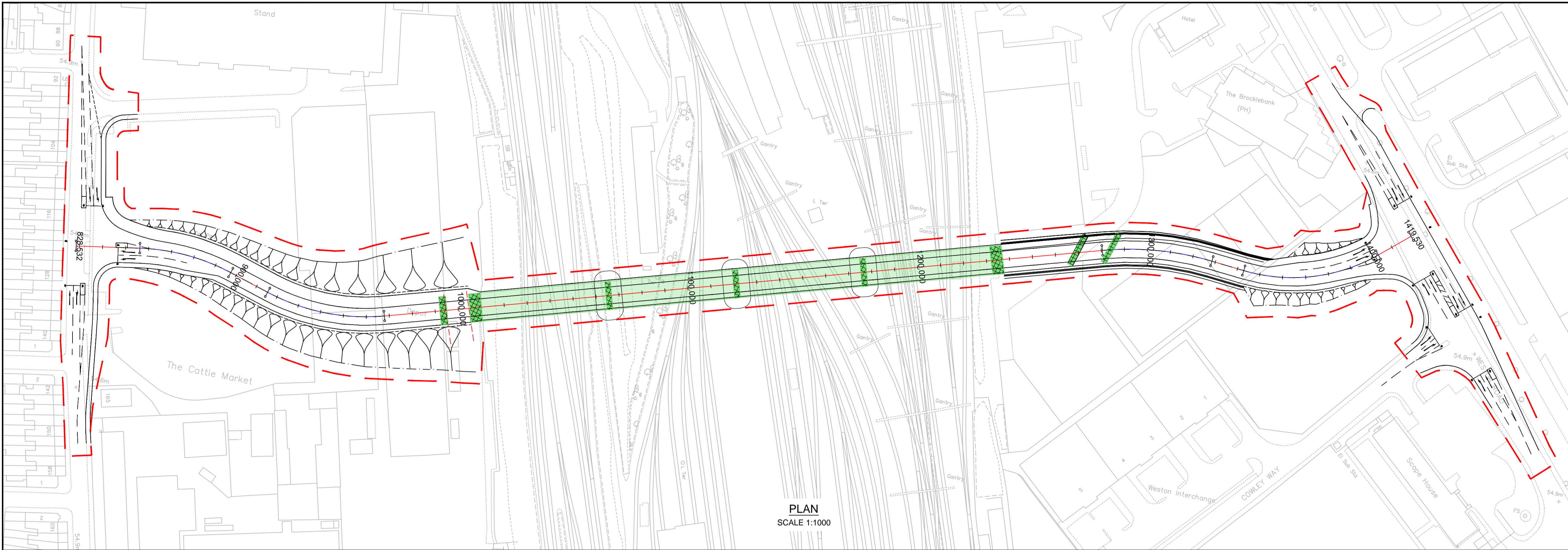
Drawing number

BRJ10614-JAC-HGN-00-SK-CH-0052

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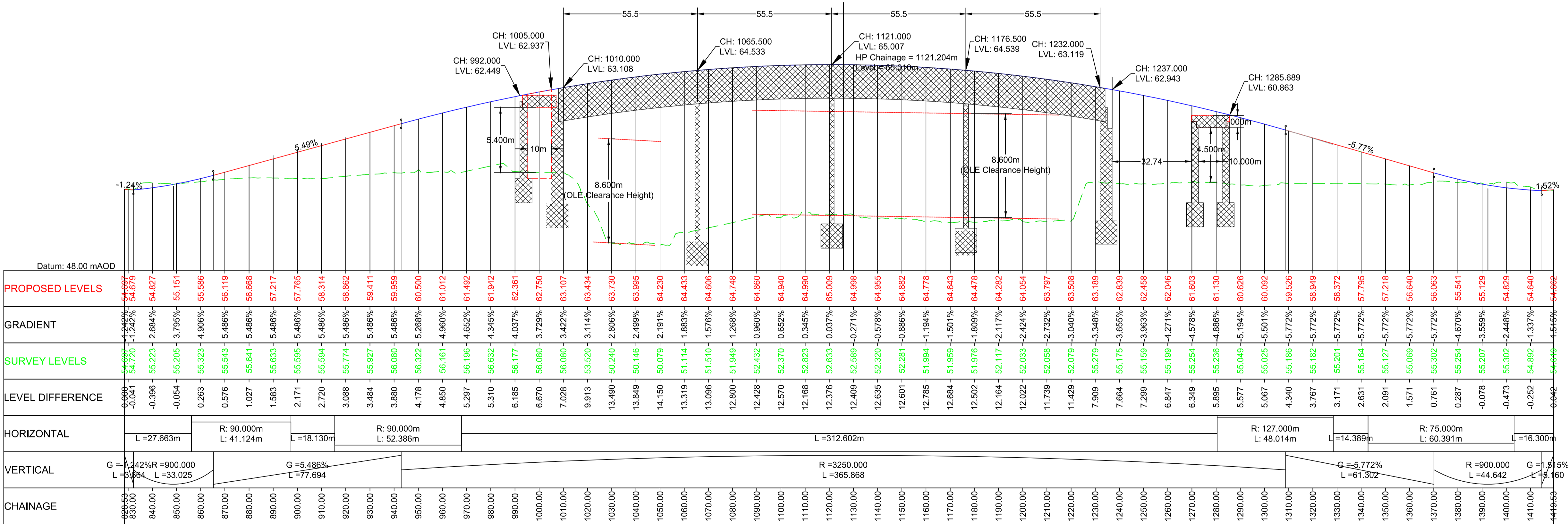
Appendix C – Preferred Route Alignment

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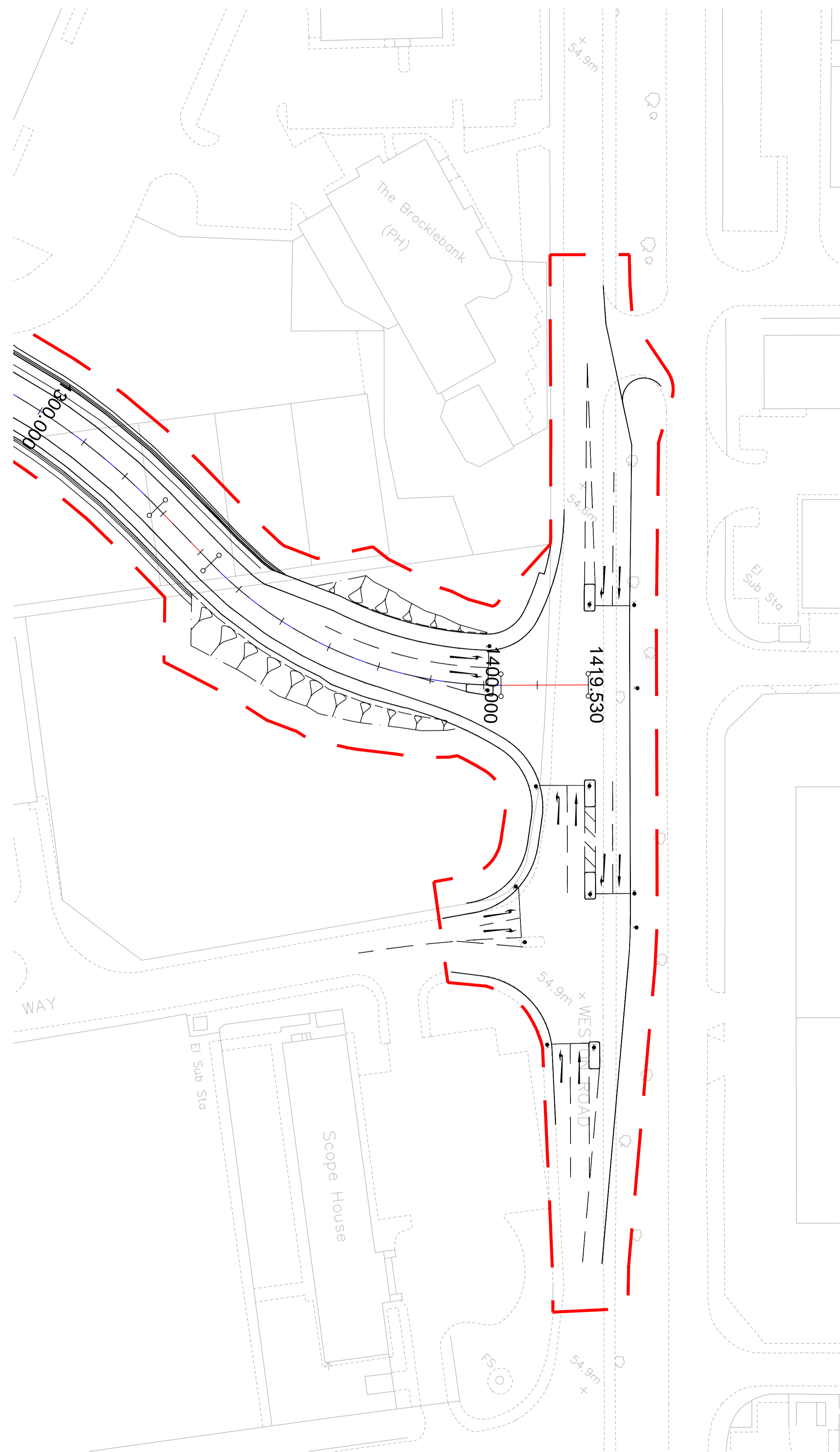
PLAN
SCALE 1:1000

- Notes
- Do not scale from this drawing
 - All dimensions in metres unless otherwise noted
- Key
- Earthworks
 - Red line boundary
- Profile
- Existing ground level
 - Proposed road level



Scale 1:1000
10m 0m 10m 20m 30m 40m 50m 60m 70m


Datum: 48.00 mAOD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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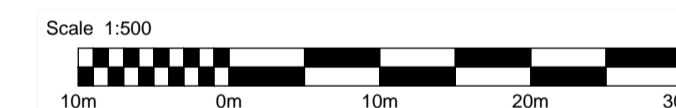
Notes

1. Do not scale from this drawing
2. All dimensions in metres unless otherwise noted

Key

 Earthworks

Red Line Boundary



P00	08/10/19	FOR INFORMATION	TR	GW	GW	PS
Rev	Rev. Date	Purpose of revision	Drawn	Checked	Rev'd	Approved

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Project

CREWE HS2 HUB
ACCESS PACKAGE

Drawing title

SCHEMATIC JUNCTION ARRANGEMENTS

Drawing status

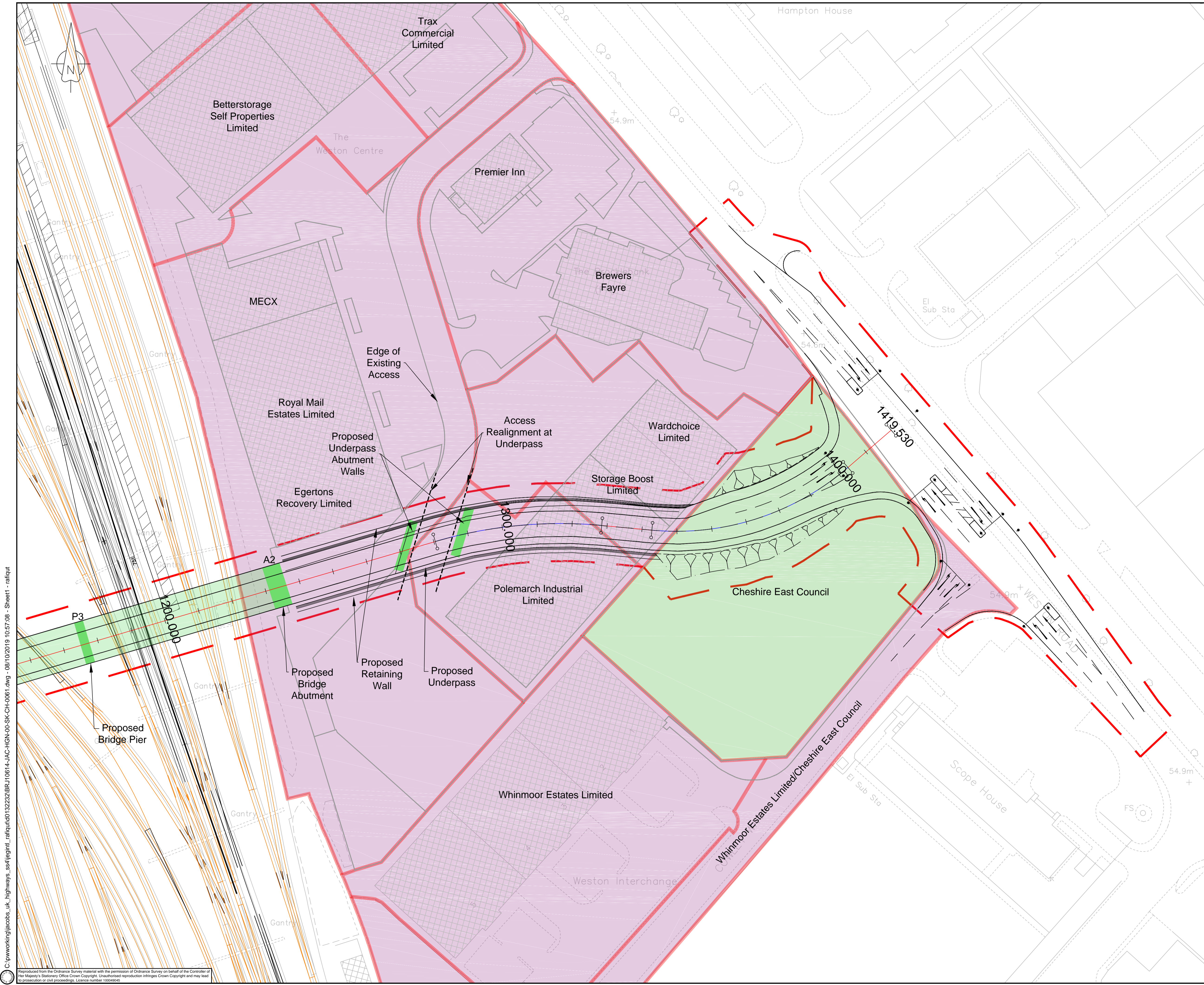
Drawing status
S2 - SUITABLE FOR INFORMATION

Scale	@N/A	DO NOT SCALE Rev P00
Jacobs No.		
Client no.		

Drawing number

BRJ10614-JAC-HGN-00-SK-CH-0059

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Notes

- Do not scale from this drawing
- All dimensions in metres unless otherwise noted

Key

- Indicative Land Boundary
- Indicative Property/Building Outline
- Existing Businesses
- Council Owned Land
- Rail Tracks
- Proposed Bridge Pier
- Proposed Bridge Deck
- Red Line Boundary

Scale 1:500

P00	08/10/19	FOR INFORMATION	TR	GW	GW	PS
Rev	Rev. Date	Purpose of revision	Drawn	Checked	Rev'd	Approved

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Client

Cheshire East Council

Project

**CREWE HS2 HUB
ACCESS PACKAGE**

Drawing title

**PREFERRED ROUTE
EAST ALIGNMENT**

Drawing status

S2 - SUITABLE FOR INFORMATION

Scale	@N/A	DO NOT SCALE
Jacobs No.		Rev P00
Client no.		

Drawing number

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Appendix D – Sensitivity Testing Results

SENSITIVITY TEST 1 (+ -10%) - WESTERN ACCESS OPTIONS

												Unweighted Scores			
Topic / Factor	Original Weighting	Sensitivity Test 1.1	Sensitivity Test 1.2	Sensitivity Test 1.3	Sensitivity Test 1.4	Sensitivity Test 1.5	Sensitivity Test 1.6	Sensitivity Test 1.7	Sensitivity Test 1.8	Sensitivity Test 1.9	Sensitivity Test 1.10	West 1	West 2	West 3	West 4
Access Option Cost	1	0.966	1.019	0.969	0.969	0.980	1.012	1.038	0.965	1.092	0.955	0	0	-1	-1
Disruption to Directly Impacted Local Businesses	1	1.057	0.905	1.053	0.900	0.961	0.972	0.924	1.093	1.073	0.970	-1	-1	-2	-3
Local Business Community Endorsement	2	2.194	1.822	2.068	1.902	1.853	2.001	1.915	1.871	2.165	2.073	1	1	1	1
Public Endorsement	1	0.995	0.979	0.910	0.927	0.921	1.017	0.935	1.046	1.025	1.100	1	2	0	1
Accessibility (including Non-Motorised Users)	0.25	0.258	0.228	0.233	0.246	0.230	0.239	0.271	0.227	0.275	0.244	2	1	2	3
Engineering Constraints	0.25	0.268	0.260	0.230	0.244	0.272	0.241	0.242	0.273	0.235	0.244	0	0	0	0
Road User Safety	1	0.901	1.062	1.024	1.099	1.077	0.961	1.089	0.975	0.917	0.953	0	1	0	0
Constructability	1	1.059	1.052	1.012	1.034	1.019	1.020	0.979	0.936	0.924	0.962	0	2	0	0
Environmental Impacts	0.5	0.502	0.495	0.491	0.533	0.481	0.542	0.490	0.488	0.538	0.533	0	0	-1	-1
Traffic Constraints	1	0.975	0.923	1.084	0.910	0.948	1.089	1.062	1.023	1.041	1.087	3	2	2	2
												Total Unweighted Scores			
												6	8	1	2

		Total Weighted Scores			
		West 1	West 2	West 3	West 4
Sensitivity Test 1.1		5.573	8.353	1.077	1.273
Sensitivity Test 1.2		5.121	8.115	0.800	1.102
Sensitivity Test 1.3		5.642	8.283	1.135	1.225
Sensitivity Test 1.4		5.150	8.088	0.911	1.184
Sensitivity Test 1.5		5.116	7.974	0.825	1.015
Sensitivity Test 1.6		5.791	8.483	1.159	1.444
Sensitivity Test 1.7		5.652	8.301	1.204	1.486
Sensitivity Test 1.8		5.347	7.990	0.733	0.913
Sensitivity Test 1.9		5.789	8.263	1.021	1.248
Sensitivity Test 1.10		5.951	8.598	1.306	1.680
Average		5.51	8.24	1.02	1.26

Sensitivity Assessment		
West 2 - West 1	West 1 - West 3	West 1 - West 4
2.781	4.495	4.299
2.993	4.321	4.020
2.640	4.507	4.417
2.937	4.239	3.967
2.858	4.292	4.101
2.692	4.632	4.347
2.649	4.448	4.166
2.643	4.614	4.434
2.474	4.768	4.541
2.647	4.645	4.271
2.73	4.50	4.26

Unweighted Scoring Key	
3	Extremely Beneficial
2	Significantly Beneficial
1	Beneficial
0	Neutral
-1	Adverse
-2	Significantly Adverse
-3	Extremely Adverse

SENSITIVITY TEST 2 (+ -25%) - WESTERN ACCESS OPTIONS

												Unweighted Scores			
Topic / Factor	Original Weighting	Sensitivity Test 1.1	Sensitivity Test 1.2	Sensitivity Test 1.3	Sensitivity Test 1.4	Sensitivity Test 1.5	Sensitivity Test 1.6	Sensitivity Test 1.7	Sensitivity Test 1.8	Sensitivity Test 1.9	Sensitivity Test 1.10	West 1	West 2	West 3	West 4
Access Option Cost	1	1.016	1.015	0.838	0.924	0.872	0.936	0.841	1.244	1.121	0.801	0	0	-1	-1
Disruption to Directly Impacted Local Businesses	1	0.751	0.881	0.935	1.124	1.224	0.939	0.984	1.022	1.096	0.804	-1	-1	-2	-3
Local Business Community Endorsement	2	2.033	2.380	1.528	1.899	2.446	2.367	1.983	1.634	2.149	2.270	1	1	1	1
Public Endorsement	1	0.878	1.042	1.082	0.870	0.985	1.029	1.096	1.012	1.035	0.933	1	2	0	1
Accessibility (including Non-Motorised Users)	0.25	0.277	0.202	0.294	0.235	0.270	0.312	0.260	0.303	0.224	0.278	2	1	2	3
Engineering Constraints	0.25	0.255	0.310	0.251	0.227	0.236	0.204	0.192	0.261	0.302	0.285	0	0	0	0
Road User Safety	1	0.949	0.973	0.781	0.922	1.074	0.783	1.019	0.769	0.960	0.842	0	1	0	0
Constructability	1	1.065	0.840	0.826	1.038	1.165	0.792	1.127	1.004	1.249	1.241	0	2	0	0
Environmental Impacts	0.5	0.391	0.460	0.589	0.500	0.567	0.481	0.497	0.377	0.444	0.451	0	0	-1	-1
Traffic Constraints	1	1.036	1.129	1.131	0.753	1.064	1.235	1.224	1.070	1.215	0.847	3	2	2	2
												Total Unweighted Scores			
												6	8	1	2

		Total Weighted Scores			
		West 1	West 2	West 3	West 4
Sensitivity Test 1.1		5.821	8.465	1.750	2.154
Sensitivity Test 1.2		6.331	8.696	1.804	2.167
Sensitivity Test 1.3		5.656	7.747	1.082	1.522
Sensitivity Test 1.4		4.374	7.255	0.204	0.186
Sensitivity Test 1.5		5.940	8.993	1.227	1.258
Sensitivity Test 1.6		6.786	8.635	2.166	2.569
Sensitivity Test 1.7		6.286	9.171	1.644	2.016
Sensitivity Test 1.8		5.439	7.856	0.713	1.006
Sensitivity Test 1.9		6.183	9.236	1.272	1.436
Sensitivity Test 1.10		5.496	8.626	1.660	2.067
Average		5.83	8.47	1.35	1.64

Sensitivity Assessment		
West 2 - West 1	West 1 - West 3	West 1 - West 4
2.644	4.071	3.668
2.365	4.527	4.164
2.091	4.574	4.134
2.881	4.170	4.188
3.053	4.713	4.682
1.849	4.620	4.217
2.885	4.642	4.270
2.417	4.726	4.433
3.053	4.911	4.747
3.130	3.836	3.429
2.64	4.48	4.19

Unweighted Scoring Key	
3	Extremely Beneficial
2	Significantly Beneficial
1	Beneficial
0	Neutral
-1	Adverse
-2	Significantly Adverse
-3	Extremely Adverse

SENSITIVITY TEST 3 (+ -40%) - WESTERN ACCESS OPTIONS

												Unweighted Scores			
Topic / Factor	Original Weighting	Sensitivity Test 1.1	Sensitivity Test 1.2	Sensitivity Test 1.3	Sensitivity Test 1.4	Sensitivity Test 1.5	Sensitivity Test 1.6	Sensitivity Test 1.7	Sensitivity Test 1.8	Sensitivity Test 1.9	Sensitivity Test 1.10	West 1	West 2	West 3	West 4
Access Option Cost	1	1.390	0.615	0.698	0.713	0.740	0.753	0.663	1.206	0.690	1.141	0	0	-1	-1
Disruption to Directly Impacted Local Businesses	1	1.075	1.368	1.093	1.390	0.632	0.793	0.781	1.224	1.193	0.725	-1	-1	-2	-3
Local Business Community Endorsement	2	2.492	2.171	1.562	1.866	1.345	1.945	1.944	2.700	1.525	2.704	1	1	1	1
Public Endorsement	1	0.740	1.288	1.178	1.021	0.787	1.101	0.953	0.838	0.762	1.015	1	2	0	1
Accessibility (including Non-Motorised Users)	0.25	0.275	0.165	0.343	0.345	0.330	0.341	0.152	0.268	0.233	0.193	2	1	2	3
Engineering Constraints	0.25	0.265	0.296	0.325	0.298	0.176	0.340	0.296	0.199	0.257	0.225	0	0	0	0
Road User Safety	1	1.210	0.659	1.372	0.657	0.969	1.309	1.195	1.341	0.983	1.113	0	1	0	0
Constructability	1	1.374	1.029	0.834	1.079	0.851	1.223	1.376	0.958	0.648	0.688	0	2	0	0
Environmental Impacts	0.5	0.537	0.534	0.627	0.398	0.678	0.341	0.641	0.698	0.306	0.571	0	0	-1	-1
Traffic Constraints	1	0.968	1.376	1.145	0.797	1.226	1.314	1.207	1.082	0.875	0.948	3	2	2	2
												Total Unweighted Scores			
												6	8	1	2

		Total Weighted Scores			
		West 1	West 2	West 3	West 4
Sensitivity Test 1.1		5.609	9.066	0.900	0.840
Sensitivity Test 1.2		6.549	9.013	1.368	1.453
Sensitivity Test 1.3		5.767	8.496	1.026	1.454
Sensitivity Test 1.4		4.576	7.271	0.257	0.232
Sensitivity Test 1.5		5.836	7.740	1.773	2.257
Sensitivity Test 1.6		6.876	10.077	2.574	3.222
Sensitivity Test 1.7		6.042	9.583	1.796	2.121
Sensitivity Test 1.8		6.097	8.841	1.049	0.932
Sensitivity Test 1.9		4.185	6.119	0.359	0.162
Sensitivity Test 1.10		6.224	8.587	1.825	2.308
Average		5.78	8.48	1.29	1.50

Sensitivity Assessment		
West 2 - West 1	West 1 - West 3	West 1 - West 4
3.456	4.710	4.770
2.464	5.181	5.096
2.730	4.741	4.313
2.695	4.319	4.344
1.903	4.063	3.579
3.201	4.302	3.654
3.542	4.245	3.921
2.744	5.048	5.166
1.933	3.826	4.023
2.363	4.400	3.916
2.70	4.48	4.28

Unweighted Scoring Key	
3	Extremely Beneficial
2	Significantly Beneficial
1	Beneficial
0	Neutral
-1	Adverse
-2	Significantly Adverse
-3	Extremely Adverse

SENSITIVITY TEST 1 (+ -10%) - EASTERN ACCESS OPTIONS

												Unweighted Scores			
Topic / Factor	Original Weighting	Sensitivity Test 1.1	Sensitivity Test 1.2	Sensitivity Test 1.3	Sensitivity Test 1.4	Sensitivity Test 1.5	Sensitivity Test 1.6	Sensitivity Test 1.7	Sensitivity Test 1.8	Sensitivity Test 1.9	Sensitivity Test 1.10	East 1	East 2	East 3	East 4
Access Option Cost	1	1.008	1.031	1.092	0.926	0.979	0.928	1.001	0.969	0.989	0.987	-1	-1	-2	-1
Disruption to Directly Impacted Local Businesses	1	0.974	0.952	0.929	0.970	1.026	1.064	0.925	0.918	0.934	0.971	-3	-3	-1	-1
Local Business Community Endorsement	2	1.950	2.040	2.175	1.871	2.128	1.841	1.823	1.852	1.858	1.970	1	1	1	1
Public Endorsement	1	0.937	1.067	1.067	0.992	1.025	1.076	0.999	0.966	1.086	0.993	1	1	1	2
Accessibility (including Non-Motorised Users)	0.25	0.248	0.251	0.253	0.228	0.264	0.272	0.260	0.233	0.251	0.236	3	2	1	1
Engineering Constraints	0.25	0.264	0.263	0.235	0.259	0.226	0.229	0.267	0.246	0.241	0.269	0	0	0	0
Road User Safety	1	0.985	0.937	1.019	0.907	1.090	0.958	1.047	0.970	0.973	0.953	-1	-1	0	0
Constructability	1	0.926	0.983	1.086	0.918	0.906	0.974	0.996	1.025	0.983	1.011	0	0	1	1
Environmental Impacts	0.5	0.485	0.465	0.497	0.468	0.451	0.512	0.530	0.472	0.534	0.464	0	0	0	0
Traffic Constraints	1	1.078	1.049	1.077	0.958	0.943	0.943	0.948	0.948	0.971	1.084	2	2	3	3
												Total Unweighted Scores			
												2	1	4	6

		Total Weighted Scores			
		East 1	East 2	East 3	East 4
Sensitivity Test 1.1		0.873	0.625	4.305	6.250
Sensitivity Test 1.2		1.137	0.885	4.475	6.573
Sensitivity Test 1.3		1.256	1.003	4.698	6.857
Sensitivity Test 1.4		0.719	0.491	4.059	5.977
Sensitivity Test 1.5		0.682	0.418	4.168	6.171
Sensitivity Test 1.6		0.541	0.269	4.072	6.076
Sensitivity Test 1.7		0.677	0.416	3.996	5.996
Sensitivity Test 1.8		0.717	0.485	4.062	5.997
Sensitivity Test 1.9		0.877	0.625	4.180	6.254
Sensitivity Test 1.10		0.986	0.750	4.517	6.496
Average		0.85	0.60	4.25	6.26

Sensitivity Assessment		
East 4 - East 3	East 3 - East 1	East 3 - East 2
1.945	3.431	3.680
2.098	3.339	3.590
2.159	3.442	3.695
1.918	3.341	3.569
2.004	3.486	3.749
2.004	3.532	3.803
2.000	3.320	3.580
1.935	3.345	3.578
2.074	3.304	3.555
1.980	3.530	3.766
2.01	3.41	3.66

Unweighted Scoring Key	
3	Extremely Beneficial
2	Significantly Beneficial
1	Beneficial
0	Neutral
-1	Adverse
-2	Significantly Adverse
-3	Extremely Adverse

SENSITIVITY TEST 2 (+ -25%) - EASTERN ACCESS OPTIONS

												Unweighted Scores			
Topic / Factor	Original Weighting	Sensitivity Test 1.1	Sensitivity Test 1.2	Sensitivity Test 1.3	Sensitivity Test 1.4	Sensitivity Test 1.5	Sensitivity Test 1.6	Sensitivity Test 1.7	Sensitivity Test 1.8	Sensitivity Test 1.9	Sensitivity Test 1.10	East 1	East 2	East 3	East 4
Access Option Cost	1	1.127	1.193	1.084	0.910	1.018	0.842	1.151	0.830	1.080	1.162	-1	-1	-2	-1
Disruption to Directly Impacted Local Businesses	1	0.820	0.840	1.136	0.839	1.023	0.779	1.128	1.093	1.039	1.085	-3	-3	-1	-1
Local Business Community Endorsement	2	2.172	2.026	1.624	2.108	2.030	2.467	1.772	2.288	2.492	2.467	1	1	1	1
Public Endorsement	1	0.981	1.055	1.058	0.817	1.238	1.155	1.119	1.204	0.887	0.973	1	1	1	2
Accessibility (including Non-Motorised Users)	0.25	0.282	0.198	0.263	0.189	0.259	0.191	0.290	0.219	0.282	0.294	3	2	1	1
Engineering Constraints	0.25	0.246	0.198	0.248	0.214	0.224	0.228	0.311	0.258	0.297	0.242	0	0	0	0
Road User Safety	1	1.068	0.883	1.062	1.156	1.058	0.863	0.864	0.778	1.197	0.877	-1	-1	0	0
Constructability	1	0.914	0.813	1.166	1.157	1.033	1.173	0.913	0.908	0.890	1.160	0	0	1	1
Environmental Impacts	0.5	0.524	0.406	0.576	0.461	0.443	0.448	0.580	0.491	0.508	0.591	0	0	0	0
Traffic Constraints	1	1.109	1.109	1.130	0.897	1.081	1.227	0.989	1.047	1.085	0.801	2	2	3	3
												Total Unweighted Scores			
												2	1	4	6

		Total Weighted Scores			
		East 1	East 2	East 3	East 4
Sensitivity Test 1.1		1.562	1.280	4.602	6.710
Sensitivity Test 1.2		1.298	1.100	4.193	6.441
Sensitivity Test 1.3		0.175	-0.088	4.196	6.338
Sensitivity Test 1.4		0.702	0.513	4.301	6.029
Sensitivity Test 1.5		1.062	0.803	4.743	7.000
Sensitivity Test 1.6		2.608	2.416	6.205	8.202
Sensitivity Test 1.7		0.341	0.051	3.631	5.900
Sensitivity Test 1.8		1.356	1.137	5.007	7.041
Sensitivity Test 1.9		1.001	0.718	4.605	6.572
Sensitivity Test 1.10		0.632	0.338	3.889	6.025
Average		1.07	0.83	4.54	6.63

Sensitivity Assessment		
East 4 - East 3	East 3 - East 1	East 3 - East 2
2.108	3.040	3.322
2.247	2.896	3.093
2.142	4.022	4.284
1.727	3.600	3.789
2.256	3.682	3.941
1.997	3.597	3.788
2.270	3.290	3.580
2.034	3.651	3.870
1.967	3.604	3.887
2.136	3.257	3.551
2.09	3.46	3.71

Unweighted Scoring Key	
3	Extremely Beneficial
2	Significantly Beneficial
1	Beneficial
0	Neutral
-1	Adverse
-2	Significantly Adverse
-3	Extremely Adverse

SENSITIVITY TEST 3 (+ -40%) - EASTERN ACCESS OPTIONS

												Unweighted Scores			
Topic / Factor	Original Weighting	Sensitivity Test 1.1	Sensitivity Test 1.2	Sensitivity Test 1.3	Sensitivity Test 1.4	Sensitivity Test 1.5	Sensitivity Test 1.6	Sensitivity Test 1.7	Sensitivity Test 1.8	Sensitivity Test 1.9	Sensitivity Test 1.10	East 1	East 2	East 3	East 4
Access Option Cost	1	1.288	1.286	1.062	1.058	1.016	1.218	0.705	1.151	0.851	0.698	-1	-1	-2	-1
Disruption to Directly Impacted Local Businesses	1	0.758	1.232	0.707	0.814	0.997	0.883	0.805	1.041	1.269	0.963	-3	-3	-1	-1
Local Business Community Endorsement	2	2.289	2.580	2.739	1.484	2.389	1.976	1.351	1.698	1.621	1.680	1	1	1	1
Public Endorsement	1	1.257	0.998	0.644	1.169	1.266	0.784	1.072	1.267	1.078	1.310	1	1	1	2
Accessibility (including Non-Motorised Users)	0.25	0.168	0.154	0.315	0.150	0.223	0.203	0.165	0.294	0.192	0.230	3	2	1	1
Engineering Constraints	0.25	0.181	0.229	0.253	0.285	0.271	0.252	0.229	0.339	0.191	0.320	0	0	0	0
Road User Safety	1	1.104	0.791	0.944	0.955	1.016	1.318	0.856	1.320	0.647	1.131	-1	-1	0	0
Constructability	1	1.044	0.850	1.020	1.142	0.928	0.674	1.353	1.334	0.699	1.155	0	0	1	1
Environmental Impacts	0.5	0.591	0.393	0.644	0.423	0.351	0.575	0.559	0.447	0.465	0.353	0	0	0	0
Traffic Constraints	1	0.816	1.029	1.025	1.340	1.122	1.028	1.338	0.927	0.640	1.319	2	2	3	3
												Total Unweighted Scores			
												2	1	4	6

		Total Weighted Scores			
		East 1	East 2	East 3	East 4
Sensitivity Test 1.1		1.014	0.847	3.871	6.416
Sensitivity Test 1.2		0.327	0.172	3.866	6.151
Sensitivity Test 1.3		2.251	1.937	4.963	6.669
Sensitivity Test 1.4		1.328	1.178	5.035	7.262
Sensitivity Test 1.5		1.546	1.323	5.144	7.426
Sensitivity Test 1.6		0.240	0.037	3.402	5.405
Sensitivity Test 1.7		1.616	1.451	5.739	7.515
Sensitivity Test 1.8		0.105	-0.189	4.028	6.447
Sensitivity Test 1.9		-0.752	-0.944	2.537	4.466
Sensitivity Test 1.10		1.600	1.370	5.972	7.980
Average		0.93	0.72	4.46	6.57

Sensitivity Assessment		
East 4 - East 3	East 3 - East 1	East 3 - East 2
2.545	2.857	3.024
2.285	3.540	3.694
1.705	2.712	3.027
2.227	3.707	3.857
2.282	3.598	3.822
2.002	3.162	3.365
1.777	4.123	4.287
2.419	3.923	4.217
1.929	3.290	3.481
2.008	4.371	4.602
2.12	3.53	3.74

Unweighted Scoring Key	
3	Extremely Beneficial
2	Significantly Beneficial
1	Beneficial
0	Neutral
-1	Adverse
-2	Significantly Adverse
-3	Extremely Adverse

Appendix E – Local Junction Improvements

INDICATIVE FUTURE JUNCTION IMPROVEMENTS REQUIRED TO
MANAGE FUTURE TRAFFIC FLOWS AND SUPPORT GROWTH

